WRITING ACTS: THE RISE OF MECHANISED WRITING AND THE BODY OF MODERNITY, 1711-1905

THESIS

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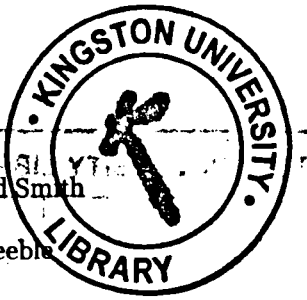

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Abstract

Alongside the telephone and camera, the typewriter is one of the most influential technologies of the late nineteenth century, often understood as being born fully formed and successful in 1874, with the arrival of the Sholes & Glidden Type-Writer on the open market. Yet prior to this machine, there had been over 150 attempts at inventing a mechanised writing machine, stretching back to the early eighteenth century; and after this date, there were a large number of writing machines that presented significantly different design propositions to keyboard-typebar mechanism for the typewriter.

This thesis sets out to explore the pre- and early history of the typewriter, beginning with the first recorded appearance of a writing machine in 1711 and ending in 1905 when, at a meeting of the Union Writing Machine Company, the design of the typewriter became stabilised. In its exploration, this thesis sets out to answer the double question: how has the body written and how has writing 'written' the body. Through these writing machines and alongside a history of writing and a history of machine-body relations, this question is answered through four tropes of mechanised writing: copying, fragmentation, dexterity, and agency.

Beginning in the early eighteenth century, this thesis begins with a comparative analysis of automata, early typewriting machines, polygraphs, pantographs, physiognotraces and handwriting pedagogy to argue that the Enlightenment's writing technologies and techniques were expressive of and formative to a discourse of copying and imitation. It then argues that as the human body became discursively fragmented into discrete units, through physiognomy, phrenology, anthropometry and Bertillonage, writing itself transformed from a process of continuity to one of fragmentation. It also argues that this process of fragmentation was part of the late-nineteenth century's pursuit of media transparency.

This thesis then examines the absorption of women's bodies into the labour market of late-nineteenth century Western capitalism as typewriter operators, arguing that the very domesticated dexterity ascribed to these bodies and articulated through the new theories of evolution and biological science, was a bodily skill through which women were able to subvert the cultural norm of 'angels of the home' to become commercial workers. Finally, this thesis turns to the question of agency and mechanised writing, though an analysis of an 'other' form of mechanised writing machine of the late nineteenth century, the index typewriter. Arguing that these machines are similar technologies to the Ouija Board, the thesis focuses on the phenomenon of nineteenth century Spiritualism, arguing that it can be understood not only as a deeply technological practice, but also one to which the act of writing was fundamental, as the inscription method through which a ventriloquism of agency could be performed.

Through this analysis of pre-twentieth century typewriters and typewriting, this thesis argues that as writing is a bodily act, it is both formative to and a reflection of the key discourses of modernity.

Keywords

Typewriter, Index Typewriters, Keyboard Typewriters, Automata, Pantograph, Polygraph, Planchette, Telegraph, Ouija Board, Writing, Handwriting, Typewriting, Needlework, Piano Playing, Spirit Writing, Silhouettes, Composite Photography, Chronophotography, International Auxiliary Languages, Spiritualism, Magic, Society for Psychical Research, Dexterity, Agency,

FOR MY DAD

WOLF HIRSCHMANN

FOR THE CURIOSITY OF IT ALL

&

IN MEMORY

FRIEDRICH KITTLER

1943-2011

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CONTENTS: PART I

Abstract ii

Dedication iii

Acknowledgements iv

Contents v

CHAPTERS

0.0 **Introduction** 1

The Problems of the Body Writing and of the Writing Body

1.0 **Copying Hands, Copying Bodies** 11

An Exploration of Automata, Copying Devices and Writing Techniques in the Eighteenth Century

Introduction 11

1.1 Copying Bodies (Sometimes Writing) 15

The Beginning of Enlightened Moving Bodies

Accomplished Automata

The Useless vs. Productive Gesture of the Machine

Conclusion: Living Encyclopaedias

1.2 Multiplying the Line: 'Facie-Traces,' Copying Machines and Polygraphs 25

Tracing the Head, Writing the Face

Early Photocopying Machines (Before the Photo)

Conclusion: Drawing and Writing as Copying

1.3 Eighteenth Century Types: Hand and Machine Writing 34

An Eighteenth Century Hand

Enlightened Mechanised Writing Machines

Conclusion: Copying to Write

Conclusion: Imitating Writing and Drawing Performance 39

2.0 **Typing Bodies** 40

The Science of Body Classification and Drive Towards Mechanised Writing

Introduction 41

2.1 Reading the Head: Physiognomy and Phrenology 44

Physiognomic Translations

Phrenological Writing

Conclusion: The Analytical Eye's Move To Type

2.2 Measuring Body Space: Constructing the Body Fragment 52

Francis Galton and the Birth of Anthropometrics

The Anthropometric Laboratory

Alphonse Bertillon's Criminal Library

Conclusion: The Laboratory and the Library

2.3 Photographic Ordering: Graphs, Grids, Composites and Mugshots 64

Étienne-Jules Marey's Graphical Abstractions

Francis Galton's Composite Faces

Alphonse Bertillon's Mugshots

Conclusion: A Multitude of Photographic Moments and Intents

2.4 Writing States: The Late Nineteenth Century Reconstruction of Babel 78

Detecting Writing, Characterising Handwriting

Language Content Transparency

The Malling-Hansen Writing Ball

Conclusion: Readable Bodies and Transparent Writing 88

3.0 **Dexterous Hands, Sinister Bodies** 90

The Naturalisation of Typewriting as a Feminine Practice

Introduction 90

3.1 Constructing the Female Stereotype 94

Evolution and its Mechanisms: The Biogenetic Law and Sexual Selection

The Shape and Content of the Female Stereotype

The Reproductive Economy of Femininity= Women as Mechanism

3.2 Superfluous Women and Their Accomplishments 105

The Odd Women: Excess Population in the Reproductive Economy

Needlework, Its Social and Phenomenological Practice

Piano Playing, Its Social and Phenomenological Practice

Dexterity and Typewriting Phenomenology

Phenomenological Distinctions and Technological Remediation

3.3 Mechanised Women: Telegraphists and Typewriters 1832-1905 119

Telegraph/y/ists

Typewriter Training

The Business Practices and Economics of the Typewriter

Conclusion: Technique Acquisition for the Commercial World 133

4.0 **Spirit (Writing) Media** 135

Ghostly typewriters of the Fin-de-Siécle and the Ventriloquism of Agency

Introduction 135

4.1 An Explosion of Writing Machines 138

Index (Type) Writers

Talking/Writing the Spirit

4.2 An Explosion of Spirit(ualism) and the Evident Ghost 145

The Birth of the Spirit Alphabet

The Media of Spiritualism

The Technologies of Spirit Media

4.3 Investigative Practices and Legitimate Knowledges 158

The Beginnings of Investigative Practices

Society for Psychical Research

Maskelyne and Cooke

Maskelyne's Automata

4.4 The Magical, The Spiritual, The Fantastical and The Typewriter 172

Conclusion: Moving in the Iron Cage 179

5.0 **Write Me, Read Me** 182
Concluding Remarks

Bibliography 190

Appendices

1: List of Pre-1868 Mechanised Writing Machines 213

2: List of Post-1868 Mechanised Writing Machines 220

CONTENTS: PART II

List of Figures i

A	Figures for Introduction: The Problems of the Body Writing and of the Writing Body	1
B	Figures for Copying Hands, Copying Bodies	4
C	Figures for Typing Bodies	23
D	Figures for Dexterous Hands, Sinister Bodies	50
E	Figures for Spirit (Writing) Media	54
F	Figures for Conclusion: Write Me, Read Me	68

Bibliography 69

The Problems of the Body Writing and of the Writing Body

> "Everybody knows what a typewriter is, and almost everyone uses one."
>
> F. Masi, *The Typewriter Legend* (1985)[1]

In his seminal 1950 paper 'Computing Machinery and Intelligence,' British mathematician Alan Turing argued that the criteria for a successful artificial intelligence would be a machine's ability to produce a piece of written text indistinguishable from one produced by a human being (Turing 1950, 433-436). In his attempt to answer the question 'Can machines think?'–albeit from a self-admittedly oblique angle–Turing drew on a Victorian parlour game in which a man and a woman, through a question and answer process, compete to convince an ungendered human third party that they are the woman.[2] Replacing the woman with an imagined machine, Turing's thought experiment adapted the imitation game to ask whether a machine in competition with a man could convince a judge that it was the man. Turing's rationale in choosing writing over speech as the communication medium was to silence the competing parties, so that the "tones of voice may not help the interrogator" (Turing 1950, 434). In shifting the competitors' voices into writing, Turing believed that their bodies, whichever and whatever form they took, would no longer leave an impression on the evidence of the game. In this process of divorcing man from his communication, Turing considered how this game could be enacted at a more practical level, through an evaluation of the most suitable writing technology. It was in this technological evaluation that a ubiquitous and particular hierarchy of writing technologies was re-articulated, with Turing outlining that in the game,

> ... the answers [of the players] should be written, or better still, typewritten. The ideal arrangement is to have a teleprinter communicating between the two rooms. (Turing 1950, 434).

For Turing, the strength of his imitation game in testing artificial intelligence was that it drew "a fairly sharp line between the physical and intellectual capacities of a man" (Turing 1950, 434). In drawing this line in the materiality of the communication, Turing's promotion of machine writing over and above handwriting was to promote man's intellectual capacity over and above his physical ability. However, in attempting to establish the rules of the game for artificial intelligence Turing's order of writing technology preference–first teleprinter, then typewriter, and finally handwriting–is based on the assumption that moving down the list from one writing technology to the next sees, somehow, an increasing physical presence of the author within the materiality of the text; or, to reverse the claim, the movement up the list, from handwriting to the typewriter to the teleprinter, is met by an emptying out of individual from his inscriptive mark.

This assumption about writing technologies has been articulated elsewhere, most famously only a few years earlier during a lecture series delivered during the winter semester of

[1] Masi 1985, 3.

[2] No reference to this game was found in a number of publications on Victorian parlour games, including Beaver 1974. Turing's use of this game can therefore, arguably, be seen as part of his own personal knowledge, rather than book knowledge; and thus part of an oral culture.

1942-43 at the University of Freiberg to a small class of fifteen students. On 15 December 1942, in the middle of his third lecture in a series of six on the Greek pre-Socratic philosopher Parmenides and ontology, German philosopher Martin Heidegger launched a tirade against the typewriter. Not only was this outburst met with the audience's reported surprise and bewilderment, it also left his students in no doubt as to how the philosopher had written his lecture series.[3] But what is more interesting for the purposes of this project is that after valorising the hand as "the essential distinction of man," Heidegger pours invective on the typewriter for it "tears writing from the essential realm of the hand," so much so that it is "one of the reasons for the increasing destruction of the word [read world]" (Heidegger 1992, 80-1). For Heidegger, "mechanical writing deprives the hand of its rank in the realm of the written word and degrades the word to a means of communication"; in short for Heidegger, "the typewriter makes everyone look the same" (Heidegger 1992, 81).

Some sixty years earlier, in the early 1880s, another German philosopher, this one near myopic, purchased a newly available object of technology, a writing machine. By this time, failing eyesight had become problematic for the prolific philosopher, most notably effecting his ability to write. As a possible solution, his sister Elisabeth sent him a clipping from *Süddeutsche Zeitung* from 1 December 1881 on a new type of machine that might prove to be a solution to his problem. The philosopher placed his order for a Malling Hansen Writing Sphere immediately, sending the required 375 Marks along with his order; and within eight weeks he was in receipt of this Danish brass writing machine, bought to his lodgings in Sils Maria, Switzerland by Paul Ree on 4 February 1882 (Figure 0.1). With this purchase, the philosopher Friedrich Nietzsche became the first 'mechanized philosopher' (Kittler 1990). After some two weeks of ownership, Nietzsche wrote the following verse about his writing machine on his writing machine,

> Schreibkugel ist ein Ding gleich mir: von Eisen
> Und doch leicht zu verdreh'n zumal auf Reisen.
> Geduld und Takt muss reichlich man besitzen
> Und feine Fingerchen, uns zu benützen[4]
>
> The typing-sphere is something like me: made of iron
> Yet easily distorted especially while travelling.
> One has to have sufficient tact and patience
> And delicate little fingers in order to use us.
>
> (Nietzsche 16 February 1882; quoted in Kittler 1990, 197. See Figure 0.2)

Besides presenting an erotic of writing, this verse binds the writing machine to Nietzsche's body, drawing attention to the particularity of the act of writing and in an (pre-)echo of Turing, alluding to the machine's possible agency, to its autonomous human-like state of being. It was this understanding of writing as a material act and the writing machine as a possible subjectivity in its own right that later led Nietzsche to speculate that as much as human action was required to operate this machine-tool, so might this machine-tool operate on the human mind. When the

[3] The lecture course was originally entitled 'Parmenides and Heraclitus'. However, as the translators of the lectures André Schuwer and Richard Rojcewicz note, when the lecture series was published it became simply Parmenides, due to Heidegger's concentration on this philosopher over and above Heraclitus (Heidegger 1992, i). An attempt to address this predicted bewilderment of his audience was made by Heidegger half way through his tirade, when he said,

> I have not been presenting a disquisition on the typewriter itself, regarding which it could justifiably be asked what in the world that has to do with Parmenides. My theme was the modern relation (transformed by the typewriter) of the hand to writing, i.e., to the word, i.e., to the unconcealedness of Being. A meditation on unconcealedness and on being does not merely have something to do with the didactic poem of Parmenides, it has everything to do with it. (Heidegger 1992, 85)

[4] Taken from facsimile of Nietzsche's Malling Hansen poem, February-March 1882 (Kittler 1999, 207)

philosopher's proof-reader and editor, composer Paul Gast, observed that there was a different style in the philosopher's writing since he began using the machine, and speculated on whether the philosopher would be creating a new philosophical idiom, Nietzsche answered more stridently, writing in response "Our writing tools are also working on our thoughts" (Kittler 1999, 200).[5]

These three philosophic stories of type writing–of Turing and his imitation game, of Heidegger's invective against the typewriter at the height of the Second World War, and of Nietzsche's speculation about writing technologies and thought in the decade when the typewriter was becoming a mass culture technology–highlight a set of problems around machine writing and the body. The first two mid-twentieth century moments rest on the assumption that the typewriter, in some way, empties out the subject from his writing, no doubt because of its products' supposed mechanical uniformity. This emptying out of the subject from the technology of writing is itself an echo of a particular thread of modernity, that of medium transparency, expressed by the sociologist Georg Simmel at the turn of the nineteenth century who argued that "the [type]written page now conveys only its pure content without any support or disturbance from its written form" (Simmel 2004, 469). Like Turing, Simmel argued that the typewriter concealed "the most personal element" and that the use of the typewriter acted as a mute to a body's signification so much so that typewriting, in a particular way, doesn't mean anything (Simmel 2004, 469). What is clear in both Heidegger and Turing's thinking on the typewriter is that the hierarchy of writing technology is ordered by its proximity to the subjectivity of writer; handwriting being the most intimate, most legible inscriptive mark for human identity; teleprinting (that which nowadays we might call computer writing) the most distanced, the most illegible for the human being who wrote it. Whereas handwriting is thought to embed the subject, teleprinting strips her out from the text. And it is between the hyper-authenticity of handwriting and the separation of the subject from her writing with the teleprinter that the typewriter stands as a liminal object, a writing technology through which subjectivity begins to be torn from the individual. However, this liminality also finds its articulation in the nature of the object itself, in that as Heidegger noted, "the typewriter is not really a machine in the strict sense of machine technology, but is an "intermediate" thing, between tool and a machine, a mechanism" (Heidegger 1992, 86).

However Heidegger's invective is problematic, as the typewriter does not bypass the hand, as the philosopher Jacques Derrida has noted; rather it "engages another hand, another "command," so to speak, another induction, another injunction from body to hand and from hand to writing" (Derrida 2005, 21). Therefore, despite the claims of Heidegger, Turing and Simmel, the body is still necessarily present in typewriting, as the typewriter is not a self-acting machine. And as the body is necessarily present in machine writing, it is not, Derrida notes, "legitimate to contrast writing by hand and "mechanical" writing, like a pre-technological craft as opposed to technology", a contrast made frequently and one that carries with it the status of ontology if following Heidegger and the ontological status of intelligence if following Turing (Derrida 2005, 20). For the argument that writing by hand is a pre-technological craft and writing by typewriter is a technology is a false binary, undermined by the ontology of writing itself, as a notational system that is deeply technological–for "when we write "by hand" we are not in the time before technology; there is already instrumentality, regular reproduction, mechanical iterability" (Derrida 2005, 20). In this observation that writing itself is a technological practice, Derrida is following in the footsteps of other medium theorists of language including the classicist Eric Havelock, the social anthropologist Jack Goody, the cultural theorist Walter Ong and the media

[5] He wrote this in a letter to Paul Gast, February 1882, in 1975-1984, pt. 3, 1: 172. There are various translation of this sentence, including "*Our writing tools* are also involved in our thoughts" and "our writing equipment takes part in the forming of our thoughts" (e.g. Carr 2008).

theorist Marshall McLuhan, who argue that the transition of a culture from an oral culture into an alphabetic or ideographic one is a profoundly technological moment, one that radically alters the culture in which writing appears (see Havelock 1981; Havelock 1986; Goody and Watt April 1953; Goody 1977; Goody 1987; Goody 1987; Ong 1977; Ong 1982; McLuhan 1962; and McLuhan 1964). Certainly throughout the body of his own highly influential media work, it is clear that McLuhan was keen to underscore the phonetic alphabet's status as a piece of technology, arguing in a technologically deterministic model that the phonetic alphabet 'created' modern 'civilized' man (McLuhan 1964, 91).

However in his recognition of the alphabet as technological, McLuhan argued that the content of medium of writing is speech (McLuhan and Fiore 1967, 107). Against this argument stands his one-time student Walter Ong, who argued that the decline of oral cultures and the rise of chirographic ones collapsed knowledge from a spatial and holistic form into a fragmented and individualised linear one. The separation of spoken language–the seemingly continuous stream of sound flowing through the body, altered by breath, tongue and teeth–into sentences, phrases, words and alphabetic symbols is not only a technological manoeuvre, but crucially for the language medium theorists noted above, a form of technology in which the individual and subjectivity itself becomes constituted.[6] This thread of language and body reveals another set of body-writing problems, one found reflected in Nietzsche's encounter with the Malling Hansen Writing Sphere that revolves around the proposition that the body is constituted within technology, that the history of body is inscribed within the history of technology. This proposition is traced through the most famous and influential critical texts on the typewriter, Friedrich Kittler's book of 1999 *Gramophone, Film, Typewriter*, in which Kittler argues that 'man' comes into being only through discourse networks, technological networks of inscription that place limits on the possibilities of meaning (Kittler 1999).

These two approaches to the machine-writing-body problem–one which foregrounds the body that writes, and the other the technologies that write the body–are entwined approaches, approaches that will be explored through the form of the typewriter. In paying attention to these foregroundings, it focuses on the history of the 'typewriter,' of mechanised writing, in the eighteenth and nineteenth century. By drawing on a liminal object, a technological machine that is, to requote Heidegger, a machine-tool which seems to stand half-way between handwriting and teleprinting (or computer writing), this thesis will attempt to answer the questions how has the body written; and how have these writing technology and techniques 'written' the body.

As a machine-tool that is not self-acting, it is clear in the first instance that typewriting, like handwriting, is an act of the body and as an act, writing is a technique. Using the anthropologist Marcel Mauss' definition of technique, it can be said that the act of writing is both effective, in that it works, and traditional, that it is a bodily process transmitted through culture, a definition which media philosopher Sybille Krämer specifies the act of writing more precisely, defining it as a cultural technique, by which she means "an operative process for dealing with symbolic worlds" (Mauss 1992 [1934], 75; Krämer 2003). However the use of a machine in the act of writing rather than a pen, pencil or quill, alters the technique of writing and this thesis explores how effective this machine writing was, as well as how the traditional aspect of the technique of type writing came into being, during the period of the typewriter's long and varied

[6] Walter Ong argues that the move from an oral culture to a literate one has re-structured human consciousness (Ong 1982). There are still those who argue for the primacy of oral language over written language, such as Steven Pinker, who writes, "But writing is clearly an optional accessory; the real engine of verbal communication is the spoken language we acquired as children" (Pinker 1994, 16). In his claim, Pinker sets to one side the different discourses around writing, how they intersect or do not with speech, the fact that speech and writing both are historically specific, and that children acquire writing at the same time as speech. It is this very 'optionality' of writing, as the simple inscription of speech that I intend to challenge through an historical account of writing practice.

conceptualisation, development and the early decades of its cultural and commercial success as a mass culture technology.

Although the popular history of the typewriter has it emerging fully formed and successful in the 1874, as a product of Remington & Sons, its actual history is far more intricate, far more complex. One example of this complexity is that before the commonly held birth date of 1868, when the first Sholes, Glidden and Soulé Type-Writer patent was registered (Figure 0.3), there were over 150 other attempts at inventing a mechanised writing machine, the volume of attempts alone challenging the 'fully formed' argument by revealing a genealogy of machines (Sholes, Glidden et al. 1868; also see Appendix 1: List of Pre-1868 Mechanised Writing Machine).[7] Another example of this complexity can be found in the growth of the nascent typewriter industry more broadly. Certainly it can be argued that no machine revolutionised the practice of writing in the way that the Sholes & Glidden Type-Writer (Figure 0.5 and 0.6), and its progeny were to do in decades following its introduction on the open market in 1874–although a few of these pre-1874 writing machines did enjoy some small commercial success.

And yet its immediate success is something of a fallacy–for this typewriter's early history between 1868 and 1878, between the date of its first patent registration and the production of the Remington Standard Two, reveals its subsequent 'success' as somewhat precarious, with only 2,000 of the first batch of 5,000 machines sold.[8] Certainly in its first decade the typewriter's success as embodied by the first Remington & Sons machine, the Sholes & Glidden Type-Writer, was in no ways automatic nor guaranteed. Another area of historical intricacy lies in the machine itself, as typewriter embodied by the Sholes & Glidden Type-Writer was not born fully formed. When it was first conceived in 1868, its first registered patents and its various prototypes show a machine substantially different to the one that was to appear six years later (Figures 0.4, 0.5 and 0.6). During the machine's development between 1868 by the inventors Charles Latham Sholes, Carlos Glidden, Robert Soulé and their circle–including the entrepreneur James Densmore and the mechanic and clockmaker Mathias Schwalbach–and the subsequent involvement of the arms manufacturer Remington & Sons in 1872, there are accounts of between twenty-five and thirty separate prototypes being made in the first four years (Figures 0.7 and 0.8), and up to fifty by the time of its launch in 1874 (Adler 1973, 143; and Wershler-Henry 2005, 68).

The problems around the historical account of a successful writing machine born fully formed in the mid-1870s throws into sharp relief the other writing machines that preceded it. Although often cast as failed designs, these other machines can be considered as both important technological forebears of the Sholes & Glidden Type-Writer and as a set of vapourware, a group of objects that although sometimes never realised, worked through a set of problems and issues around writing, and the writing body (Atkinson 2010, 164).[9] In taking account of these 'failures,'

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[7] Typewriter histories vary greatly in the number of different writing machines invented before 1868, remaining a subject for debate to typewriter historians, with numbers varying between 52 and 112 (Lundmark 2002, 13; and Masi 1985, 13). For this dissertation, the machines included as pre-1868 typewriters are noted in Appendix 1: Pre-1868 Mechanised Writing Machines.

[8] Like many claims made around the typewriter's early history, the numbers of machines manufactured and sold are heavily contested. In its first six months of sales, there are claims that only 200 machines were sold and that four years later, only 4,000 machines had sold (Monaco 1988). In his 2002 article, cultural historian Barry Sanders states that of the initial run of 1,000 machines from the Remington & Sons production line, only 400 sold (Sanders 2002). Certainly historian Richard Current notes that in its initial agreement, Remington & Sons agreed to manufacture 1,000 machines to start with, followed by 24,000 at its discretion (Current 1949, 404). Yet what is certain, is that the relatively low number of sales reflected that the "typewriter business failed to prosper" (Current 1947, 421).

[9] When Sholes, Glidden and Soulé came to invent a writing machine in the 1860s, it was after reading an article on the recent exhibition in London of John Pratt's Ptereotype, from the *Scientific American*, 6 July 1867. In this article, the author speculates that "the weary process of learning penmanship in schools will be reduced to the acquirement of the art of writing one's own signature and playing on the literary piano, or rather one of its improved successors" ("Type Writing Machine" 1867). Prior to the publication of this article, Sholes, a printer and newspaper editor by trade, had invented two machines for the printing trade, an address labelling machine and a page-numbering machine. On viewing Sholes' latest model of page-numbering machine in the spring of 1867, Charles Glidden is reported to have said, "Sholes, if you can make

this thesis explores those machines that presented 'other' ways of imagining mechanised writing in order the understand how the discourse of writing shifted through the eighteenth and nineteenth century.

In tracing these questions of the writing body, this thesis begins in 1711 with the first recorded invention of a writing machine with James Ranson's account of a twin-keyboard harpsichord writer, comprising rods, strings and an inked ribbon.[10] It ends in 1905, when a meeting of the leading typewriter manufacturers in Canada that formed the Union Writing Machine Company, a typewriter 'trust', agreed to standardise the design of the typewriter, with a QWERTY keyboard that controlled a series of typebars (Beeching 1990, 40-41).[11] By taking these moments as its bookends, the methodology of this thesis draws upon the theory of the social construction of technology (SCOT), first outlined by historians of technology Trevor Pinch and Wiebe Bijker as an alternative model to technological determinism (Pinch and Bijker 1987). With an emphasis on the social factors of technological development, SCOT proposes that following the emergence of a new technology, there is a period of 'interpretative flexibility' in which the meaning of the technology is negotiated by so-called 'relevant social groups' (RSGs) and the design of the technology evolves in-line with these negotiations. Once the RSGs are sufficiently satisfied that any potential conflicts between understandings of the technology are resolved, the form and function of the technology is closed and the technology stabilised. This quasi-evolutionary understanding of technological development, one which sets up technological development as one of variation and selection, can be seen in the emergence of the typewriter, with its eighteenth and nineteenth century history being its period of interpretative flexibility. However, in producing an account of how the meaning of the writing machine was negotiated and stabilised, this thesis does not focus on RSGs for, as critics of SCOT have argued, SCOT's methodology, rooted in sociology, is limited in explaining how social factors affect technological development more broadly, particularly in how RSGs are chosen and delimited by SCOT theorists, and in what are the mechanisms for the negotiation of consensus (Klein and Kleinman 2002). Therefore, this thesis' methodology takes a cultural studies approach, proposing that consensus was reached over the meaning of the typewriter within the wider cultural understanding of writing, within a particular constellation of the discourse of writing and the discourse of the body.

This research project began with the construction of a chronology of writing machines, included in this thesis as Appendix 1: List of Pre-1868 Mechanised Writing Machines and Appendix 2: List of Post-1868 Mechanised Writing Machines, compiled in order to produce a more complete record of mechanised writing machines in the eighteenth and nineteenth century, through the synthesis of their differing early histories. Initially, it was planned that through this chronology of objects, this thesis would form a design history of the emerging typewriter. However, due to the large period of time over which there was interpretative flexibility of the writing machine, a fact reflective of the complex issues around 'writing' and 'the body' in the eighteenth and nineteenth century, and the growing understanding that the differences in the early histories of writing machines was due to different authors' understanding of what does and doesn't count as writing, it soon became clear that such a design history of early writing machines

a thing like that to print figures and numbers, why not one to print letters and words in much the same way? If a numbering machine, why not a writing machine?" (Current 1954, 10-11).

[10] Nearly all accounts of the birth of mechanised writing begin in 1714, with the British Patent 233 issued to Henry Mill, a engineer with the New River Company (Mill 1714). Yet there is also record of an earlier writing machine in 1695, called a writing multiplier, as well as a undated invention by a Le Roy of some sort of writing machine. For details see Appendix 1:List of Pre-1868 Mechanised Writing Machines. This thesis begins with Ranson's invention, in order to encompass this early history.

[11] This company was a typewriter trust formed in 1893 that 'controlled the major American typewriter manufacturers by fixing prices of their machines. Initiated by Remington & Sons, the trust included The American Writing Machine Company, Yost Writing Machine Company, Desnmore and Brooks. In 1908, the company was renamed the Union Typewriter Company (Davis n.d.).

would need to, at some level, account for the discourse of writing as practice, and the discourse of mechanised writing. Therefore this research project broadened out its understanding of writing machines from the standard pre- and early typewriter histories to include such machines and devices as automata, polygraphs and Ouija boards, in addition to including inscription devices seemingly tied to other practices, such as drawing and photography, in an attempt to understand through this variety how the typewriter *qua* typewriter came to exist. In including devices and machines from other practices, this thesis attempts to understand, almost by throwing in relief, how writing as practice was understood through its similarities with and differences to other inscriptive practices. In its new-found breadth, this thesis is not a 'pure' design historical account of the rise of the typewriter, but rather seeks to account for the changing state of writing in modernity, through the object of emerging writing machines in the eighteenth and nineteenth century. In its seeking, it attempts to answer Derrida's call for a new history of digitality not only literally, in its exploration of dexterity and the typewriter, but more broadly, in how inscription and their technologies have been underpinned by understandings of the body, its operation and its representation.

This thesis is underpinned, both theoretically and historically, by two key texts. The first is media theorist Friedrich Kittler's *Gramophone, Film, Typewriter* (1999), a seminal book on the technological moment of the late nineteenth century in which sound, moving image and writing all became mechanised, explored through his theory of media discourse analysis. In Kittler's analysis, technological objects are pulled apart from the inside, for their 'intrinsic logic', which is then mapped out, to account for the changing relation between body and technology, and therefore the changing discourse network. In the tradition of technological determinism, Kittler rejects both the liberal humanist subject and the social use of technologies, famously writing as the first line of the book "Media determine our situation" (Kittler 1999, xxxix).

Certainly the three technologies on which Kittler focuses do hold in common a re-orientation of time, in their ability to hold time so that events and experiences can be repeated; that is to act as storage devices and therefore transform how sound, moving image and writing were understood. However, within this trinity, the typewriter seems to stand somewhat awkwardly next to gramophone and film, in that the latter two technological transformations are sensory plug-ins, sound and vision, whereas writing seems to be of an entirely different order of phenomena; for, as noted above, writing itself is already a technology. Indeed, Kittler, at some level, separated the three technologies in a similar way, grouping sound and film together and mechanised writing as a qualitatively different form; this did not mean that he assumed sound and vision as given categories, given experiences, but rather that there was an implication that the technologies of sound and vision in the second half of the nineteenth century, through their naming as phonograph and cinemagraph, were derivatives of writing, were graphic forms of sound and vision (Kittler 1999, 3).

In producing a history of the technology-body nexus through the emerging technology of the typewriter, this thesis' differs from Kittler's technologically determining methodology in that it attempts to draw into the object cultural and social factors, to produce an understanding of how human beings press themselves into emerging technologies, especially during the stage of interpretative flexibility, and how in their pressing, the ways in which they understand their bodies and the emphasis they place on certain parts of the body necessarily have both cultural and social causes and effects. Therefore this thesis digs through the objects of its study, following Kittler's pursuit of an 'intrinsic technological logic', to the body and out into cultural history of writing and technology; and at times it performs this method in reverse, starting with an event or moment in the cultural history of writing and technology and burrowing back through the body and into the technological object. In its attention to the objects, their form and function, this

thesis, whilst much broader than initially proposed, both in terms of its disciplinary scope, and the breadth of other technologies and techniques it deals with, still carries the legacy of its design historical roots. However, in drawing in and out of the body, it also works with media discourse theory, to produce a cultural and critical history of the writing body.

The second text that underpins this thesis is literary critic N. Katherine Hayles' *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics* (1999), in which Hayles charts the historical movement, post-WWII, towards the disembodiment of information and the dissolution of liberal humanist subject, arguing that these two trajectories are necessarily interwoven. Whilst this thesis' time period is prior to Hayles' focus, it can be read as a complimentary text for, in its mapping of the technological development of the typewriter of the eighteenth century and nineteenth century, it charts the increasing internalisation of writing practice, from external device to part of the internal machine of the mind, working its way into the heart of the modernist body.

In attempting to gain a foothold in a dense and complicated pre- and early history of the typewriter, this thesis set out to explore four central tropes of mechanised writing, tropes which emerged from the initial writing machine chronology in Appendix 1, and from initial readings in the history of the typewriter, ordered broadly historically: prosthetic writing machines; the fragment in writing and of the body; female dexterity and technological operation; and the failure of invention. However over the course of the research, two of these tropes, the first and last, changed as a result of research outcomes into a particular set of machines: what began as prosthetic machines became copying machines, as an examination of eighteenth century writing practice took account of physiognotraces, pantographs, polygraphs and early experiments with photographic methods; and what began as a set of machines, known as index writers, commonly understood as design failures was re-organised around the trope of agency as the research pointed towards the fact that this form of writing machine was not unsuccessful in its own time and indeed had notable design features in common with other writing machines, so-called dial-plate devices. Therefore, in attempting to answer the twin question of how has the body written and how has writing written the body, this thesis will centre on four tropes of that arise in the writing machine and in the construction of the modernist body simultaneously, emerging as key features of the machine-body-writing relationship: copying; the fragment; dexterity; and agency. The thesis chapters will address these tropes in the following ways.

The first chapter, 'Copying Hands, Copying Bodies: An Exploration of Automata, Copying Devices and Writing Techniques in the Eighteenth Century,' will argue that writing in the Enlightenment was constructed around copying an ideal form, both for the materiality of the text and, as an indexical relation, for the character of the writer; and that the eighteenth century trope of copying was reflected in both the body and the practice of writing. It will contextualise the 'typewriters' that began to appear in the eighteenth century within the period's writing practice and other writing technologies, to understand these machines not as simple precursors to the computer, but as part of a broader set of inscriptive writing technologies and techniques, a category that includes drawing and musical notation. It will begin with a history and analysis of the automata of Jacques Vaucanson and Jaquet-Droz, focussing on those Enlightenment automata that wrote, before moving onto eighteenth century writing/drawing devices–the pantograph, the polygraph and the physiognotrace–and ending with a history of eighteenth century writing pedagogy and an analysis of the 'typewriters' of the period. In paying attention to the materiality, mode of operation and intended purpose of these writing machines–noting how and what they wrote and drew and for whom they were intended–this chapter will argue that eighteenth century 'typewriters' fit into a family of inscription machines that articulated a trope of copying, and that because of this, these 'typewriters' were understood as printing machines, not writing machines.

The second chapter, 'Typing Bodies: The Science of Body Classification and the Drive towards Mechanised Writing' will argue that the success of the typewriter–both commercially and culturally–in the late nineteenth century was due in large part to the double articulation of the fragment by the writing machine and the body. In tracing the fragment through the history of the body, this chapter will begin with an argument that the (pseudo) scientific understandings of the body built through the practices of physiognomy, phrenology and then late-nineteenth century scientist Francis Galton's anthropometry and police clerk Alphonse Bertillon's method of bodily classification, Bertillonage, can be understood as writing practices. As writing practices, it will argue, they fragmented the body into parts, seeking to make the body legible for agency and identity. This chapter will then argue that the use of photography in both expressing and constructing these knowledges by Galton, Bertillon and by physiologist-photographer Étienne-Jules Marey was itself part of an articulation of the legible body fragment. It will conclude with an exploration of the changing state of writing and language in the nineteenth century, through the birth of modern graphology, the explosion of *a posteriori* artificial languages, so-called International Auxiliary Languages, and handwriting pedagogy, arguing that in writing, as with the body, there was a move towards the fragment, under the paradigm of medium transparency.

The third chapter, 'Sinister Bodies, Dexterous Hands: The Naturalisation of Typewriting as a Feminine Practice,' will address the question of how women became intimately tied to mechanised writing from the early stages of the typewriter's history. Through tracing a history of women's work in the art of piano playing and the craft of embroidery, it will argue that the one of central reasons why women's bodies were considered to be the ideal operating instruments of the typewriter was because they were understood as mechanisms. As mechanisms, this chapter argues that women's bodies were trained in particular skills which they were then able to transfer to the typewriter. Beginning with an exploration of how women's bodies were understood and constructed within the emergent field of evolutionary biology, this chapter will argue that women were ideologically constructed as mechanisms, adept at particular physical and mental labours built around the concept of dexterity. It will then address the anxiety around women's bodies in the nineteenth century as articulated by the debate The Woman's Question, an anxiety that raised a raft of questions around the best role of women in society, all of which fed into the ideological construction of middle-class women's labours. This chapter will then provide a history and analysis of the two most popular accomplishments of middle-class Victorian women, embroidery and piano playing, to establish how these women's labouring bodies were understood and constructed. To further this understanding, it will then include a phenomenological analysis of these labours, to unpick what was meant by dexterity from the perspective of bodily knowledge.[12] Finally, this chapter will draw through these ideological constructions and phenomenological experiences to explore the histories of women's labour with the telegraph and then the typewriter in the nineteenth century, arguing that the construction of women as mechanisms and the remediation of techniques learnt through accomplishments were a key factor in establishing women's natural place at the typewriter and the feminisation of typewriting practice.

The final chapter, 'Spirit (Writing) Media: Ghostly Typewriters of the Fin-de-Siécle and the Ventriloquism of Agency,' will argue that writing in the nineteenth and early twentieth century

[12] In his book *Bodies and Technology*, the philosopher of science and technology Donald Ihde constructs a productive framework for analysing the historical relationship between mechanised writing machines and the body (Ihde 2002). He proposes two interpretative models of the body: the first is the lived, experienced body, the body of experience and the senses; the second is the cultural and social body. These two bodies interact and are mutually informed and constructed in a third dimension, that which he calls the technological dimension. Yet against a criticism of too hard a separation between the two, a rigid separation of the individual experience and the culturally determined, Ihde ties the two more intimately together when he writes: "... for there to be a marked cultural body or body two, there must be a body one that is markable" (Ihde 2002, 70). This thesis draws on Ihde's interpretative model by entering his third dimension to grasp the interplay between the experienced body and the socially constructed one, to explore how these two bodies have interacted and mutually informed the other.

was a practice through which particular discourses around agency and automation emerged, discourses that challenged the rise of rational materialism. Through focussing on an 'other' form of writing machine that appeared on the typewriter market post-1874, so-called index typewriters, and tying them to an 'other' form of writing device, the talking board–or Ouija board as it is better known–this chapter will argue that sociologist Max Weber's characterisation of modernity as an "iron cage" and a "disenchantment of the world" is challenged by an 'other' set of propositions about how bodies operate, a set proposed by these writing machines (Weber 1930 [1905], 181; Weber 1958, 8). It will propose that the supposed split between rationality and irrationality, between the material and immaterial, between knowledge and belief, were not binaries but rather formed intense dialectic tensions, so intense as to be found often as double expressions. Beginning with a comparative history and analysis of index typewriters and the writing technologies used to commune with the spirits, this chapter will argue that the displacement of agency these machines proposed was crucial for underpinning the possibility of spiritualist practice. In exploring investigations around the Fox Sisters, the work of the Society of Psychical Research and the magicians John Nevil Maskelyne and George Cooke, this chapter will then pivot around the figure of Maskelyne who in addition to being an anti-spiritualist magician, also invented automata and a typewriter, demonstrating how the practices of technology, agency, writing and magic were intertwined. In arguing for this entwinement, this chapter will end with a comparative analysis of the life and work of Charles Lutwidge Dodgson and Arthur Conan Doyle, fleshing them out as double embodiments of magical thinking and technological rationalism.

Through addressing the problem of writing and its attendant technologies, this thesis proposes to answer its core questions–how has the body written and how has writing 'written' the body–by paying attention to how the modernist body can be understood as a historically specific construct intimately tied to the technologies and techniques of period: with the typewriter, this thesis will argue that as the body becomes text in a particular way, so the text becomes embodied.

1: Copying/Writing/Bodies

An Exploration of Automata, Copying Devices and Writing Techniques in the Age of Enlightenment

"D'ALEMBERT: I wish you'd tell me what difference you think there is between a man and a statue, between marble and flesh.

DIDEROT: Not very much. You can make marble out of flesh and flesh out of marble.

D'ALEMBERT: But still one is not the other."

Denis Diderot, *D'Alembert's Dream* (1769)[13]

"The irony at the heart of rationalism is that it arose from a dream."

Simon Penny, *Virtual Reality as the Completion of the Enlightenment Project* (1994)[14]

"Everyone admits that handwriting is part of a person..."

Colette Sirat, *Writing as Handwork* (2006)[15]

" ... a good Countenance is a Letter of Recommendation."

Henry Fielding, *Tom Jones* (1749)[16]

Introduction

The first moments in which writing began to take machine form belong to the eighteenth century.[17] Writing machine records begin in 1711, when James Ranson invented a writing machine reported to have a double-harpsichord keyboard and an inked ribbon (Stone 2005, 225; and Tepper 1996). Only three years later, another more famous writing machine appears in the historical record, with the granting of British Patent No. 395 to Henry Mill for "an artificial machine or method for the impressing or transcribing of letters singly or progressively one after another as in writing ... So neat and exact as not to be distinguished from print" (Mill 1714). However, although often taken as the first mechanised writing machine in historical record, no machine or device, nor any illustration, fitting Mill's description has been found. These technologies of Ranson and Mill were the first of a number of writing machines invented in the

[13] Diderot 1966.
[14] Penny 2004, 231.
[15] Sirat 2006.
[16] Porter 2003, 249-50.
[17] "The idea of imitating the movements of someone writing by an automation is a very old one, and we have seen it in automata by the Arabs, but there the figure only appeared to write. Automata actually writing were first manufactured in the eighteenth century. These mechanical writers and draughtsmen rank high among the most perfect (or if it is preferred, least imperfect) imitations of human beings" (Chapuis and Droz 1958, 289). For a more in-depth discussion of the periodisation of this chapter see footnote 10 below.

eighteenth century that not only took the form of the more commonly understood technological tool or machine but also, notably for this thesis, as artificial embodiments, in the form of automata. Certainly the most famous writing machine of this era, one that most visibly elided man and machine, was the Jaquet-Droz company's automaton, L'Écrivain (The Writer), currently on display with his sister La Musicienne (The Musician) and brother Le Désignateur (The Draughtsman) at the Neuchâtel Museum in Switzerland. Together with the earlier automata of Jacques Vaucanson–Le Flûteur (The Flute Player), Le Tambourinaire (The Drum Player) and Le Canard Digérateur (The Defecating Duck)–these machines have become a crucial stage in the history of computing, from which follow Jacquard's automatic hand loom, Charles Babbage's Difference and Analytical Engines, commentated upon and conceptually expanded by Ada Lovelace, through to Herman Hollerith's Census machines, the work of Alan Turing and the birth of the digital.[18] This chapter does not follow this trajectory of computing history, but instead addresses these automata as writing technologies, focussing on the discourse around writing through the inscription technologies and techniques of the period and contextualising these automata with other writing technologies of the age, notably copying machines and early mechanised writing machines.

In a first analysis of the different forms of writing machines in the eighteenth century, the discourse of copying, one of the most dominant tropes of the period, immediately stands clear. From scientific experimentation, through to the biological concepts of replication and variation, the division of labour and the birth of design as a separate category from art and craft practice, the dominance of 'copying' has been noted by historians of the period, with copying "[displaying] the very mind-set of this age" (Uglow 2002, 304). However, the term 'copying' is itself semantically broad, containing a wealth of subtly different meanings; historian Jenny Uglow refers to the developments of the eighteenth century in a chapter of her book under the title of 'Creative Copying', an entitling which carries with it not replication or imitation, but rather something looser and more interpretative, more along the lines of emulation. In this variation of the meaning and practice of copying, the epistemology of copying comes to the fore; it is an epistemology reflective of the conceptual diversity in the term itself, a concept which itself has a history (see Foucault 2009). By paying attention to copying in the relationship between writing and the body in the eighteenth century, this chapter will establish how early mechanised writing machines were discursively constructed in the Age of Enlightenment as products of both Reason and Romanticism and of early Industrialisation. It will show how these copying technologies, in their cultural and mechanical operation, made the entwined economics of commercial and cultural success improbable in an age when writing was becoming, but was not yet, synonymous with composition, being more closely aligned with the manual crafts and a particular definition of production.[19] This chapter will argue that the success of first two of the three types of machines and devices that are the focus of this chapter, automata and pantographs/polygraphs/physiognotraces/early photocopiers, and the lack of success of the latter, early typewriters, lies within the construction of the meaning in the material act of writing in the

[18] For Babbage's Engines and the work of Ada Lovelace, see Plant 1995; Plant 1998; Essinger 2004; Huskey and Huskey 1980; Stein 1984; Larcombe 1999; Fuegi and Francis 2003. As these texts demonstrate, the history of computing rests on the history of mechanised weaving and the work of Jacquard. However it should be noted that Jacquard's invention of the handloom drew directly on Jacques Vaucanson's work as the superintendent of weaving in Lyons, a position he was awarded as a result of his work on automata, when he invented a programmable loom. An example of Vaucanson's loom is currently on display at the Musée des Arts et Métiers, Paris, France.

[19] This chapter explores the history of mechanised writing in the long eighteenth, a periodisation analysed more fully in footnote 10 (below). In addressing this period, specifically the tail-end of it, typewriter historian Michael Adler notes that ".. early in the nineteenth century the world was not clamouring for the typewriter. Far from it! Resistance to the machine was ubiquitous and the task of the inventor was a thankless one, as the diaries and letters of many of them indicate. Society was in fact not fully ready for the typewriter until the last quarter of the century, when suddenly demand was there, and a frenzy of commercial activity set about filling it" (Adler 1973, 56). This chapter aims to explore Adler's claim of a ubiquity of resistance, to produce a more nuanced reading of the period.

eighteenth century and its particular relationship to specific eighteenth century discourses around body.

The first section of this chapter, 'Copying Bodies (Sometimes Writing)', explores the history of eighteenth century automata, with an emphasis on those of human form, notably those that wrote, analysing their mode of operation, both how their machinery worked and what they produced. In examining who could be represented in moving material form and what they could be represented doing, this section establishes the nature of the relationship between writing and the body as one that was both imitative and illustrative. In paying attention to the forms of copying as they appear, over the machine, its practice and its product, this section begins to draw mechanised writing and the body together, to understand how these objects were expressive of, and at the same time formative to, concepts of productivity and uselessness around writing, machines and bodies.

The second section of this chapter, 'Multiplying the Line: 'Facie-Traces' and Copying the Quill', addresses another class of eighteenth century writing machines built on the same trope of copying. Better understood nowadays as devices rather than machines, these technological objects were frames through which attachments to the authorial pen would enable the author to make multiple copies of the same text/drawing/face.[20] By analysing these devices, variously called pantographs, polygraphs or physiognotraces, depending on what these devices were used to draw or write, alongside James Watt's early photocopying machine, this section demonstrates how the concept of copying the hand and copying the body were inter-related.[21] It argues that the creation and copying of the line, whether that line formed writing or drawing, was always to be done in such a way as to ensure that the mark maker was accurately reproducing the fixed standard of mark making within that specific cultural practice. It also draws in other copying devices such as Erasmus Darwin's Bigrapher, Matthew Boulton and Joseph Booth's 'mechanical painting' technologies, Ralph Wedgwood's Manifold Writer and Tom Wedgwood's 'silver pictures', to show how drawing and writing were again part of the same practice, and how the birth of photography can be located within the eighteenth century discourse of the copy.

The third and final section of this chapter, 'Eighteenth Century Types: Hand and Machine Writing', focuses particularly on the writing technologies of the eighteenth century. Following Ranson's machine of 1711 and Mill's British Patent No. 395, there were approximately twenty-five documented inventions of a mechanised writing machine during the period under study in this chapter.[22] Although variously invented throughout the period of the eighteenth century, none of

[20] In the eighteenth century, machine was a term applied to a host of different technologies, ones that nowadays would not be defined as such. The circumscribed definition of machine as a self-powered object, a technology that contains its own power source, appeared in the early nineteenth century, when powered machines became the dominant type in the broader 'machine' category (Wise 2007).

[21] The use of the word 'polygraph', or multiple mark maker, to describe a copying device in the eighteenth century, is of interest to note in relation to the machine to which this term was applied in the late nineteenth century, the so-called lie detector. A key figure in the development of this latter machine was Jules-Étienne Marey and his sphygmograph, for detecting and inscribing the pulse, which led him to invent related devices such as the cardiograph, pneumograph, pantograph, myograph and most literally, a polygraph (Dagognet 1987, 15-63). For an in-depth reading of Marey's work, and the relationship between physiognomy and photography, with some notes on the role of silhouettes see section 2.3, 'Photographic Ordering: Graphs, Composites and Mugshots'.

[22] For a full list of eighteenth century writing machines, see Appendix 1: Pre-1868 Mechanised Writing Machines. Historical studies of the eighteenth century approach the period through either the short or long period: the short period is taken as marking the time between the death of Louis XIV of France, 1715, and the French Revolution of 1789; the long period is taken as marking the time between the English Civil War of 1688 and either the Battle of Waterloo of 1815 or the accession of Queen Victoria in 1837. The short periodisation is centred on the notion of Enlightenment, whilst the latter marks the rise of the Industrial Revolution. This chapter takes it start point from the short periodisation, but takes its end point from that of the long periodisation–from the birth of Enlightenment to the full force of the Industrial Revolution–because records of these writing machines coalesce around this start point, whilst by 1837, the frequent mention of mechanised writing machines in the press and in patent records indicate a degree of cultural acceptance. See, for example, Woloch 1982 and Blanning 2000. For more on the construction of periodisation of the eighteenth century, see Siskin 2009. The pure verbal description of the first 'typewriter' with Henry Mill's patent for "An Artificial Machine" with no illustration or model existent, has led to some broad interpretations of this first invention by typewriter historians, including Silvio Bedini's

these mechanised writing machines were commercially successful, whilst there was a significant increase in the learning and practice of handwriting, through a pedagogy of copying, and in the invention and use of copying devices, of writing, of drawing and of profile production.[23] The final section of this chapter draws in the material act of drawing the line in the eighteenth century, exploring how handwriting was learnt and what forms it took, as well as the history of early 'typewriters', to understand how the material act of writing was historically understood and bound, through the Enlightenment, and the first decades of the Industrial Revolution.

identification of it as a copying rather than writing machine (Bedini 1984, 10). For the full transcription of the Mill patent, see Bliven 1954, 24; Masi 1985, 13; and Linoff 2000, 10.

[23] Although the eighteenth century saw the rise of print and an increase in the rates of literacy, it should be noted that in this period, reading and writing were two distinct practices, not necessarily 'joined' together. This will be discussed below, in section 1.3 'Eighteenth Century Types: Hand and Machine Writing.' For historical studies of literacy in the eighteenth century, sometimes defined as reading, sometimes as reading and writing together, see Febvre and Martin 1990; Lough 1970; Schofield 1968; Ong 1982; Wendorf 2003; and Borsay 2002.

1.1 Copying Bodies (Sometimes Writing)

This section traces the history of eighteenth century automata, machines that took animal form, most often human, and exhibited particular operations of animate life. By focussing on these objects, it argues that eighteenth century automata established man's mechanistic nature at the same time as they displayed a machine's' potential for animation. Beginning with Jacques Vaucanson and his triumvirate of automata, and moving to the Jaquet-Droz's family of machines and Henri Maillardet's Le Designateur-Écrivain, this section analyses those automata of human form, specifically those that wrote. It argues that these automata's acts of writing demonstrate a relationship between machine and body that reveals writing to be a human act that could only be exemplified by a particular type of human, one that demonstrated writing as accomplished performance rather than economically productive act.

The Beginning of Enlightened Moving Bodies

The fashion for, and in, automata was set by the French mechanic Jacques Vaucanson (1709-1782). Noticed as a naturally 'mechanically minded' boy, Vaucanson was trained as a Jesuit, and subsequently joined the Order of Minims in Lyons, where he was given a workshop to carry out his mechanical experiments. However, in 1727, at the age of 18, his first public attempt at creating automata failed, and failed spectacularly, when his whole project was considered to be morally unsound. A senior figure at the monastery, having seen Vaucanson's first set of human-like machines–reported as being variously a series of serving waiters, a collection of flying angels, a selection of mechanical animals but, more probably, a group of priest automata–ordered their destruction, on the grounds of profanity (Wood 2002, 17; and Metzner 1998, 166-7). Subsequently dismissed from his monastic order, and with all his work destroyed, Vaucanson disappears from the historical record, reappearing in 1737 with the automaton Le Flûteur (The Flute Player) (see figure on the left, in Figure 1.1). As to why he created this particular form of android, his biographer Condorcet tells the story that whilst Vaucanson was in a delirious fever as a result of illness, he had a vision of a man playing the flute, a vision that subsequently drove him to build his machines anew (Wilson 2006, 103).[24]

A year later, Vaucanson is found presenting Le Flûteur to the Académie de Science in Paris, before hiring a showroom to exhibit his automaton to the general public in the Hôtel de Longueville. The location and type of the showroom (called the Salon des Quatre Saisons), the high entrance fee of three livres (the equivalent of a week's wages for a manual labour), and the limited numbers Vaucanson permitted to enter the showroom contributed to the machine's popularity with Parisian society. By making the display of this machine a spectacle, Vaucanson called attention to it as a philosophical toy whilst making it a commodity in itself, promoting it to a society noted for its *avide de nouveauté*, its hunger for novelty (Liu 2000, 99). Thus, displayed as an elite object, to society's elite, in a spectacular location, Le Flûteur was as much a spectacular object, an object of entertainment, as it was educational.[25]

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[24] Eric Wilson describes the machines destroyed in the monastery as 'robot animals', whilst Gaby Wood describes them as being 'flying angels' (Wilson 2006, 103;and Wood 2002). However a more accurate source could be the Marquis de Condorcet, Marie Jean Antoine Nicolas de Caritat (1743-1794), who wrote 'Eloge de Vaucanson' (1782). Condorcet sets out that Vaucanson created "some automaton-priests that duplicated a few of the ecclesiastical offices"; the subsequent destruction of Vaucanson's first automata and his personal disgrace can therefore be seen as a result of not just philosophical discomfort with automata *per se* by the religious orders, but also as a result of the humiliation of the ruling priests at being mocked in mechanical form (Metzner 1998, 166). For other appearances of dream in technological invention, see section 2.3 'Photographic Ordering: Graphs, Composites and Mugshots.'

[25] Vaucanson stresses the spectacular nature of the machine by using the sales technique of reverse psychology, stating that, "To shew that the Contrivances for moving these Wings are nothing like what is made use of in those wonderful pieces of Art of the Cock mov'd by the Clock at Lyons, and that at Strasburgh, the whole Mechanism of our artificial Duck is exposed to View; my Design being rather to demonstrate the Manner of Actions, than to shew a Machine. Perhaps some Ladies, or some People, who only like the Outside of Animals, had rather have seen the whole cover'd; that is, the Duck

In its materiality Le Flûteur was a life-sized multi-media machine, standing at five and a half foot tall and made of steel, brass, leather and other manufactured materials; however in its construction, it was an object which remediated an already familiar object, as its form was based on sculptor Antoine Coysevox's *Berger flûteur (Faun Playing A Flute)* of 1709 (Figure 1.2), one of the numerous pieces of sculpture produced by Coysevox for Louis XIV's Tuileries Garden (Cottom 1999, 52). By copying this marble sculpture, there is a clear indication that, at the very least, Vaucanson had not dreamt up the form of automaton from nothing. To achieve visual accuracy as a copy of the statue, the wooden exterior of the machine was painted to look like marble and placed on a large pedestal, so that Vaucanson's automaton was a piece of moving statuary, set up to be admired for its form, whilst it amazed with its movement.[26] Le Flûteur was a double simulation; it simulated the Coysevox statue at the same time in its shape and dimensions as it simulated the human movement of a flute player. However because it was an already familiar object, the novelty of the new–a novelty that had led to Vaucanson's expulsion from his monastery and subsequent poverty–was tempered; Vaucanson was making movement in an already familiar object.

What made this machine distinct from the millennia of automata that had come before was that the music of the flautist came from the machine itself. Thus not only did Vaucanson build a mechanism to imitate human movement into a form of human being, but also the product of the machine, the musical piece, was itself the result of air forced through and controlled by the machine in that the combined movement of the fingers controlled the air blown through the flute to produce the sound (Figure 1.4). This was in stark contrast to pre-Enlightenment musical automata, which would synchronise their movements to sound produced by a self-contained musical box. The suspicion that this was one of the same type of machines, that it simulated rather than imitated, did however follow this automaton, held all the more firmly when it was demonstrated that it could perform fourteen different pieces of music, including Blavet's Le Rossignol (Metzner 1998, 163). Vaucanson addressed this suspicion in his 1738 lecture to the Académie de Science, later published by the inventor and showman as a pamphlet sold at the exhibition (Figure 1.3). In this pamphlet, Vaucanson outlines how the air was produced by nine bellows, which, in groups of three, fed into three pipes. Each set of three bellows could produce different pressures of air and this was the mechanism for pushing the air through the automation, and thus enabling Le Flûteur to produce 'realistic' sounds, in that it had the ability to produce individual notes at different dynamics of sound.[27] In using this bellow and pipes system to create a life-sized android of a flute player, Vaucanson re-purposed the technology of a musical organ (Figure 1.4).

While Vaucanson was able to re-purpose the technology of the church organ to drive the air through the machine, the design and construction of the hands to operate the flute was more difficult. In order that this element of the machine was supple and flexible enough to move and close the holes of the flute, Vaucanson had to soften the hardness of the wooden fingers; this he achieved by covering the automaton's fingers in 'peau', or skin–although whether the skin was

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with Feathers. But besides, that I have been desir'd to make every Thing visible; I wou'd not be thought to impose upon the Spectators by any conceal'd or juggling Contrivance" (Vaucanson 1742, 22-23). Daniel Cottom argues that Vaucanson's description of Le Canard Digérateur in a letter to Abbé Fontaine shows that he wanted to demonstrate (*démontrer*), not just simply exhibit (*montrer*) (Cottom 1999, 52).

[26] It was from this showroom exhibition and its attendant publication by Vaucanson that the entry 'androide' in Diderot and D'Alembert's *Encyclopédie* was drawn. For Vaucanson's detailed description of the operation of Le Flûteur as it was reproduced word for word in the *Encyclopédie*. Bolter and Grusin's concept of remediation appears below in this thesis, in a discussion about the relationship between sewing machines, pianos and typewriters, both as technological devices and in the use of the machines themselves. See Section 3.4 'Mechanised Women: Telegraphists and Typewriters, 1832-1905.'

[27] This element of variety across homogeneous elements, as in musical notes, but also depth within the individual notes reappears below in this thesis, in section 3.2 'Superfluous Women and their Accomplishments', with a phenomenological analysis of feminine fingers at labour.

animal or human is never specified (Wood 2002, 24). In using real skin, Vaucanson literally fleshed out his machine to ensure its dexterity, further situating it as a philosophical toy in that by its very materiality, it questioned the criteria for human being. When this materiality is added to its mode of operation, to its ability to mimic a human performer, Vaucanson's Le Flûteur is often interpreted as an *unheimlich* object, whose approximation to human behaviour is such that it becomes an object of the Freudian uncanny.[28] However, historian of technology Jessica Riskin argues against this reading of these Enlightenment automata, as,

> The story of the origins of modern artificial life lies not in a changeless quest emerging from timeless human impulses, but rather experimenters', philosophers', and critics' continually shifting understandings of the boundary between intelligent and rote, animate and mechanical, human and nonhuman. (Riskin 2003, 99)

Riskin's 'shifting boundaries', a reading which defines an epistemic approach to the historical, is more helpful in the reading of these objects, as it reveals, in relating ontological objects and concepts, the formative role of the expression of these objects and subjects, the acts they perform. It reveals that as ontological categories shift, so do those of practice and therefore knowledge (Foucault 2009). This particular argument about objects and practices can be demonstrated by Vaucanson's subsequent automata, Le Tambourinaire (or Figure playing on the Tabor and Pipe, sometimes called The Drummer), and Le Canard Digérateur (or the Defecating Duck) (Figure 1.1 and 1.3). Presented in late 1738 as accompaniments to Le Flûteur, these machines appeared as manna to feed the all-consuming appetite of Parisian society for spectacle (Vaucanson 1742, 23). Whilst Le Tambourinaire, who played over twenty different tunes including 'Minuets, Rigadoons and Country-Dances', held interest for the briefest of moments, it was Le Canard Digérateur that drew the most attention from its audience. For more than breathing and moving, this machine imitated the digestive process–it could be fed food that was then (or appeared to be) excreted. If Le Flûteur garnered interest not just because it played the flute, rather than simply appearing to, but also because it moved and drew breath, Le Canard Digérateur drew attention for its perceived realism in its imitation of another physiological act of animate life, that of digestion. However, in addition to animalistic movement typical of a duck, it could both quack as well as rise and settle on its legs (Metzner 1998, 163). Yet this animal automaton was something of a deceit, in contrast to the authenticity of movement with Le Flûteur and Le Tambourinaire. For although Le Canard Digérateur did swallow food, the excretion was not the same matter as that ingested, with the excreted product pre-placed within the machine (Figure 1.5).[29] Therefore, unlike with his other automata, Vaucanson's claim of having constructed a physiological machine was disingenuous.[30]

[28] Catherine Liu also pursues the Freudian interpretation of eighteenth century automata, using Freud's dream interpretation of machines as stand-ins for genitals, an argument interesting in its adoption due to Vaucanson's reported dream of the machines. Liu argues that "Genitals and machines exists in a relationship of metonymy because of *manipulation*: Sublimation can take place because of the efficacy of the metonymical substitution" (Liu 2000, 36). However, more interesting is her note that Enlightenment machinery split into the soulless and soulful; those machines of 'pure' operation and those that embodied the knowledge of the time (Liu 2000, x).

[29] Le Canard Digérateur has subsquently been lost; after being rescued in a dilapidated condition with Le Flûteur by Goethe in 1805, it was last recorded as being presented for viewing to Louis I of Bavaria, by its then owner Johann-Bartholome Rechsteiner in 1847 (Kang 2011, 104).

[30] Following the success of his automata, Vaucanson was appointed as superintendent of weaving in Lyons, an appointment seemingly nothing to do with his previous work. However looms and weaving are intricately woven into the history of technology, specifically writing machines and latterly computers (See for example, Plant 1998; and Essinger 2004). Vaucanson continued to work on automata, developing a project to build a more realistic, simulated automata that would circulate blood, digest, breathe and have a more human sense of movement through the accurate construction of muscles, tendons and nerves. In this failed project, he was attempting to build a machine that would be of use to the new medical profession, so that these new practitioners had lifelike models to work on before turning their hand to human bodies.

In this construction, Vaucanson is famous for his attempt to utilise a new technology in building a circulatory system, brought from the Americas to Europe by the French. This new technology was rubber and, although used by native Americans and noted by Spanish conquistadors, was unknown in European culture. This history of the project to develop

However Vaucanson's choice in the fashioning of automata is telling. For in moving from creating musical automata, machines which could move and 'breathe' to play their musical instruments, to the creation of a machine of pure physiological process, Vaucanson was clearly focussing on the ontological features of these Enlightenment machines, with the fundamental physiological operations of animate life being demonstrated as being able to be imitated by a machine. By choosing to demonstrate digestion, and defecation in particular, rather than just breathing, Vaucanson was driving towards the more philosophical side of the machines; and as they became more philosophical, they became more spectacular. Additionally, the practice of Vaucanson's automata was secondary to the illustration it provided of animated physiology; the practice of playing music provided the 'cover' for Vaucanson's experiments with animate life, experiments that he learnt to his cost had threatened powerful sections of eighteenth century society.[31]

Accomplished Automata

Perhaps the most expressive automata of the Enlightenment philosophy of Riskin's 'shifting boundaries', those machines that articulate the epistemic movements in the eighteenth century between being and practice, between the machine and body, were those invented by the Jaquet-Droz family in the late eighteenth century. Together with his son Henri-Louis (1752-1791) and Jean Fredric Leschot (1746-1824), the Swiss clockmaker Pierre Jaquet-Droz (1721-1790) built three automata in the early 1770s, initially adapting his clock-making skills to build mechanical birds, following the eighteenth century European trend for all things Oriental.[32]

Jaquet-Droz's first automaton was L'Écrivain, or The Writer, of 1772 (Figures 1.6 and 1.7). However, in constructing a writing automaton, Jaquet-Droz was not the first to create this type of machine; in 1771, there is a record of a writing automaton being presented to the Académie des Sciences in Paris by a Frenchman engineer called Payen, a machine in the form of Eros, which wrote one word, 'LOVE!', with its arrow (Adler 1973, 51).[33] When Jaquet-Droz came to build his own writer, the material form of the new model of L'Écrivain was,

> ... [a] pleasing little boy, 28" tall, is made in carved wood, seems very vivacious, and gives an unusual impression of life ... The automaton is seated on a Louis XV-style stool behind a little mahogany table. In his right hand he holds a goose quill, while his left is leaning on the writing table. His head is mobile, like his eyes, which he can turn in every direction. (Chapuis and Droz 1958, 293).

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rubber into a usable material is underdeveloped, for reasons that remain unclear, as noted by Gaby Wood. In Wood's exposition of what is known of this project, it becomes 'hard to say' anything about the early history of rubber, due to the lack of historical documentation. What is clear is that in chasing the development of rubber into a more stable usable form, Vaucanson's overall project of creating a more 'real' automaton involved botany, colonial exploration, contemporary chemistry and the politics of power, through the involvement of the King of France, and a number of leading French scientists and explorers (Wood 2002, 53).

[31] Vaucanson's automata have been important conceptual objects for a number of key texts in eighteenth and nineteenth century intellectual history, including Immanuel Kant's *Critique of Practical Reason* (1788), Thomas Carlyle's essay 'Signs of the Times' (1829), Hermann von Helmholtz's essay 'On the Interaction of Natural Forces' (1854), Karl Marx's *Capital* (1867), and Thomas H. Huxley's 1874 article ' On the Hypothesis that Animals are Automata, and Its History'. To read futher, see Kang 2011, 108-9.

[32] Birds appear again within this thesis on pre-twentieth century mechanised writing machines, in the photographic work of nineteenth century physiologist Étienne-Jules Marey; in his initial experiments with capturing movement, Marey takes birds as his paradigm of difficulty because of their movement in three-dimensional space. See section 2.3 'Photographic Ordering: Graphs, Composites and Mugshots.'

[33] Payen's L'Écrivain of 1771 is described in an article of the time as representing "the figure of the God of Love as large as the life, which arises from a bank it is discovered on, pays its respects to the spectators, then writes several lines with one of its arrows, and afterwards plays two opera-airs upon a harpsichord" (Boswell 1771). Aside from this article in the *Scots Magazine*, and another very similar one in *Mercure de France* of 1771, there is scant information about the Payen L'Écrivain and it would seem that the machine itself has not survived; nor are there any known illustrations of it (Anon. 1771; and Adler 1973, 50-1).

With its rich dress, and the use of expensive materials in its construction, Jaquet-Droz's machine was not only a costly object in and of itself, but was clearly meant to represent a body from the higher levels of eighteenth century French society. In terms of its operation, L'Écrivain uses a quill pen, and holding the paper with his left hand, he intermittently moves his right hand in performing the act of writing, including dipping the quill into an inkwell on the top right hand side of the desk. In terms of what it writes, L'Écrivain can write any sentence from a preset collection of forty individual words and so in writing a (semi-)unique sequence, L'Écrivain can be understood as being 'programmable'.[34]

The writing mechanism of L'Écrivain is controlled by three main levers, two of which controlled the horizontal and vertical movement of the hand, and the other the pressure on the pen, and thus the thickness of the strokes. Conceptually foregrounded in the mechanism of the machine is L'Écrivain's production of writing imitative of handwriting rather than printed type; the output of the machine could not simply be exchanged for printed type to turn it from a handwriting machine into a typewriting machine but rather the output was described within the operation of the machine itself. Examples of texts written by Jaquet-Droz's L'Écrivain include 'Es lebe die Stadt Albrecht Duerers' (Long live the city of Albrecht Dürer) and 'Soyez les Bienvenus a Neuchâtel' (Welcome to Neuchâtel) pointing to the fact, if both legitimately from L'Écrivain, that Jaquet-Droz's automata were bi-lingual (Figures 1.8 and 1.9).[35]

The second Jaquet-Droz automaton was Le Désignateur, or The Draughtsman (Figures 1.10 and 1.11). In the figure of a young boy, the machine is able to draw four different pictures, which it does with a piece of charcoal; these four drawings are 'Love Trained by a Butterfly', an image of Cupid in a cart being pulled by a butterfly; 'A Dog Named Toutou'; 'A Portrait of Louis XV'; and 'A Portrait of Louis XVI and Marie Antoinette' (Figure 1.12) – themselves derived from a set of eighteenth century engravings owned by the Jaquet-Droz family (Figure 1.13).[36] Following the drawing of any one of these images, this automaton then blows away excess charcoal, demonstrating its (apparent) ability to breathe, in actuality done by the use of bellows in the head of the figure, utilising similar technology to that used by Vaucanson for Le Flûteur.

Jaquet-Droz's third automaton was La Musicienne, or The Musician, a young woman playing an organised harpsichord (Figures 1.14 and 1.15), which was an instrument combining a harpsichord and a flute, again developing the technology of Vaucanson's Le Flûteur. Her action is to play the instrument, lean forward, (seem to) breathe, turn her head, look at her audience when she finishes and perform an action described as 'drawing her reverence'. She plays a keyboard that

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[34] In the period 1850-1900, the age of automata was intimately tied to concepts of magic and illusion, rather than those of the earlier period under examination here, philosophical exploration and play. The leading magician and mechanician of the latter age was Robert-Houdini, who undertook an examination of these earlier automata. It is claimed that in carrying out a 'biopsy' of Jaquet-Droz L'Écrivain, something inherently suspicious about its operationality was found, insinuating that it was, like Kempelen's The Chess Player, operated ultimately by a human being,

> There have survived down to this day some quite delicate levers, with eyelets for attaching wires to, levers which are no longer in use. One likewise sees numerous holes and notches into which must have been placed pieces now missing. The base, covered with velours, is riddled with holes and furrowed with converging grooves; one of the legs of the table is pierced through its entire length, and little mortises, cut into the corners, must have held tiny pulleys serving to guide the wire(s) and to lead them down to the floor. These wires must have been operated by one or two pedals. (Sivan quoted in Metzner 1998, 202)

However, the automaton still works and has been shown to be 'a machine' which works independently of human interaction.

[35] The written phrase 'Long live the city of Albert Dürer' would seem to be a reference to Nuremberg, a somewhat peculiar reference, as the machines were constructed in the small Swiss town of Neuchâtel, which had no known link to this German town. However, at this time, Nuremberg was part of the Prussian Empire, ruled over by Frederick II, a known collector of ideas and objects, as was his regal competitor, Catherine the Great, who is known to have collected automata. The 'Welcome to Neuchâtel' phrase therefore can be better understood within this context. Between 1782 and 1787, Jaquet-Droz, in partnership with Leschot, built two more automata that could write. However these machines condensed two of the earlier machines into one, they could both write and draw. These two machines were subsequently lost, variously disappearing in China and in Europe, through the British Court. For more on the story of the Jaquet-Droz automata, see Chapuis and Droz 1958.

[36] The choice of these images displays how in the construction of the machine, Jaquet-Droz was already considering his audience: the French Court and Marie-Antoinette especially. Also see Chapuis and Droz 1958.

comprises two arrays of wooden keys, each with twelve keys (Figure 1.16). However, unlike a harpsichord or piano of this period, the keys were not differentiated into black and white keys, nor arranged in a straight line, but in a semi-circle. Operated by four mechanisms, the emphasis of this object is on its human-like movement–the movement of its fingers, its breathing and its 'drawing reverence', rather than on the music it plays, or on its performance (aside from the fact that it does perform); for whilst only one mechanism produces the air to operate the musical instrument, the other three are interconnected to animate La Musicienne's body. Furthermore, the mechanism for her animation is able to continue once the other two had 'run down', giving the illusion of a moving body long after she has performed her act.

Of the forms of the Jaquet-Droz automata, their represented figures intersect with their occupations as their bodies intersect with their practices. Firstly in the prospectus that accompanied the exhibition of these automata, L'Écrivain is described as being two years old, as is Le Désignateur, whilst La Musicienne is described as being between ten and twelve years old (Metzner 1998, 169-170). Thus all these machines are the embodiments of children or young adults, at a time when the conceptual category of 'childhood' was being formed: these machines took juvenile forms.[37] Secondly whilst Le Désignateur and L'Écrivain are both male, La Musicienne is female, demonstrating the conventional gendering of practices in the eighteenth century as implicitly embedded within the representations of their activity; to draw and to write, to operate a quill or piece of charcoal was a male act, whilst to produce a piece of music was a female one, requiring the dexterity of female hands. The permanence of writing and drawing was masculine; the ephemeral, feminine.

The popularity of the automata, and the attendant wealth and fame they bought to their inventors and owners, soon tempted more individuals to turn their hand to their creation. One of the first was the Swiss watchmaker Henri Maillardet (1745-?), a leading figure of Jaquet-Droz's London business, who built Le Désignateur-Écrivain, or Draughtsman-Writer, a condensed version of the two Jaquet-Droz's automata. Currently on display in the collection of The Franklin Institute Science Museum in America, the Maillardet Le Désignateur-Écrivain was constructed as a young boy who could both draw and write (Figure 1.18). [Its restoration after a fire in the mid-nineteenth century resulted in its longstanding appearance as a cloaked young girl; the restorer performed a gender reassignment as he rebuilt Maillardet's machine. It has since been re-assigned to its original gender (see Figures 1.17 a and b for its gender re-assignment)].[38] The automaton draws four different pictures: a sailing ship with three masts; a Chinese pagoda; a Cupid in a landscape shooting an arrow; and Love in chariot drawn by two doves, with the last three images additionally all appearing within a self-drawn frame (Figures 1.19-1.25). In addition, it also writes three different texts, in French and English.

Text One:
"Enfant cheri des dames
Je suis en tout pays
Fort bien avec les femmes
Meme avec les maris.
Ecrit par L'Automatede Maillardet"
(Figure 1.23)

Translation:
"A child, the darling of the fair,
Throughout the world as I dare tell
The ladies love me everywhere
And so their husbands do as well.
(Written by Maillardet's automaton)"

[37] For the construction of childhood as a conceptual category in the eighteenth century see Cunningham 2006; Muller 2006; and Cunningham 2005.
[38] Maillardet's Le Désignateur-Écrivain has now been re-clothed as a small boy, although only partially; half the machine is exposed for visitors to see the mechanism at work. Additionally, the Institute believes the machine to be cursed. For further information, see Penniman 2011.

Text Two:
"Un jeune enfant que le zèle dirige
De vos faveurs sollicite le prise
Et s'il l'obtient n'en soyez point surpris;
Le desir de vous plaire enfant à ce prodiges"
(Figure 1.24)

Translation:
"A little one with zeal impassioned
Seeks for the tribute of you praising
Should he succeed 'tis not amazing
To please you with this marvel fashioned."

Text Three:
"Unerring is my hand tho' small
May I not add with truth.
I do my best to please you all
Encourage then my youth."
(Figure 1.25)

There are a number of points to note in the choice of text. Firstly, Maillardet's Le Designateur-Écrivain first text is a section of verse taken from the comic opera *Les Visitandines* (*Sisters of the Visitation*) by François Devienne, a controversial anti-clerical work first performed in Paris in 1792.[39] Secondly, with two verses in French and one in English, Le Désignateur-Écrivain is, like the Jaquet-Droz's L'Écrivain, bi-lingual. Thirdly, both the second and third verse draw attention to the immaturity of writer, begging the audience's forgiveness for any errors and urging its own praise at the wonder of him; these texts indicate this is a machine under construction as human, through the references to its juvenile status, both in its physical form and the choice of text it writes. Additionally, the material form of the texts produced by these writing technologies express eighteenth century concepts of the nature of writing, embedded within the mechanism of the automata themselves. Firstly, the three pieces of writing, the product of the machine, are in the handwriting style of the period, so-called round hand, or copperplate. But beyond that they are also in the textual design of the period, each text is written in the centre of a decorative escutcheon, drawn around the verse, and decorated in a manner typical of the penmanship of the eighteenth century.[40] Therefore, in its very materiality of form, demonstrable of the machine's control of the pen, and its investment in the aesthetic character of the text, the written coalesces with the drawn, the text with the image, as twin faces of the same practice.[41] The embodiment of drawing and/or writing automata as young male figures demonstrates how this skill was already gendered, part of the modernist discourse of writing that threads its way through the history of mechanised writing and the modernist body.[42]

The Useless vs. Productive Gesture of the Machine

Prior to the machines of Vaucanson, Jaquet-Droz and Maillardet, automata were artistic renditions, aesthetic objects constructed and displayed to morally inform a lay audience, usually as part of a larger machine, such as a clock or water fountain. However in the Enlightenment's

[39] *Les Visitandines*, written by the librettist Jean-Louis Picard, expressed and heralded a new social order in post-Revolutionary France, and its "audiences ... reveled in it as one of the manifestations of their newly granted right to criticize members of the clergy" (Dudley 2010). The historical literature and critical theory of automata contains no mention of the appropriation of text from another source. Based on the appropriation, there has to be a suspicion that all of Maillardet's Le Désignateur-Écrivain texts and drawings are likewise appropriated from other sources. To date, these sources remain untraced.

[40] The subject of handwriting forms in the eighteenth century is directly addressed below in section 1.3 'Eighteenth Century Types: Hand and Machine Writing.'

[41] However, as the restorer of machine in the 1950s noted, "the drawing lacks the fineness and precision of the work done by the Jaquet-Droz Draughtsman" (Chapuis and Droz 1958, 305).

[42] The dominant understanding of writing as handwriting, and its concomitant gendering as male is discussed below in Chapter 3, 'Sinister Bodies, Dexterous Hands: The Naturalisation of Typewriting as a Feminine Practice.'

pursuit of a mechanistic philosophy, these machines became imitative of human beings, not just visually and materially but also in their actions. Through these developments, eighteenth century automata became objects in their own right, categorically separate from the larger machines whose technology was repurposed in their creation. Riskin analyses this birthing of the automata as a shift from analogy to simulation, noting that the rhetorical function of these objects is the result of an epistemic shift; for "analogies work by preserving a certain distance between two things being likened, whereas simulations operate by collapsing that distance" (Riskin 2003, 101). Riskin's analogy-simulation shift can be mapped onto another workable framework for understanding these machines, that of illustration and imitation. An illustration supports and explains through its specificity. It is, therefore, a characterisation; often, but not always, it is an explicit example of an abstraction. An imitation, however, is a homogeneity; it is a different type of object, with a different relational quality, as it works to be the ideal form. Imitations is associated with equivalences, at least enough of them to 'pass' for the original at some level acceptable for its audience; illustrations are only ever an approximation, a point on the approach towards the 'real'. Imitation is associated with such notions as reproducibility, copying and authenticity; illustration with examples and visualisations. Although historian Jenny Uglow explicitly ties imitation to repeatability, replication and variation, mutative learning, predictability and standardisation, it is clear from these machines that how the man-machine relationship was expressed did not adhere to this rather broad schemata (Uglow 2002, 304); and whilst these machines can in many ways be understood as imitations, imitations of earlier automata, with their clockwork mechanisms, of the process of learning, as depictions of juveniles at their accomplishments, and of the practices and processes of the accomplishments themselves, these automata can only ever be considered as articulations, as historically specific epistemological objects that fleshed out a body of knowledge of particular labouring bodies.

These machines were, in a certain sense, economically unproductive, in an age of increasing industrialisation. For, although in their spectacular display, they created wealth for their inventors, these automata did not perform economic acts even as they produced new knowledge of what machines could do and how bodies might work–they did not perform acts of bodily skill that an eighteenth century working human being would have performed at the time in earning money. Rather they performed acts of bodily skill, playing the flute, drums or harpsichord, writing, and drawing, all of which are acts of accomplishments. The act of writing occupies a peculiar place in this set of accomplishments as much as writing occupied a peculiar place in the economic structure of eighteenth century society; for the birth of the age of android automata was also the birth of the age of so-called literary production when writers had only recently begun to "turn out work for his publisher in factory style", and handwriting still carried with it its craftsman status (Marx 1977, 1044; quoted in Schaffer 1999, 131).

However, these accomplished acts, of drawing, writing and music, do not form a complete list of eighteenth century accomplishments; other accomplishments, such as sewing or embroidery, did not find their expression in eighteenth century android automata, a strange omission considering how prevalent the mechanisation of the textile industry was at this time, and how the technology of automata was so closely tied to the technology of the loom (Plant 1995; and Essinger 2004). However, it could be argued that it was the very closeness between textile work and machines that led to android automata creators' avoidance of embodying textile practices in machine form; for the mechanisation of the textile production had deep political and social implications. Therefore to represent a labouring human body with the labouring human-like machine would have not been received as an entertainment, but rather as a threat, much as Vaucanson's first automata inventions were threats to the Church; better by far to have the human-like machines perform economically useless acts.

The useless acts the automata performed in combination with the complexity and expense of construction directly led to their description as 'toys', as playful objects. However, these machines contained within them a double use-value; firstly as objects of intellectual capital, in that their illustrative qualities led to them being philosophical objects for metaphysical reflection; and secondly as objects of financial capital, exhibited in dedicated showrooms across Europe before a paying public. However, in their automation, these automata were also crucial objects in the intellectual-financial capital system, for "as commodity fetishes they played a significant role in the manufacturing economy and the mercantile system" (Schaffer 1999, 128). The layering of imitations described above is at one and the same time conventional and speculative, expressed in the cultural function of the machines as both educative and entertaining , for automata "were both arguments and entertainments, designed seductively to place craft skill within the setting of power, and to allow selective entry by that power to the inner-workings of art and nature" (Schaffer 1999, 135-6).

Conclusion: Living Encyclopaedias

Eighteenth century android automata could play a keyboard, write a text or draw an image, demonstrating a functionality altogether different from the accompanying physiological operations that these machines could also (sometimes supposedly) perform–breathing, moving, and with other animate automata, eating, digesting, and defecating. Whilst these machines could perform the basic physiological functions of animate life, demonstrating the possibility of machines becoming alive, they also performed accomplished acts, the practices of music, writing and drawing, all of which are learnt bodily skills and specific cultural practices.[43] However, in performing specific cultural practices, these automata implicitly stripped away these skills from the body, claiming them as the territory of the machine. Additionally, as a 'cover' for imitating and illustrating moving, breathing, skilled human bodies with machines, the skills themselves were made useless, as skills performed by either women or young children; these were not the skills of men but something that could be a spectacle, to be put on show.

By exhibiting moving machine bodies, automata were an artificially embodied form of knowledge of the human body, whose "...mechanical skeleton is a living 'encyclopaedia' of the different mechanical pieces and of the machine parts available at the time" (Beaune 1989, 435). And as living encyclopaedias, these automata expressed the performance of writing as a knowledge production, and were formative of knowledge of the relationship between man and machine. Thus, these android automata were essential elements, if not paradigmatic, of the Enlightenment project to know through reason and construct through rationality, as much as Diderot and d'Alembert's *Encyclopédie* project aimed to describe all knowledge through reason. And yet, in both forms, the eighteenth century android automata and the eighteenth century map of all knowledge, the ideas at play are imbued with a deadly seriousness, whilst those with a serious intent are infused with playfulness; android automata and the *Encyclopédie* were both forms of knowledge at serious play.[44] Automata historian Jean-Claude Beaune joins these forms of

[43] Anthropologist Tim Ingold, in his interdisciplinary study of the line, notes that the making of the line is not a biological determination of human being, but a learnt skill of human practice (Ingold 2008, 154-168).

[44] Diderot and d'Alembert's *Encyclopédie* famously played with the rules of publishing, and of knowledge, in the eighteenth century, and was deeply subversive, a subversiveness achieved in part through its intricate cross-referencing system. However this subversiveness could be seen in the overall project as well, as historian of the book Robert Darnton notes,

> Thus everything man knew derived from the world around him and the operations of his own mind. The *Encyclopédie* made the point graphically, with an engraving of a tree of knowledge showing how all the arts and sciences grew out of the three mental faculties. Philosophy formed the trunk of the tree, while theology occupied a remote branch, next to black magic. Diderot and d'Alembert had dethroned the ancient queen of the sciences. They had rearranged the cognitive universe and reorientated man within it, while elbowing God outside. (Darnton , 7)

For more on *Encyclopédie*, see Koepp 1986; Chandler Hayes 2008; and Zimmer 2009.

knowledge, these objects and this text, when he refers to the aesthetic nature of automata, writing "it simultaneously demonstrates and conceals the cunning artifice that makes it the supreme toy, and it also shares in the mathematical formalization of play" (Beaune 1989, 436).

1.2: Multiplying The Line: 'Facie-Traces', Copying Machines and Polygraphs[45]

While eighteenth century writing automata illustrated the human form through imitating the accomplished act of writing, the polygraph was another form of eighteenth century writing technology, itself part of a broader class of eighteenth century inscriptive technologies. These technologies, variously called physiognotraces, pantographs, or polygraphs, depending on what these devices were intended to draw or write, are all expressive of the trope of copying discussed in the previous section, albeit with a different cultural function. To analyse this trope, this section will examine the technologies and techniques of these eighteenth century inscription technologies, beginning with silhouettes and physiognotraces, and then moving on to eighteenth century copying tools, including James Watt's Copying Press, Erasmus Darwin's Bigrapher, Matthew Boulton and James Booth's 'mechanical painting' technologies, Ralph Wedgwood's Manifold Writer and Tom Wedgwood's 'silver pictures'. It will argue that copying rather than creation was the dominant trope of inscription, and that this inscriptive drive into handwriting, and thus to identity, particularly by the very use of the word polygraph. In collapsing writing and the body onto one another through writing technologies, this section argues that the concept of copying hand-made inscriptions and copying the body through the creation of silhouettes is part of the start of the modernist drive to textualise the body and flesh out text.

Tracing the Head, Writing the Face

The birth of cut-out facial profiles can be variously historically located, either in the relief figures of Etruscan vases, or, more recently, in seventeenth century aristocratic pursuits. The technique of taking these profiles became known generally by the term 'silhouette' in the early nineteenth century after becoming associated with Étienne de Silhouette (1709-1767), the comptroller-general at the court of Louis XV who, in an effort to tighten the royal purse strings, introduced a series of strict economising measures. However, when not running the royal finances, de Silhouette created paper facial profiles. The unpopularity of his 'strict fiscal policies' led to the elision of his identity with his pastime, resulting in the somewhat malicious association of his name with all things frugal: as art historian Wendy Bellion notes "The moniker stuck to the economical profile, austere in form and color, and eventually lost its negative connotation" (Bellion 2003, 40). However when exactly this moniker became ubiquitous is more uncertain, as professional 'silhouettists' as late as 1820 describe themselves as 'profilists', 'papyrologists' or 'scissargraphists', their practice as 'shadowgraphy', 'skiagraphy', 'papyrography' or 'découpûre' and their products as 'shades' (most frequently), or 'scissartypes' (Jackson 1911, 15-16).[46] This variety in the nomenclature exposes how the focus of this technique of copying the face was diffused over the subject (the profile), the material of the product (paper) and the tools of the trade (scissors), until it was removed to stand under the (then malicious) use of an individual's name.

Silhouettes are often conceptually framed as pre-photographic, a claim that rests on an almost self-evident analysis that both portrait photography and profile-taking capture the human face 'as it really is'. In its application to the practice of silhouettes, the 'pencil of nature'–that (now) somewhat clichéd description of photography first used in the title of Henry Fox Talbot's

[45] Facie-trace was the name Raphaelle Peale, son of the proprietor of The Philadelphia Museum, Charles Wilson Peale, gave to his version of John Isaac Hawkin's physiognotrace; Peale used this machine to trace faces in 'busy port cities' between Baltimore and Savannah in early nineteenth century America (Bellion 2003, 35).

[46] Emily Nevill Jackson also claims that the term 'silhouette' for cut-out profiles did not enter the English speaking world until used by the prolific silhouettist August Edouart (1789-1861), who arrived in England as a political refugee from France in the 1820s. His move to the Britain prompted his move from making pictures out of hair to creating profile images.

photographic book of 1844-46–was literal rather than metaphorical, as a pencil was used alongside a pair of scissors to capture an individual head. Additionally, there remains a strong indexical relation that binds the cut-out profile to the photographic portrait; firstly with each silhouette referring back to the individual sitter; and secondly, as a systematic record of individuals, demonstrable in the work of the prolific early nineteenth century silhouettist August Edouart's notebooks, that contained a filing system of every head he ever cut. However the relationship between the practices and products of silhouettes and photographs does not simply map from one to another; silhouettes and photography are not silhouettes of the other. For in the drive from artistic rendition to mechanised capture, through the evolution of technique, and the variety of products produced, the practice of taking silhouettes sits slightly to the side of the traditional proto-photographic interpretation. Firstly as the practice of making silhouettes became increasingly popular in the eighteenth century, in no small part due to the popularity of Johann Casper Lavater's use of 'shades' in his seminal physiognomic treatise *Essays on Physiognomy* (1775-78), various technologies were invented to catch the profile of the sitter with a larger degree of accuracy and a smaller degree of effort, by supplementing the human hand with a machine or device that would increase its accuracy (Lavater 1775-8).[47] Thus silhouettes began as a drawing skill, whether that drawing was with a pencil or scissors, before being partially mechanised and standardised in production. Secondly, silhouettes were often multi-media images, as demonstrated by the silhouettes in the V&A collection and those that appear in E. Nevill Jackson's *The History of Silhouettes* (1911). Silhouettes could be painted on glass, ivory or plaster, or cut from paper; they could be painted in watercolour or drawn in ink; gilded or painted over, or placed on a watercolour background; in some silhouettes, the fingerprint of the silhouettist can be seen, used as a printing surface with which to flesh out the body of the sitter. Certainly in their multi-media manifestation, silhouettes can be thought of as proto-collage rather than proto-photographic.

The mechanisation of silhouette making in the late eighteenth century can be located in a range of different individuals and techniques of the early nineteenth century. One example of this type of machine was invented by Joseph. P. Tussaud, son of famous Madame Tussaud (née Marie Grosholtz, 1761-1850). Whilst his mother had allegedly picked the heads out of the pile of discarded body parts set at the side of the guillotine during the French Revolution, from which she took death masks that then became the foundation of her famous London wax museum, Joseph Tussaud invented a machine for 'taking' silhouettes in the 1810s. Having been taught how to create silhouettes through the adaptation of a magic lantern and then the separate use of a pantograph, or drawing frame, to enlarge or reduce the image, Joseph Tussaud built a machine that was latterly described as "one of these identical portrait-taking machines" (Pilbeam 2006, 84; and Jackson 1911, 46).[48] But perhaps the most famous machine was invented by British emigrant to America John Isaac Hawkins (1772-1854) and patented in the USA in 1803, a device he called the physiognotrace (Figure 1.26). Living in Philadelphia from at least 1799, Hawkins was a noted piano maker and inventor, responsible for several important developments in the technology of the upright piano.[49] Before returning to England circa. 1810, Hawkins gifted Charles Wilson Peale a physiognotrace as an attraction for Peale's new Philadelphia Museum. This machine replaced

[47] Johann Casper Lavater and physiognomy is addressed in greater detail below, in section 2.1 'Reading the Head: Physiognomy and Phrenology as Reading/Writing Practices.'

[48] The inventions of Tussaud and Hawkins were preceded by Raphael Pinion's Limonchia of 1750, Gilles-Louis Chretien's Physionotrace of 1786, and followed by Schmalcalder's Profile Taking Machine of 1806 (Figures 1.29-1.31).

[49] In 1803, Hawkins patented a mechanism for the piano by which depressing a key would result in the repeat action of the hammer, which he called a 'Poiatorise stop'; he also recommended the use of other materials in the manufacture of strings of musical instruments, such as gut or silk, to prevent them becoming out of tune. Hawkins also worked towards the reduction in size of the piano and in 1802 invented a new type of instrument, which he called the Claviol, described as being "a tall instrument like an upright piano that bowed its strings" (, 168-9).

the traditional combination of a candle, a shadow, a pencil, a pair of scissors and a steady hand, with a machine into which the subject was placed and by the use of a small handle tracing around the edge of the profile shadow drew the profile of the sitter; in constructing this kind of portrait taking device, Hawkins was following in the footsteps of the artist Thomas Holloway, who in 1792 had invented a Silhouette Taking Chair (Figures 1.27 and 1.28).[50] The handle was connected not to a piece of charcoal, but rather controlled a steel stylus that cut out the head's profile through a folded up piece of white paper, itself inserted into the machine. On completion of the trace, the paper was removed from the machine and unfolded, leaving "four identical hollow heads"; each section of the paper was then placed on a dark piece of material creating the silhouettes (Bellion 2003, 32). What is of interest to note, specifically in relation to the proto-photographic characterisation of silhouettes, is that these heads are not positive images, but negatives; the actual head shape is discarded and it is the negative form displayed. In addition, there was a multiplicity at work–for it was not just one copy of the original profile was made, but four copies, all at the same time. Thus the mechanisation of drawing the line around the face not only promised greater accuracy in copying the 'ideal form' of the sitter, but also produced multiple copies of the silhouettes.

Early Photocopying Machines (Before the Photo)

At the same time as the making of images of bodies was being mechanised, through silhouette machines, textual production was also being mechanised. Like the typewriter, devices for textual production were invented at a number of historical moments until they found commercial success in the late eighteenth century.[51] The first commercially successful copying device was invented by the Scottish engineer and Lunar Society member James Watt (1736-1819), and was designed originally to copy handwriting. James Watt's attention to the copying of writing was first drawn and focused by fellow Lunar Society member (and often *de facto* leader) Erasmus Darwin and his invention of 1777, The Bigrapher (Figure 1.32). Darwin developed this mechanical copying device not just as part of his wide practice of experimentation and invention, but also as a potential source of income.[52] The Bigrapher took the form of earlier copying devices such as de Cotteneuve's *polygraphe* (1763), in that two pens (or, at this time, quills) were joined together by a wooden frame, such that writing with one made the other quill move and write in exactly the same form, at the same time. Unable to raise the money for a patent, in 1779 Darwin arranged to send the device to his friend Charles Greville, in the hope that Greville would find someone to promote it. In the same year Darwin is recorded as presenting his invention to a meeting of the Lunar Society in which the proceedings were as follows:

> Darwin said one day to his companions, 'I have imagined a certain double pen, a pen with two beaks, by the aid of which we may write every thing in duplicate; and thus at once give

[50] The sitter in a physiognotrace and the condemned in the guillotine share a similar action, in that both insert their heads into a device that then 'takes' their head.

[51] This point of various moments of invention for the copying machines has been noted in Bedini 1984, 8-9. Bedini makes the claim that these machines did not achieve commercial success until the start of the Industrial Revolution called for it, an argument akin to that made by office labour historian Margery Davies in her explanation of the commercial success of the typewriter in the late nineteenth century being due to the needs of the age of late capitalism. (Davies 1982). Davies' argument is discussed more explicitly and in further detail below, in section 3.3, 'Mechanised Women: Telegraphists and Typewriters 1832-1905'. Copying machine historians Barbara Rhodes and William Streeter divide the time of the copying machine into six 'eras', taking the invention of James Watt as their year zero: The James Watt Imported Press (1780s-1830s); Trial and Error Period (1830s-1840s); A Period of Change and Ornamentation (1840s-1860); The Modernization of Letter Copying Presses (1860s-1880s); A Period of Mass Production (1860-1900s); and, somewhat anomalously, A New Era of Innovations (1880s) (Rhodes and Streeter 1999, 198-205). For a chronological outline of typewriter inventions, see Appendix 1: Pre-1868 Mechanised Writing Machines.

[52] Erasmus Darwin, something of a polymath, not only developed his Bigrapher into a Polygrapher (Figure 1.33), he also invented a speaking automaton, using his knowledge of the throat and vocal chords drawn from his work as a doctor (Uglow 2002, 306-7).

> the original and a copy of the letter.' Watt almost immediately replied: 'I hope to find a better solution of the problem. I will work out my ideas to-night and will communicate them to you tomorrow.' (Arago 1859, 115)

Watt found his solution the next day, writing somewhat enthusiastically to Darwin that he had found "a way of copying writing chemically which beats your bigrapher hollow!" (King-Hele, 96 f.n. 79A-1; and Upham Murray Smith and Arnott 2005, 240). Although Watt noted that his copying method was chemical, in fact it was chemical, material and mechanical, in that he invented a special ink for writing with, extra thin paper to copy the document to and then a roller press for pressing the original onto the copying sheet (Figure 1.34). Aside from personal rivalry, Watt was also driven to address the problem of copying writing in order to find a solution his own personal work practices. Watt's partnership with another Lunar Society member, the entrepreneur Matthew Boulton (1728-1709) in the production of steam engines for the company Boulton & Watt (est. 1775) meant he had to travel frequently between the mines in Cornwall and Birmingham, between the mines where large numbers of the company's engines were located and the factory where the engines were built. It was the frequency of travelling between these locations that led to Watt's necessity to have his documentation in both locations, without being compelled to carry them with him all the time, or to perform the time-consuming task of copying them out by hand himself (Bedini 1984, 10).

On having Watt's copying device demonstrated to him, Boulton, who began his commercial life as a 'toy' maker (nowadays understood as a small metal worker) before becoming the steam engine entrepreneur of the Early Industrial Age, immediately offered to manage and pay for the registration of a patent for the device. Additionally Boulton suggested setting up James Watt & Co., a company singularly dedicated to the manufacture, promotion and selling of Watt's Copying Machine, as it was called in the company's promotional material (Watt & Co. 1811). The company was established in 1780, and a third partner, the chemist James Keir, was brought in to manage the business. Announcing in its advertising that copies could be made in less than a minute, and selling the copying machines at £6 through subscription, Watt & Co. was successful from the start, selling 630 machines in its first year through Britain and Europe. Within two years, Watt & Co. was selling its copying machines to the newly established USA, where they were bought by the great documentarians of American Independence, Thomas Jefferson, James Madison, George Washington and Benjamin Franklin (Rhodes and Streeter 1999, 10). However its popularity cannot simply be seen in its sales figures, and the cultural prominence of its customers, but also from its imitators. By the mid-1790s, other portable copying machines were appearing on the market, infringing on Boulton and Watt's patent just as it was running out, with individuals such as William and Frederick Fleming, John Folgham, and Joseph Bramah (famous for his locks and flushing toilets) in Britain, and John Innes in America all manufacturing, advertising and selling early photocopying machines that were,

> ... intended for public offices, counting houses, &c., and are calculated to take copies of the largest invoices or other writing; and those intended for Gentlemen to copy their letters are of so portable a size, as to be carried in the compass of the smallest travelling desk. (John Innes, *Federal Gazette* 1798, quoted in Rhodes and Streeter 1999, 11-12).

However, Watt & Co. soon realised that the ability of the machine to copy drawing was of equal importance and in response it manufactured large scale versions of Watt's copying machines for the use of engineers and architects in copying their plans and drawings (Rhodes and Streeter 1999, 9). That these machines were conceived of as both being able to copy drawing and writing is

a period echo of the (artificial) embodied acts of drawing and writing constructed and exhibited through the Jaquet-Droz automata, L'Écrivain and Le Désignateur, and the later copy of these machines, Maillardet's Le Désignateur-Écrivain; in the Watt & Co. Copying Press, the automata had found their non-identical twins.

That Matthew Boulton should have so readily seized on Watt's invention in 1780 would seem to position him as having a peculiarly prescient insight into the need for copying documentation in early industrialising Britain.[53] However, Bolton's potential insight can itself be illuminated when taking into account his attempts to establish so-called 'mechanical painting' at his Soho 'manufactury.'[54] Set up in 1777 under the management of Francis Eglinton, the mechanical painting enterprise only lasted three years, due to its unprofitability. Whilst its exact technology and/or technique remain somewhat uncertain, Boulton's mechanical painting and his involvement with the Watt Copying Press demonstrates not just an interest in but knowledge of new techniques and technologies of inscriptive reproduction that enabled him to see in Watt's invention a potentially culturally and therefore commercially successful venture (see Figures 1.35 and 1.36 for a comparison of engraving and mechanical painting).[55] Only a few years later, mechanical painting appears again, in the hands of the portrait painter Joseph Booth and his promotion of a technique he initially called Pollaplasiasmos, with which it was claimed multiple copies of oil paintings could be produced (Robinson and Thompson 1970, 498, 501). Although like Boulton's mechanical painting, Booth's technology/technique remains unknown, in the promotional material Booth claims Pollaplasiasmos is entirely new and furthermore, produces copies that are better than the original, in their very materiality; for,

> ... as this invention consists of an entirely new system of drawing and colouring, which is not subject to either change, cracking, peeling, or any other inconveniency which too frequently attend even first rate pictures painted in the usual manner, the productions of this invention must certainly be acknowledged original. In fact, this art is founded upon principles entirely new throughout; for with regard to every tint of colour, every oil varnish, or other article which the inventor makes use of in the process, he [Booth] firmly believes that their respective qualities were never before known. ... As the manner of colouring and the method of drawing are likewise entirely new, the pictures painted in Pollaplasiasmos may, in this point of view, be considered with propriety as truly original as the first works done in oil, fresco, destemper, crayons, or water ... (Booth 1784, 9)

Whilst Booth testifies to Pollaplasiasmos' 'newness', he also positions it firmly within the discourse of copying, a discourse bedded in with other types of media reproduction, stating that "In short, paintings in oil, crayons, or water colours, may all of them be exactly imitated" (Booth

[53] The entrepreneurship and drive exhibited by Boulton for Watt's invention can be paralleled to James Densmore's similar role in the development of Sholes, Glidden and Soulé's Type Writer of 1868. For more on Densmore's involvement with the development of the typewriter, see Current 1949; and Current 1954.

[54] Discussion of Boulton's mechanical painting business and his involvement with Watt & Co.'s copying machines appear variously, but importantly, within different historical sub-disciplines; the former technology appears in various articles by art historians, whilst the latter appears in literary historical studies, or, because both American presidents Franklin and Jefferson used Watt's copying machine, in early American history. This section is, from current research, the first piece of work that unites Boulton's work in these two practices under one conceptual umbrella. For art historical articles on mechanical painting see Robinson and Thompson 1970; Schweizer 1999; and Edwards 1971. For histories of writing copying devices and machines, with a specific focus on America, see Bedini 1984.

[55] At one time, Boulton's mechanical painting was thought to be an early form of photography, but more recently it has been argued that it was an adaptation of the aquatint process; certainly there are references to Mr Eglinton using three plates to 'take impressions' of the pictures (Robinson and Thompson 1970, 498-501). Examples of Boulton's mechanical paintings, include an image from the Green Drawing Room in Culzean Castle, Scotland, in the style of Angelica Kauffmann; *Graces Awakening Cupid*, again after Angelica Kauffmann, the engraving and mechanical painting copy of it are in the collection of the Science Museum (Figure 1.35 and 1.36); *Summer* after Philippe Jacques de Loutherbourg, in the collection of the National Portrait Gallery; and interior panel images in the interior of Elizabeth Mantagu's house, 22 Portman Square, again after Angelica Kauffmann (Robinson and Thompson 1970, 499-500).

1784, 10). In this defence of his copying technology, Booth is careful not to encroach on–or rather, to say he has no intention of encroaching on–other reproductive technologies such as "engraving, mezzotinto scraping, picture dealing, painting, printfelling, &c.", stressing again and again how different his technique is from engraving, as,

> Engraving may be compared to a metaphysical thought, which endeavours to form in the imagination a living being, without a body or members. (Booth 1784, 10, 19)[56]

In Booth's conceptual schemata of inscriptive technologies, engraving is a technology of Platonic forms, perhaps because the matrix that holds the original image produces multiple identical copies but is not an art work in its own right–an engraved image can therefore be seen as an unembodied one. However, in identifying all the reproductive technologies of his era, Booth identifies a desire for reproduction, for replication, a desire that ultimately is economic; for he argues that

> ... [a] propensity ... has prevailed, since the introduction of the fine arts, in imitating Nature in a greater degree than prints are capable of in one colour only. This is a proof, too, that mankind has been conscious that there was a *something* wanting;-that pictures have more truth and nature in them than any other of the imitative arts; and, that in fact, nothing has been wanting but a method of rendering them of more easy purchase, to bring them into more general use. (Booth 1784, 30-1)

In identifying reproducibility with economics, Booth's approach was a fit; for evidently Booth was more commercially successful than Boulton had been. In 1784, Booth formed The Polygraphic Society, run by a committee of 'interested' parties, and through which mechanical reproductions of a number of art works by well-known artists of the age were offered for sale by subscription, such as *Jupiter and Europa*, the first multiple painting offered for sale at three guineas.[57] However, although he formed a Society around his technology, and offered and sold mechanically reproduced paintings for purchase on the open market, Booth did not apply for a patent for fear of putting his invention in the public domain and losing the economic advantage. In maintaining the economic advantage Booth had large-scale plans for his technology, envisaging a time when the mechanical reproduction of images would occur in a 'manufactory,'

> The plan includes a variety of departments, and will lay a foundation for the establishment of a new manufactory. It will be a repository of paintings, from which the curious may furnish their cabinets. The public may be supplied too with articles appropriated to the purposes of ornaments for ceilings, hangings for rooms, &c. in which last branches, many indigent children may be employed, and thus may the institution serve, in several respects, as an asylum to honest industry. (Booth 1787, 53)

Booth's use of the word 'polygraph' in naming his business is a repurposing of a word for a multi-pen writing device called the *Polygraphe*, invented by de Cotteneuve in 1763 in France, also

[56] Of note in Booth's explanation of the differentiation of his technique is his comparison to metaphysics and the body, thus tying inscription making and the conceptualised body together.

[57] The first works offered for polygraphic reproduction include works by Benjamin West (*Europa Crowning the Bull with Flowers* (1765-1770), *Jacob and Rachel* (1765-1770) and *The Return of the Prodigal Son* (1771)) and John Singleton Copley's *Watson and the Shark* (c.1771.) By 1792, the Society was not only offering original works by contemporary artists, but also polygraphic reproductions at a smaller size, for those who did not have the room to display their larger cousins. These artists included Joseph Wright of Derby (1734-1789), George Stubbs (1724-1806), Sir Joshua Reynolds and Angelica Kauffmann (1740-1807) (Schweizer 1999, 92).

known as the *Copiste Habile* or Skilful Copyist.[58] Although such a writing device had been first recorded as early as 1647, the polygraph has the same form as Darwin's Bigrapher, and the wider category of inscriptive copying devices, the pantograph.[59] However, de Cotteneuve's double naming of this device as both multiple writing (*poly-* many; *graph*, mark) and practiced body (Skilful Copyist) reveals that copy handwriting had to be, at one and the same time, the property of the text and the property of the body; copying writing had to be the simulation of the written word as it was the imitation of the writing body. De Cotteneuve's *polygraphe* was neither the first nor the last of these types of devices; in 1647, a system was patented by Sir William Petty through which "the dexterous use of the instrument for writing many copies of the same thing at once" (Bedini 1984; and Ward 1740, 218). Following de Cotteneuve, Marc Isambard Brunel (father to Isambard Kingdom Brunel) invented a writing and drawing device for two quills, called The Polygraph, in 1799 (Figure 1.37). This was followed in 1803 by another writing frame device by John Isaac Hawkins, piano and physiognotrace inventor, also called The Polygraph but which could write with two or more quills (Figures 1.38 and 1.39) (Bedini 1984, 52).[60] With this latter device by Hawkins, The Polygraph achieved some degree of commercial success–as he had done with his physiognotrace, Hawkins sold its US rights to Charles Wilson Peale, who not only developed it into a sturdier device, replacing the quills with steel pens, and the wooden handles with brass ones, but also established a 'manufactory' of these devices next to his Philadelphia Museum, as well as promoting them in the local press, demonstrating them in local coffee houses, and selling them to local dignitaries (Bedini 1984, 62-65, 82-99).[61]

Another form of eighteenth century writing technology that copied rather than created was The Manifold Writer, invented by Ralph Wedgwood, an 'out-of-favour' relation of Josiah Wedgwood.[62] Patented on 7 October 1806, Wedgwood's invention for 'an Apparatus for producing Duplicates of Writing' might imply it was a polygraph device; it was, however, the first appearance of carbon paper (Adler 1990, 6-7).[63] Adapted from a former version designed as a technique to

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[58] In the eighteenth century, the genealogy of the word 'polygraph' reveals it to be as malleable as it was multiplicatory, being used to denote a wide variety of technologies and practices before becoming attached in the eighteenth century to the copying of handwriting. It was first used by Abbot Johannes Trithemius (1462-1516) in his book *Polygraphia* to describe the process of encipherment, the coding of secret writing, in contrast to decipherment, a practice Trithemius addressed later in a book called *Steganographia* (written 1499, published 1606). Polygraphy thus begins as a piece of terminology of cryptography as demonstrated by its later use in 1663 by Athanasius Kircher, in *Polygraphia nova et universalis ex combinatoria arte detecta* (also known as *Polygraphia seu artificium linguarium quo cum omnibus mundi populis poterit quis respondere*). In the seventeenth century it appears in France and in Venice as a term to describe writers who could work across multiple subjects, either as purely descriptive or derisory, synonymous with the contemporary term hack. Later on in the seventeenth century, the term attaches itself to writing itself, when it is used to describe a method of (what would now be understood as) shorthand before it leaps over to reproducibility in the arts in the eighteenth century, when it is used to describe the technique and technologies for producing multiple drawings, with Booth's Polygraphic Society. Its attachment to copying machines of the eighteenth century also reveals another facet of the notion of copying writing; copying was suspicious. For in the 1790s, Samuel Taylor Coleridge, in personal correspondence, and Mary Robinson, in her novel *Walsingham; or, The Pupil of Nature* (1797), both used the term to describe a person who imitated another, specifically "an impersonator who poses as an aristocrat"; thus in the eighteenth century, polygraph can be considered to be operating as a term of criticism for a person who inappropriately attempted to copy another (Schweizer 1999, 91). Important to note is that Coleridge and Robinson's use of the word polygraph applies a term first located in the domain of language, then of language machines, to human beings and their behaviours. By applying the literary use of this term to bodies, the copying aspect used is not that of simulation (acting analogically) but rather imitation (acting as if) which is present in this linguistic application.

[59] Sir William Petty was issued a patent on 6 March 1647, to teach his art of double writing. A description of it follows,

> This was performed by an instrument of small bigness and price, easily made, and very durable, whereby with an hour's practice one may write two copies of the same thing at once, on a book of parchment, as well as on paper, and in any character whatsoever; of great advantage to lawyers, scriveners, merchants, scholars, registers, clerks, *etc.* it saving the labour of examination, discovering or preventing falsification, and performing the whole business of writing, as with ease and speed, so with privacy also. (Ward 1740, 218)

[60] An example of this device is in the collection of the Science Museum.

[61] Patent X453, issued to John J. Hawkins [sic], issued on 17 May 1803, was destroyed in 1836 United States Patent Office Fire. Devices were sold under the name of Hawkins and Peale's Patent Polygraph in 1806.

[62] Ralph Wedgwood's relation to the pottery family and his position within it as 'out of favour' are described in Rhodes and Streeter 1999, 17, f.n. 67. The Manifold Writer was also known as R. Wedgwood's Patent Manifold Writer or The Manifold Stylographic Writer.

[63] Bedini describes the first version of The Manifold Writer, formed to help the blind to write:

> It consisted of a writing board with horizontal metal wires serving as feeler-guides for a metal stylus. A sheet of paper immersed in printer's ink was placed between two sheets of paper upon the writing board and when the

help the blind to write, the 'Apparatus' was "two books of transparent and carbonated papers, a stock of fine-quality writing paper, a selection of styli, and a metal writing plate finished in black lacquer" (Figure 1.40) (Bedini 1984, 154).[64] A few years later, Wedgwood patented a second writing device, called a Pennapolygraph, that, from its description as a 'pen and stylographic manifold writer,' is a combination of carbon paper and of the polygraph writing frame (Jewitt 1865, 179-180). Whilst neither the Manifold Writer nor The Pennapolygraph were commercially successful, Ralph Wedgwood's invention echoes the work of his distant cousin Thomas (Tom) Wedgwood's experiments with copying carried out four years earlier with a young Humphrey Davy, latterly Sir Humphrey Davy, head of the Royal Academy. For in 1802, Tom Wedgwood (1771-1805), the youngest son of Josiah, devised a process for the transfer of images onto leather and ceramics with Davy. However this process was different from Ralph Wedgwood's carbon transfer method for handwriting; Tom Wedgwood and Humphry Davy were experimenting with silver nitrate and silver chloride coated paper and so were using chemical reactions rather than material transfer to copy images. Referred to as Tom's 'silver pictures' within the Wedgwood family, Wedgwood and Davy began to experiment with this image making technique on their first meeting in Penzance in 1797, when Wedgwood was lodging in Davy's mother's boarding house. (Wedgwood and Wedgwood 1980, 111, 123). In 1802, the pair worked again on these 'silver pictures', resulting in the publication of 'An Account of a Method of Copying Paintings upon Glass and of making Profiles by the Agency of Light upon Nitrate of Silver, invented by T. Wedgwood, Esq., with observations by H. Davy' in the *Journal of the Royal Institution* (Davy and Wedgwood 1802, Reproduced in Litchfield 1903, 189-192). As the title would suggest, this article documents how what are essentially photographic images, albethey created without lenses, can be 'obtained' on silver-nitrate soaked paper (Figure 1.41). Additionally through its title, the paper exposes how the chemical transfer of images, like the mechanical one, was conceived of as an act of copying, and that this act of copying was applicable to traces and bodies, to drawings and silhouettes. For whilst it means "a copy or silhouette of an object could be obtained when its shadow was thrown" onto the paper, likewise, "a silhouette of a picture painted on glass could be obtained by placing the glass on a sensitized surface in the sunlight" (Wedgwood and Wedgwood 1980, 123-124).

Wedgwood and Davy's experiments in copying using chemicals formed the foundations for the invention of photography by William Henry Fox Talbot in Britain and in France, the partnership of Joseph Nicéphore Niépce (1765-1833) and Louis-Jacques-Mandé Daguerre (1787-1851), as Robert Hunt in the first account of photography *A Popular Treatise on the Art of Photography* notes in 1841 (Hunt 1841, 2-3). Repeatedly the concept of copying can be seen within the work of early photographers; for example, Hunt's 1839 paper 'Directions for using the Photographic Drawing Papers, and for Taking Views with the Camera Obscura' on his new invention of photogenic paper, demonstrates by its very title how photography was considered another form of copying, 'taking' from nature to produce a 'drawing'. This is further demonstrated in a letter from Hunt to Sir William Herschel, another key figure in the history of photography, when Hunt wrote of his new invention on 9 December 1839,

> For six months I have devoted very much attention to Photogenic drawing and I have prepared for sale a very sensitive paper of my own devising which preserves the natural

top sheet was written upon with the stylus following the wire guides, a copy was rendered on the bottom sheet. (Bedini 1984, 56).

[64] The Manifold Writer reached one of the most famous documentarians of The Enlightenment, Thomas Jefferson, a man who had used and been involved in the development of Watt's Copying Machine, and then Hawkins' polygraph (as well as pianos). Jefferson had an unfavourable opinion of Wedgwood's copying device and although The Manifold Writer never brought Ralph Wedgwood great wealth, it is clear that he did gain intellectual standing in Britain, being granted the Royal Institution's certificate of merit in 1829, and winning a medal at the 1862 International Exhibition (Rhodes and Streeter 1999, 19).

> order of the lights and the shadows. (Royal Society of London, Herschel Papers, HS.10.80. Quoted in Hunt 1841, xiv)

In its preservation of the 'natural order of the lights and shadows', Hunt's photography can be seen to be adhering to the trope of copying, in that he copied images from nature.

The relationship between the Watt Copying Press, Ralph Wedgwood's Manifold Writer and Tom Wedgwood's 'silver pictures' highlights some key features around writing and drawing devices of the late eighteenth and early nineteenth century, in both what was copied and how. Firstly, whilst Watt describes his method as 'chemical', in actuality it was as much about the material and the mechanical as it was about the chemistry of the process. The implication of what Watt meant in applying this term to his technology and technique is that the process of copying by machines makes copying itself mechanical–even though these machines required a hand to operate them. Secondly, there are differences between the processes in their relation to time. For whilst Watt's copying machine had to be used within twenty-four hours of the creation of the original document, Ralph Wedgwood's method had to perform its copying at the same moment as the document was being created, and Tom Wedgwood's method of copying from nature required exposure time. Thirdly, although with Watt & Co.'s Copying Press the original document was sent and the copy kept for records, with The Manifold Writer the original document, written on very transparent, thin paper with either a glass or metal stylus, was kept, and it was the copy, containing the transferred trace of carbon on thicker higher quality, that was sent as the 'original'.[65] Therefore although the products of The Manifold Writer do not have a negative/positive relationship like that which appears in the production of silhouettes through physiognotraces, The Watt Copying Press does produce something akin to a positive/negative, in that the copied document displays its copied writing in reverse. However, because the paper is so thin, it only has to be turned over for the copy to become legible.

Conclusion: Drawing and Writing as Copying

Although generating a whole industry of scissargraphists, the fashion for silhouettes in the eighteenth century was both expressive and formative of the dominant trope of copying of the period. Whilst individual sitters wanted to own a recognisable depiction of themselves for a more economical price than the only other method of personal depiction, a painted portrait, Tussaud and Hawkins' recognition of sitters' desire for accuracy of depiction led to the invention of silhouette machines, machines that promised to produce an accurate copy of the individual head. By being adaptations the technology of drawing and writing frames, physiognotraces, pantographs and polygraphs all made possible the copying of bodies, drawings and writing from the original, and all only worked if the original was contemporaneous with the creation of the copy. Copying was soon put to work with other inventions and intentions, to create the first photocopier, a technology/technique for copying original paintings, and the first excursions into creating photographs. However, within these type of machines/devices, those that were devoted to writing could only ever be writing copiers; they were not writing composition machines.

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[65] The Manifold Writer was eventually picked up, manufactured and marketed successfully by the American grocer Lebbeus Roberts, who noticed newspaper reporters using carbon sheets when noting down their interviews with him, following what is described as "a hot air balloon stunt" in 1868, the same year that in Milwaukee, newspaper man Sholes with fellow tinkerers Carlos Glidden and Samuel Soulé filed their first patent for a typewriter. These initial carbon sheets were manufactured by fellow American Cyrus P. Dakin, for the Associated Press. Roberts' subsequent success began with the production of standardised business practice books, such as ledgers and inventories, in which carbon paper was bound in with the other normal paper sheets. Such was his success that Roberts went on to demonstrate its usefulness at the first demonstration of the first Remington Typewriter, the Sholes & Glidden Type-Writer, in 1874 (Bedini 1984; and Rhodes and Streeter 1999, 20).

1.3: Eighteenth Century Types: Hand and Machine Writing

From the illustrative writing automata, imitative of human bodily skills, through to the copying devices of writing, drawing and the facial profile, this section focuses on the act of writing itself in the eighteenth century. Starting with a history of handwriting pedagogy and then moving to the early history of the 'typewriters', machines that were invented to write at the control of an individual, this section draws through ideas around copying to produce an understanding of writing as handwriting, distinct from composition. In contextualising writing machines within their historical and cultural relations to writing pedagogy in the eighteenth century, this section will show how early mechanised writing machines could only ever supplement rather than extend the writing body.

An Eighteenth Century Hand

In the eighteenth century writing and reading were, for the most part, two separate although interlinked skills. Whilst reading was more widely learnt, with some historians of the period estimating literacy rates rising to as large a proportion as half the population in more liberal, urban areas by the late eighteenth century, writing was a rarer skill (Schofield 1968; and Neuberg 1971). The rise in literacy rates was not simply due to the greater availability of printed matter, a deterministic reading of the so-called media explosion of eighteenth century, but emerged from a complex intersection of a rise in Protestantism, a growing middle class and the cultural and social inheritances of Renaissance humanism (Hudson 1994, 4). Reading was taught from an early age, predominantly at informal schools by a female teacher, at so-called 'dame schools', whilst writing was an accomplishment taught by writing masters, as penmanship. That the teaching of writing was almost exclusively a male pursuit/position is unequivocal; a history of writing masters by Joseph Champion from 1750 lists 141 individuals, only one of whom is a woman (a Mrs Maria Strick of Delft, in 1611), whilst a twentieth century history of writing masters, although containing the biographies of 450 individuals, notes only four female 'writing masters'–Hester Inglis, Mary Johns, Elizabeth Lucar and Elizabeth Penniston (Champion 1750, C3; Heal 1931. Also see Thornton 1996, 197, f.n. 9). The gendering of the teaching of the skills of reading and writing not only confirms the gendering of eighteenth-century writing automata, but also mirrors the gendering of those who learnt the skill of writing–whilst both sexes learnt to read, it was predominantly boys who went on to learn how to write. And yet, although often viewed as an accomplishment, writing was a cultural practice that was undoubtedly masculine; writing was a masculine accomplishment.[66] For example, in an advertisement for his skills in teaching young men, the writing master John Seally also taught the accomplishments of drawing and French alongside penmanship (Seally 1794).

In addition to their teaching practices, writing-masters often authored handbooks of handwriting as a means of supplementing their somewhat precarious teaching income. Usually a collection of printed samples of handwriting, these eighteenth century manuals, called copybooks, include works such as Joseph Champion's *The Parallel; Or Comparative Penmanship* (1750), Edward Lloyd's *The Young Merchant's Assistant* (1751) and George Bickham's *The Whole System of Penmanship, or, Writing-master's Companion* (1755). In these books, a limited number of different forms of writing are presented for the student, limited as each form of handwriting embodied a particular professional identity–in being able to copy accurately a particular form of writing presented in the copybook, a student was able to begin to become the embodiment of a particular profession (see, for example, Champion 1750; Bickham 1731; Bickham 1741 and

[66] Nineteenth century accomplishments are explored in Chapter 3, 'Sinister Bodies, Dexterous Hands.'

Bickham 1755). Most importantly, this was done through the hand, for "Each hand was regarded as the aesthetic embodiment of the corporate character of the social, occupational, or gender group that made exclusive use of it" (Thornton 1996, 37). Therefore handwriting in the eighteenth century was prescriptive, with the formal qualities of the handwriting mapped onto the body, rather than descriptive, as handwriting was to become in the late nineteenth century with the birth of graphology, when the body is read into handwriting (Thornton 1996, x).[67] As historian of handwriting Tara Plakins Thornton notes, in the eighteenth century handwriting incorporated "... a logic that defined human beings as players on a social stage" as well as serving "as a mechanism whereby handwriting faithfully represented the self" (Thornton 1996, 37). Therefore, she argues that just,

> "As each human performs a socially differentiated part, so is each given a different "script." Conversely, by reading that script for its social information one could learn all there was to know about the writer. Here at last was a sincere medium for selfhood." (Thornton 1996, 37).

Therefore, in the eighteenth century, handwriting, or penmanship as it should more accurately be described, was read in an 'intuitive' way, according to the rules and conventions of the time, a form of semiotics of writing form that has been broadly lost to contemporary literate society. A survey of eighteenth century copybooks reveals a remarkably high degree of agreement (to a twenty-first century eye) in the types of handwriting represented and taught, with six different types of script–two forms of gothic script Court and Chancery, the former for those wishing to enter the Royal Court, and the latter for those who pursued a legal career; Secretary, for those wishing to enter trade; Round Hand, for those wishing to enter mercantile trades; and finally Italian, which became a female only script by the early 1700s. In Champion's *The Parallel* (1750), he introduces the alphabets outlined as "Correct Alphabets in all the most usual Hands of Great Britain; Design'd to establish a true Judgment [sic] &c. in the Art of Writing and Striking by Command of Hand" (Champion 1750) before presenting his alphabets.[68] But by far the most prominent handwriting represented in these copybooks is Round Hand, a versatile form of handwriting that was promoted as being the best form for business and government communication. What is interesting to note is that this handwriting gained its contemporary name of copperplate after its popularity was both promoted and established through the use of printed copybooks used to teach handwriting; thus Round Hand became known as copper plate precisely because it was so frequently engraved on copper plates used in the printing process. However the printing of handwriting guides and the double use of 'roundhand' by man and machine induces a necessary reassessment of the position and role of handwriting in what has been classed as a period in which there was an explosion in print culture (Harris 2002). Certainly the advent of printing did not disable handwriting but rather provided a means for its increased promotion, as copybooks proved to be highly commercially successful, with new editions being produced in swift succession.[69] Although handwriting and printing were two distinct discursive spheres, they were

[67] Handwriting in the nineteenth century is explored below in section 2.4 'Writing States: The Late Nineteenth Century Reconstruction of Babel.'

[68] Champion's copybook contains pages of before the copybook proceeds with its pages of Square Text, German Text, Engrossing, Secretary, a Gothic Script, Court and Chancery in both Set and Running forms (Figs. 50, 51, 52, 53 and 54); similarly Bickham's *The Whole System of Penmanship* begins with Round Text, Round Italian, the Mercantile Round Hand, Mercantile Running Round Hand followed by Italian Hand, Italian, German Text Capitals, Engrossing, Court Hand, Court, Secretary, Chancery, German Text, Engrossing, Court Hand, Roman, Hebrew, Greek, Roman and Old English. (Figures 55, 56, 57, 58, 59, 60 and 61).

[69] An example of the commercial success of copybooks is that George Fisher's *The Instructor; or, a Young Man's Best Companion* of 1735 was in its seventh edition by 1744, and in 1748 was reissued in America by the printer Benjamin Franklin as *The American Instructor* (Monaghan 2006, 214-5).

conceptually underpinned by the same trope of copying; for at the time, both were conceptually underpinned by the same understanding of textual production, in that both were understood as reproductive. For printing is built on a concept of identical reproducibility, whilst eighteenth century handwriting was conventional, as writers were taught to write to copy an ideal form of handwriting. But this ideal form of handwriting could never be materialised in printed form, as Benjamin Franklin noted when he drew on the process for learning handwriting to make an analogy to his own life. For in pursuing the ideal form of handwriting,

> ... those who aim at perfect Writing by imitating engraved copies, tho' they never reach the wish'd for Excellence of those copies, their Hand is mended by the Endeavor, and is tolerable while it continues fair & legible. (Franklin 2008, 77).[70]

Enlightened Mechanised Writing Machines

The first two sections of this chapter dealt with a number of machines and devices often included by typewriter historians in the timeline of the development of the typewriting machine, including automata, polygraphs and pantographs. Setting these machines and devices to one side, those inventions left in the history of typewriters produce two particular traces of mechanised writing in the long eighteenth century, coalescing around two groups of machines.

The first group of machines, including Johann Friedrich Unger's Machina ad Sonos (1745), Rev. Creed's Melograph or Megalophone (1745), Hohlfield's Musical Writing Machine (also a Fantasy Machine) (1771) up to Pastor Schönfeld's Musical Writing Machine (1808), are those that do not write the alphabet but rather musical notation; they create the inscription of musical notation directly from the musical instrument creating the sound, normally a harpsichord or clavichord (Figures 1.42, 1.43 and 1.44).[71]Although music and writing have appeared previously in this chapter with the discussion of musical automata, these music writing machines are somewhat different to the figurative representations of musicians; these musical writing machines can best be understood as reverse-engineered musical automata. For rather than these machines translating the inscription of the music into its aural (and visual) performance as programmed automata do, they turn the performance into inscription. These music writing machines operate by pressing a key that at one and the same time produces the sound and translates the bodily movement needed to create the sound into the notation; they are supplementary to the musical instrument, with a description of Rev. Creed's Melograph as a machine that could be 'attached' to any harpsichord or clavichord (Adler 1973, 48). This translation of sound into inscribed form through a keyboard would seem to have suggested itself to those inventors subsequently looking to create alphabetic writing machines, such as Pierre Carmien and his 1749 invention of a writing machine with a piano keyboard, a design thread that re-appears recurrently in the history of the typewriter with Benoit Gonod's Shorthand Writer (1827), Xavier Projean's Machine Kryptographique (1833), Guiseppe Ravizza's Cembalo Scrivano (1837) and Antoine Dujardin's

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[70] Franklin, like Thomas Jefferson, was a key figure in developments in textual production: as a printer, he reissued George Fisher's *The Instructor; or, Young Man's Best Companion* in 1748 as *The American Instructor* (he was not, as Florey claims, the author but rather the publisher); he was a notable user and inventor of written codes and ciphers, and the inventor of an encoding machine, a "cipher cylinder" that was still in use by the American Navy up until 1967; and as the founder of the Academy of Philadelphia, now better known as the University of Pennsylvania, Franklin insisted that good handwriting, a so-called 'legible hand', be an entrance requirement for all applicants. For more on Franklin's use of cryptography see Wheeler 1997.

[71] What form of notation these machines took varies but one description by typewriter historian Michael Adler provides an indication,

> It [Unger's Machina ad Sonos] consisted of a supplementary keyboard attached to that of an existing instrument in such a way that depression of a key actuated a series of rods and levers and resulted in a note being drawn on an endless roll of paper. The printed note took the form of a straight line, the length of which was determined by the duration of key depressions. (Adler 1973, 48-49).

For a detailed history of music writing machines, see Southgate 1881.

Writing Machine (1838) all of which were reported as having piano keyboards (Figures 1.45-1.50). That these writing machines circle around the piano in the early nineteenth century can be seen as a reflection of the way in which inscriptive forms, specifically in this case music and writing, also circle around each other.

The second group of machines coalesce around blindness. Beginning with Von Kempelen's Printing/Writing Machine of 1779, followed by the development of a writing frame to aid the blind by Jean-Claude Pingeron in 1780, and Franzose L'Hermina's 1784 Machine for the Blind, again based on the writing frame, and Pellegrino Turri's invention of 1808, what ties all these early writing machines together is that they were invented as solutions to an increasing problem of the early industrialising Enlightenment: how to enable the poorly sighted/blind to write.[72] Whilst the actual machines and devices have largely disappeared from the historical record, their intended purpose is part of the same purpose behind the previously discussed Manifold Writer by Ralph Wedgwood. This particular thread of writing machine history, blindness, exhibits the prosthetic nature of writing machines, where these machines that printed rather than produced handwriting were always and only supplementary. A survey of British patents for these machines provides evidence of the conceptual location of eighteenth century writing machines as prosthetic, as supplementary. For these patents, rather than being filed by The Patent Office under Class 146 'Writing-Instruments and Stationery and Writing Accessories', are filed under Class 100 'Printing, Letterpress and Lithographic' (see The Patent Office 1893; The Patent Office 1896; The Patent Office 1904; The Patent Office 1905; and The Patent Office 1905). Furthermore, not only are they filed under the printing rather than writing classification, they are most often sub-categorised within Class 100 under the index heading 'Blind persons, Teaching and communicating with.' (Ibid.)[73]

In drawing together these two seemingly divergent strands of inscription technologies, music writing machines and the writing machines for the blind can be seen as hybrid machines. Whilst the former group can be seen as hybrids of the practices of music and writing, and the latter of printing and writing, it should be understood that this conceptual framing can only be understood retrospectively. But in setting these machines up as hybrid devices, there is a necessary implication that printing, writing and music were, in their singularity, 'pure' practices, an implication that may have contributed to these individual practices' technology and techniques being cross-wired. However it is certainly because they were their own practices that these hybrid machines were never commercially successful; music was only to become captured by inscription through the technology of the gramophone, whilst writing machines for the blind only become

[72] This thread extends well into the nineteenth century with the invention by Pierre Foucauld, a student at the Blind Institute, Paris, of a Raphigraphe in 1843 (Figures 1.51 and 1.52) and Clavier Imprimeur in 1849 (Figure 1.53); Director of the Henshaw Institute for the Blind in Manchester G. A. Hughes's invention Typograph of 1850, which went on to win a medal at the 1851 Great Exhibition (Figure 1.54); in 1857, Scotsman Peter Hood invented an index typewriter for the Blind; and in 1859 Frenchman Adolphe Charles Guillemot invented a Machine for the Blind, which had a piano keyboard (last recorded at the 1924 Exhibition Chambre Syndicale de la Mecanographique). All that remains of Pellegrino Turri's invention are the letters from the Countess Fantoni (Figure 1.55). The most famous writing machine for the blind was the Skrivekugel, invented in 1865 by Pastor Rasmus Hans Johan Malling Hansen, who ran the Copenhagen Institute for the Blind and Deaf. Hansen's Skrivekugel will the object of focus in section 2.4, 'Writing States: The Late Nineteenth Century Reconstruction of Babel.'

[73] The attention to blindness that these early mechanised writing machine inventors of the eighteenth century was not just practical but also epistemological. For blindness in the eighteenth century became a philosophical, as much as a physical, problem, not least demonstrated by Diderot's *An Essay on Blindness* of 1750, in which the author used blindness as a device through which to investigate epistemological foundations (Diderot 1750). However this attention to vision and blindness, specifically in relation to writing, demonstrates that writing was, in this period, shifting between a skill required because of the individual's position in society, to a shibboleth, a skill that would permit an individual entry to a certain level and position in society. That handwriting was tied to the social stage also discursively permits the notion of disguise, a feature of eighteenth century life that caused a considerable amount of social anxiety. It is within this discourse of social anxiety that handwriting's position as a marker of identity becomes underpinned, through the advocacy that handwriting was an accurate material form through which to 'judge' human character. However this advocation is based on the logic that anyone wishing to disguise themselves would be unable to learn the correct Hand for his 'new' position; the human polygraph would be exposed by his hand.

successful with the advent of Braille's invention of alphabetic forms for the blind, both nineteenth century inventions.

Within this trope of the hybrid another form of eighteenth century writing machine warrants discussion: this is the set of four machines invented by mechanic to the Royal Court at Vienna Friedrich von Knauss (1724-1789). Between 1753 and 1760, von Knauss presented four writing machines to the Austrian Court of Emperor Francis I, machines that sit somewhere between automata and typewriters (Figures 1.56-1.59). Whilst the first von Knauss writing machine had a bronze hand emerging from a large metal globe, itself supported on a pedestal, he developed his initial design into three subsequent machines, that not only saw an increase in their size, but also an increase in the number of words they could write (Adler 1973, 50-51). The fourth and last machine, presented to the Court in 1760, performed its act of writing through the body of a relatively small bronze figure sitting atop a globe, itself supported by a four-legged marble base, with scroll ornaments, decorated with a brass laurel wreath, on top of which sits two bronze birds (Figures 1.59 and 1.60). As rather baroque pieces of technology, von Knauss' machines were intensely expensive, constructed with very costly materials; however his last writing machine demonstrates his technical development of the machines, as he produced a writing machine able to write passages of up to sixty-eight words in French. However, whilst von Knauss' machines can be understood in one sense as a form of automata, with writing emerging from a figurative representation, and the writing, being handwriting, being limited to a fixed number of words and phrases that had been 'pre-programmed', the figurative element was only part of a much larger machine; and as such, were diluted automata.

As for what these machines could write, automata historians Chapuis and Droz include a possible sample of von Knauss' second writing automata, written in Latin, which translates as "God has established the royal house of Austria without limits in time or space" (Figure 1.61) (Chapuis and Droz 1958, 291). Of particular note in this reproduction of the handwriting is that the automata could be programmed to write different fonts; the first two words are in a capitalised serif font; God is written in a lapidarian style font; whilst the remainder of the sentence is written in running script, in one "continuous stroke of the pen" (Chapuis and Droz 1958). However it is the fourth von Knauss machine that begins to take control of the act of writing. With this machine, unlike its three forebears, any set of words could be written, and through the use of what Chapuis and Droz refer to as a "letter keyboard", dictation could be taken. Yet if writing could be manipulated through a keyboard directly into the machine, the Von Knauss writing fairy would seem to suggest itself as the first typewriter–that is until it is realised that she could only write in batches of sixty-seven words, and that the writing is imitative of handwriting, rather than the printing press.

Conclusion: Copying to Write

In the eighteenth century, writing was indexical of an individual's social position and therefore writing could only be handwriting. As handwriting, it was tied to the performance of the hand as an expression of the relation of hand and eye. Writing could not be printed, because, if it were, the indexical trace was cut. However there was one criteria under which this trace could be cut–when the relation between the eye and the hand was itself likewise cut, due to poor vision. This 'natural' break between hand and eye permitted writing with the aid of a machine, and therefore handwriting was released from its firm cultural grasp, to exist at the tips of the fingers played out through various keyboards.

Conclusion: Imitating Writing and Drawing Performance

Eighteenth century android automata illustrated Enlightenment bodies at the same time as they imitated 'useless' cultural practices, operating as 'living encyclopaedias' of the eighteenth century discourse around man and machine. Of the useless cultural practices the android automata performed, the act of writing was centre stage, alongside playing a musical instrument and drawing. However in the performance of these accomplishments, automata creators' choices of the specific types of bodies that acted out specific cultural practices were deliberate. For writing, these practices were performed by representations of male children who, in an expression of their juvenility, wrote texts that either praised the viewer, or expressed the machines own immaturity. Yet, as Henri Maillardet's later machine demonstrates in its compression of two of the Jaquet-Droz machines, L'Écrivain and Le Désignateur, writing and drawing in the eighteenth century were intimately bound together, forming part of the same bodily repertoire.

Writing and drawing were also bound up in eighteenth century inscription devices, such as the pantograph and polygraph, frames through which the human body could be extended, by supplementing it with another 'arm' that wrote or drew a copy of the inscription at the same time as the author drew or wrote the original marks. The supplementary mode embodied in Erasmus Darwin's Bigrapher was seized upon by other inventors engaged by inscription, such as James Watt and Tom Wedgwood, as the kernel for what would later became the first photocopying machine, the first mechanical image reproduction technologies and the first experiments in creating photographic images.

Writing and drawing were bodily acts possible because of a particular relation between the hand and the eye, a relation that necessarily tied the act of writing to drawing. With writing frames, the writing body was extended through duplication, as this form of writing technology added another arm to the body, an arm that became another writing limb. However, these writing machines could only copy what was already present, adding an arm to another arm that operated the device, adding another pen to an already existent pen, and producing a piece of writing that was a copy of a piece of writing being created elsewhere. Likewise, the 'typewriters' of the same period were supplementary, in that they were additions to bodies; however they were supplementary to bodies in which there was a break in the relation between the hand and eye. These machines, most frequently noted as machines for the blind, were furthermore filed by their inventors under the patent class for printing, letterpress and lithography rather than under writing-instruments, stationery and writing accessories. Therefore as supplements to the body, these eighteenth century writing machines were duplicating devices, situated between the failing eye and the able hand in order that the disabled body could be absorbed into the rising literate culture of early industrialising Western economies.

The Science of Body Classification and the Drive Towards Mechanised Writing

"In passing, we will express an opinion that Nature never writes a bad hand. Her writing, as it may be read in the human countenance, is invariably legible, if we come at all trained to the reading of it. Some little weighting and comparing are necessary."

Charles Dickens, 'The Demeanour of Murderers' (1856)[74]

"The key question is whether we can take a snapshot of an individual based on their appearance and how they look."

Lucy Hartley, *Physiognomy and the Meaning of Expression in Nineteenth Century Culture* (2001)[75]

"The applications of the process are numerous, as must always be the case when a hitherto vague perception is brought within the grip of numerical precision. To myself it has the especial interest of enabling the departure of individual features from a standard type to be expressed numerically."

Francis Galton, 'Measurement of Resemblance' (1906)[76]

"Physiognomy is as necessary–and as natural–as language."

Burke, quoted in Lavater, *Essays on Physiognomy* (1787)

"The observer is incontestably the man of genius ...[they are those] sublime birds of prey who, while rising to high regions, have the gift of seeing clearly in matters here below, who can at the same time abstract and specify, make exact analyses and just syntheses."

Balzac, *Théorie de la démarche* (1833)

"Why should an intelligent photographer, of whom so much is expected, and who bases all his operations, and the processes he works by, upon sciences well established, not also be called a scientist?"

Charles Ehrman, 'Plea for a Photographic College' (1885)[77]

"To accept the idea that there is a content-system which is the same for all languages means, fatally, to take surreptitiously for granted that such a model is the western one."

Umberto Eco, *The Search for the Perfect Language* (1995)[78]

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[74] Dickens 1997, 477.
[75] Hartley 2001, 3.
[76] Galton 1906, 25,898.
[77] Ehrman 1885.

Introduction

Between 1872 and 1874, the arms and sewing machine manufacturer E. Remington & Sons developed the prototype writing machine from the Kleinstuber workshop under contract with the entrepreneur James Densmore. In 1874, the machine was put into production as the Sholes & Glidden Type-Writer, with an initial run of 1,000 machines, and an option to produce 4,000 more. However, during its first years on the market, it was not a successful technology, selling only 400 machines of its first batch (Current 1954, 34). This difficult birth of the typewriter is argued to have been the result of various factors, including the American economic depression of the 1870s, the newness of the technology and the market, and the writing design problems present in the first Sholes & Glidden machine. During the 1870s, Remington & Sons produced and sold only 3,876 mechanised writing machines; in 1880, the number of professional stenographers and typists recorded in the US Census–the category that included typewriter operators–was 2,000. However, by 1890, the typewriter had become successful both commercially and culturally: Remington & Sons alone had produced nearly 50,000 machines; there were nearly 34,000 recorded professional stenographers and typists; and the re-christened Remington & Sons Typewriter had a number of competitors (Davies 1982, Table 1). (See Appendix 2: Post-1868 Typewriters.) This rapid absorption of the typewriter into the fabric of western industrialising nations during the 1880s therefore demands its account, and in its demand, this chapter will argue that the typewriter's success, both cultural and economic, came about–although not solely–as part of a double articulation by the machine and the body of one of the dominant tropes of modernity: the fragment.

The shift of writing machines' eighteenth-century conceptual location as a type of printing machine, to that of a writing machine proper in the late nineteenth century can only be understood, this chapter will argue, in relation to a particular symbiosis between the conceptual form of the body and that of the writing machine. As critical theorist Nicholas Gane has noted, following McLuhan, "[The typewriter] changed the materiality of the text itself by organizing writing spatially through the distribution of discrete rather than continuous (as in handwriting) signs (as characters and character spacings are assigned a standardized size)" (Gane 2005, 30). This change in materiality of the text, this chapter argues, is a thread that can be directly traced through the changing materiality of the body, as evidenced through body coding and classification techniques of modernity. For, as the typewriter emerged as the dominant writing method, so did the concept of the modernist fragmented body.[79] By tracing the entwined emergence of the fragmented body and of mechanised writing technology, this chapter will demonstrate that the fragmentation and normalisation of the written word was coiled around the fragmentation and normalisation of the human body. It will show how the typewriter and the construction of the fragmented modernist body (through science and social practice) produced in their products, the typewritten letter and a particular understanding of human form, an assemblage of formalised, standardised parts–of transparent characters and a transparent character.[80]

The first section of this chapter, 'Reading the Head: Physiognomy and Phrenology,' draws on the previous chapter's encounter with the silhouette in its exploration of the late-

[78] Eco 1997, 330.

[79] Art historian Linda Nochlin, in tracing body fragments in Modernist art, argues that the shift of the body fragment from negative to positive trope went hand-in-hand with a central drive of Modernism, the destruction of times past, 'a pulverization of what were perceived to be its repressive traditions' (Nochlin 1994, 8).

[80] In his influential 1980s essay 'The Body and the Archive', Allan Sekula argued that the 1880s and 1890s saw a rise in the archiving of the body not just through the work of Bertillon and Galton, but also saw the construction of these archives as part of a 'shadow' archive of the social (Sekula 1986).

eighteenth and early-nineteenth century practices of physiognomy and phrenology. It examines how the classification of bodies became formalised into a scientific practice from previous divinatory systems, and in this exploration, focuses on how the body was analysed ('written') and subsequently interpreted ('read') by the observer. Furthermore it will argue that both the practices of physiognomy and phrenology were understood to be reading practices, built on the premise that the human body was a textual form, able to be understood with correct training in reading the symbols and signs.

The second section of this chapter, 'Measuring Body Space: Anthropometrics and Bertillonage,' will argue that although by the mid–to–late nineteenth century physiognomy and phrenology had declined as an empirical science and risen as a form of popular culture and entertainment, the anthropometric system of British amateur-scientist gentleman Francis Galton and the French police administrator Alphonse Bertillon's system of criminal classification, Bertillonage, were both underpinned by these older body classificatory systems, as the critic Allan Sekula argues in his seminal essay 'The Body and the Archive' (Sekula 1986). It will push Sekula's argument forward, arguing that the fragmented body became more conceptually entrenched under the guise of the new science of anthropometry, through the formalisation and mathematisation of the body. By paying close attention to the mechanisms of fragmentation, it will show how the understanding of the body as an ordered, categorised and measured system was intimately tied into writing practices, and can be understood as an attempt to read and write the body, under the guise of media transparency.[81]

The third section of this chapter, 'Photographic Ordering: Composites, Mugshots, and Graphs', will demonstrate that the analysis of the body into bits, that began with the head and face in phrenology and physiognomy, spread out over the entire body, through the medium of photography and the rise of the bureaucratic society. By focussing on the photographic work of Galton and Bertillon, as part of their anthropometric and Bertillonage systems, and that of the French physiologist and chronophotographer Étienne-Jules Marey, this section will argue that the adoption of photography in mapping and then classifying bodies marks a shift from an abstracted system of ideals to an explicitly demonstrable one, through indexical representation. Through the techniques and technologies of photography that Galton, Bertillon and Marey used, there was a flattening of the body through its representative abstraction. It will argue that as a complementary practice to already established systems of written forms–anthropometry, Bertillonage and the graphical method–photography was understood, in a particular sense, as another form of writing.[82]

Tracing the historical conception of photography as another form of written language, the final section of this chapter, 'Writing States: The Late Nineteenth Century Reconstruction of Babel,' will then explore the late nineteenth century's explosion in attempts to find a 'perfect language' through the construction of *a posteriori* languages, so-called International Auxiliary Languages (IAL). It will argue that these languages were constructed in the belief that the very universality of language necessarily implied the possibility of reconstructing an ur-language, which itself inferred the possibility of rendering language as a transparent medium, pushing its medium specificity to the background, and therefore foregrounding language's meaning. This section will then draw through the concept of linguistic transparency to the practice of writing in the nineteenth century by exploring the birth of the handwriting expert and contemporary

[81] This is the Foucauldian understanding of the archive, as explicitly explored through in Sekula 1986.
[82] The phrase 'perfect language' is taken from Umberto Eco's 1997 book *The Search for the Perfect Language*, an historical exploration of attempts to ameliorate the collapse of the Tower of Babel and recreate perfect communication (Eco 1997).

'scientific' graphology, to show how the handwriting became an identifiable material form of a unique personal identity, with the material form of writing being a blank page through which identity could be clearly read. It will conclude with a section on the Danish Pastor Rasmus Malling Hansen, arguing that his promotion of a particular IAL, Volapük, and his invention of a typewriting machine, the Malling-Hansen Writing Ball, were part of the same drive towards transparency in language in line with other media of the period.

2.1 Reading the Head: Physiognomy and Phrenology

Drawing on the history of how the human body was systematically mapped, a process by which its fragmentation became discursively possible, this section sets out a history of the reading of the body, predominately the head, from the late eighteenth century up until the mid-nineteenth century, through the sciences of physiognomy and phrenology. Beginning with physiognomy and the work of Johann Caspar Lavater (1741-1801), it examines how the analogous readings of the human body–those better understood now as divinatory–became replaced at the end of the Enlightenment with a systemised and analytical methodology, one that whilst it abstracted the body, at the same time contextualised it. This section then moves on to examine phrenology, a practice of analysing and interpreting the skull begun by Franz-Josef Gall (1758-1828). It argues that not only did this new science of bodily classification draw through the paradigms of physiognomy but that in its particular articulation, phrenology fragmented the body into discretely bound individual units, units that could then be understood as the fundamental scriptural units in writing the human body.

Physiognomic Translations

Although physiognomy reached the height of its popularity in the nineteenth century and was still a popularly accepted and influential practice in the early part of the twentieth century, it was an ancient practice, diffused over all the major world religions (Swain 2008). However, until the late eighteenth century, physiognomy had been predominantly a practice of analogy. Beginning with Aristotle's *History of Animals and a Treatise on Physiognomy*, through to Giambattista della Porta's *De Humana Physiognomia* (1586), physiognomy 'read' the human face for likeness to a particular species of animal, and from this reading, assigned the central 'quality' of that animal to the individual. Referred to as 'zoological physiognomies' this methodology relied on an already anthropomorphosised animal kingdom (Figures 2.1 and 2.2), and in its methodology of perception, it sat alongside the divinatory practices of astrology, palmistry and chiromancy (Magli 1989).[83]

The shift from magical practice to an Enlightenment science came in the late eighteenth century through the work of Johann Caspar Lavater, a Swiss Protestant minister, with the publication of the four volume *Essays on Physiognomy: Designed to Promote the Knowledge and Love of Mankind* [*Physiognomische Fragmente zur Beförderung der Menschenkenntniss und Menschenliebe*] in 1775-1778.[84] Whilst firmly adhering to the humoral interpretation of the human body–an interpretation inherited from the Classical world and dominant up until the nineteenth century–as well as making use of the zoological physiognomic methodology,

[83] "When, therefore, we perceive in the face of a man a decided resemblance to that of a lion, a bear, an ox, a sheep, or a hog, it is fair to infer that the natural character of the individual is dignified and firm, or churlish and solitary, or peaceable and laborious, or meek and timid, or covetous and grovelling" (Anonymous 1818, 3-4). Sociologist Richard Twine expands this discussion of zoological physiognomies as indicative of the application of the order of 'nature' to the order of social relations, the folding in of the natural world to the one of human social order (Twine 2002, 69-70). The Wellcome Library holds a collection of short tracts and excerpts dating from around 1450-1500 on the subjects of astrology, chiromancy and physiognomy (Miscellanea XV [Archive Material] c. 1450-1500). Other titles referred to are J. Indagine's *The book of palmestry and physiognomy: Being brief introductions, both natural, pleasant, and delectable, unto the art of chiromancy, or manual divination, and physiognomy, with circumstances upon the faces of the signs: Also, canons or rules upon diseases or sicknesses: Whereunto is also annexed, as well the artificial as natural astrologie, with the nature of the planets.* Translated by Fabian Withers. London: J. Cottrel for Edw. Blackmore, 1651; and J. S.'s *The true fortune-teller or, guide to knowledge. Discovering the whole art of chiromancy, physiognomy, metoposcopy, and astrology.* Fourth Edition. London: Printed for E. Tracy, 1698.

[84] Lavater's system proved not only to be immediately popular, but also popular for a substantial period of time; his *Essays on Physiognomy* was quickly translated and published into English (1781) and French (1788-1789), then published in America (1794), and by 1840 there had been 16 German editions, 15 French editions, 20 English editions (Stemmler 1993; and Collins 1999, 253).

Lavater's *Essays on Physiognomy* was a handbook on how to analyse the human body. However, what marks out Lavater's work from previous physiognomic treatise was its explicit claim of being a scientific practice; as historian of psychiatry and psychology Alan F. Collins has noted, Lavater claimed that physiognomy met the criteria for scientific practice because "it offered law like regularities, depended on empirical observation, promised progress through greater knowledge, and differentiated the expert observer from the everyday onlooker" (Collins 1999, 253). With particular focus on the head, Lavater's readers were promised an understanding of the qualities and character of the individual, an understanding that crucially introduced the notion of measurement, of observable physical data (Figure 2.3).

A paradigm of eighteenth century guides, Lavater's *Essays on Physiognomy* resembles so-called commonplace books as it is, like other manuals of the period, a "compendia of earlier sources with inventive additions by the author" (Lavater 1797, n.p.). As a concatenation of 'extractions' (or quotations) from other works, such as the Bible, works on Classical and Renaissance art, it is an amalgam of other authors such as the philosopher-scientist Francis Bacon, the naturalist Georges-Louis Lecler de Buffon and the painter Henry Fuesli, as well as the author's friends (Woodrow 2005, 74). This extraction of information from a variety of sources mirrors the extraction process of the physiognomist; for as Lavater extracted and wove together various texts, images and theories to form his physiognomic handbook, so the physiognomist was urged to extract the character of the individual under analysis within language through a concatenation of interpretations of a variety of different physical elements. This process of analysing human bodies through extraction and interweaving has been noted not as one of scientific rationalism (as it is claimed to be) but rather one of interpretation; for it is more accurately described as a "veritable hermeneutic" project that has "all the hallmarks of a translation from one language to another" (Stoichita 1997, 158). With the methodology of translation at the forefront of physiognomic practice, perhaps the more accurate translation of the original German title as *Physiognomic Fragments* (rather than *Essays on Physiognomy*) exposes the fragmentary process as lying at the heart of Lavater's physiognomic practice; and as fragmentary, it is also both "cumulative and patchy", characteristics that are fundamental aspects of the entire physiognomic project (Percival 1999, 162).

Central to physiognomic practice is language, not as metaphor, as a number of theorists and historians of physiognomy have approached it (with frequent references to 'reading faces'), but as literal methodology (Benedikt 1995; and Zebrowitz 1997). In performing the physiognomic analysis, the practitioner had to first perform the 'selective and sequential disembodiment of the figure', visually separating out the face and body into proportion of the head, the profile, eyes and eyebrows, the nose, the mouth and lips, the chin, the cheeks, the teeth, the ears, and the hands (Figure 2.4, 2.5, 2.6 and 2.7) (Woodrow 2005, 74). The physiognomist then performs an assessment of these individual parts, so that an individual's intellect could be evaluated from the shape of the forehead, his "taste, feeling and moral sensitivity" from his nose, and his "instincts and sensuality" from his mouth, lips and chin (Staum 2003, 31). The result of this assessment was thus formed within language, as a linguistic description of an individual's character rooted in the form of physical features; evaluative descriptions used in forming physiognomical analyses include such terms as modest, sensible, judicious, generous, friendly, or, more negatively, artful, suspicious, covetous, deceitful, obstinate and ambitious. Thus the shape of particular physical features began to be read for the capacity and quality of its metaphoric mental faculties; the metaphor became literalised, as the mind became embodied.

In overlaying mental characteristics onto physical ones, Lavater was fleshing out language into physical form; he was making metaphor a physical reality, in the shift from the analogical to material form. However, even in the actualisation of metaphor, Lavater made a clear distinction between physiognomy and pathognomy, where the former was the reading of character from the head, and the latter the reading of emotion: the former was considered to be permanent, still, fixed, whereas the latter was considered to be fleeting, transient, dissolving. Sociologist Richard Twine argues that Lavater's emphasis on the static over and above the dynamic saw "agency extracted from the body and given to physiognomist", a process that echoes both Lavater's method in constructing his text, and the practice of physiognomy itself (Twine 2002, 71). Language, as the medium in which the process of extraction and giving over of agency is formed, was the currency of the physiognomist; for in order to be a fluent physiognomist, Lavater stressed that the practitioner had to have a mastery of the language in which the analysis was formed, urging his readers that,

> All that language can express, the physiognomist must be able to express. He must be creator of a new language that must be equally precise and alluring, natural and intelligible. (Lavater 1797, 158-9)

From his first argument of the entire four volume publication, that there was an "original language of Nature, written on the face of Man", Lavater consistently urged for physiognomic practitioners to increase and improve their linguistic ability (Lavater 1797, n.p.). Thus the practice of physiognomy was not only a translation of fleshy form into language, but the fleshy form of the face was itself conceived of as a speech act of Nature's own language. Physiognomy was therefore a more literal act of translation, in that the object of study was a text written in the language of Nature to be read by the human eye and articulated within human language.[85] This act of linguistic translation was dependent on what Lavater called the observer's physiognomical perception, an ability he claimed that everyone possessed but which required training. In conducting a physiognomical analysis of an individual, the evaluation was a visual one, conducted by the eye. However the eye was not neutral, as the analytical eye "learns to read the body in a particular way" (Collins 1999, 256).[86] The practice of physiognomy was crucial to the ideological construction and interpretation of the body in two respects, both stemming from visual culture theorist Ross Woodrow's description of physiognomy as a "progression from the "simplest" to a full attainment of understanding "the highest level" of the assemblage" (Woodrow 2005, 74). Firstly, Lavater's physiognomy drew through what had been personal,

[85] Both physiognomy and its later sister practice, phrenology, were recommended as being best learnt from literary writers, precisely because of these writers' mastery of language. Subsequently there have been numerous scholarly books of literary scholarship that explore physiognomic practice as it appears across a variety of authors, including Charlotte Brontë's *Jane Eyre*, and the eighteenth-century sentimental novel, and Conan Doyle's Sherlock Holmes. See Kurshan 2006; Benedikt 1995; Armstrong 2005; Price 1983; and Stern 1983.

[86] Collins precedes this comment by comparing physiognomy with clinical medicine in its analytical methodology, in that both seek diagnostic signs, an echo of Carlo Ginzburg's 1979 essay 'Morelli, Freud and Sherlock Holmes: Clues and the Scientific Method' (Collins 1999, 255; and Ginzburg 1979). However the diagnostician uses not only the sense of sight but also touch, smell, and sound in analysing the patient, and therefore clinical medicine has a different epistemological base. The pursuit of an analytical methodology is evidenced more recently with Madeleine Stern's publication of *The Game's A Head: A Phrenological Study of Sherlock Holmes and Arthur Conan Doyle* (Stern 1983).

Like his forebears, Lavater embraced the concept of vision altering form–so, for example, in a chapter on monsters, giants and dwarves, Lavater adheres to the traditional belief that a pregnant woman's experience is impressed onto the form of the child, recounting how one pregnant woman, on being delighted by being dealt an ace of spades, and thus winning the card game, bore a child who had pupils in the shape of the ace of spades; likewise, a watchful wife's physiognomy changing, by the act of observation of her husband, into that of her husband's physiognomy (Lavater, 156-165).

intimate knowledge and formalised it into a system of abstraction. Secondly, by systemising the body in dividing its physical form into fragments and by articulating the actualisation of metaphors into physical form, the body began its process of being written and read, so that the body became, as semiotician Patrizia Magli has noted,

> ... an image and a symbol. The moral language code spreads over the entire surface of the body–over every detail, from man's head to his feet, over every shape, line or fold; over firm flesh as well as soft; over moist flesh as well as dry; over hair and nails; over the sound of one's voice, as well as over all parts covered with more or less thick hair. Such a code numbers each element as a lemma, defines it as a signifier, and attributes a precise meaning to it. (Magli 1989, 89)

Magli's positioning of physiognomy as a process of semiotics, with its lemmas, codes, signifiers and meanings, makes obvious how there was a perceived transparency in reading the meaning from individual heads; Lavater's physiognomic analysis was necessarily self-evident, as his discussion of the shape of the contours of the face demonstrates,

> Contours completely rounded are the infallible indication of sensuality, of indolence, or of a constitution, on one word, in which every thing is given to the body at the expence [*sic*] of the mind. Finally, where strait [*sic*] lines gently blend with curves, there will be neither tensions nor laxness. (Lavater 1797, 145)

However, what is also demonstrated by this discussion on the shape of contours, is that Lavater's physiognomy was rooted in the linguistic, with its materialisation of metaphors and of abstract forms. However it was not only abstract forms of the face that spoke to an individual's character; for Lavater, every element of the body was ripe for analysis, from its material form, to its movement, to its skill–such as handwriting,

> I represent to myself a tutor, a father, beginning attentively to inspect into the conduct of his pupils or children; I imagine myself more closely examining the form and structure of their body, the contours of their face, their features and gesture, their gait and their handwriting; apportioning to every one, who with more choice and discernment, the task which he is able to perform; and extracting from each that only which he is in a condition to furnish. (Lavater 1797, x)

In terms of how Lavater presented visual illustrations and examples for his treaty, *Fragments* presents a series of heads, sometimes drawn in profile, analysed in the accompanying text through the four temperaments of sanguinity, choleric, phlegmatic and melancholic (Figure 2.8); or some combination of the four. However a large number of the illustrations of heads are half-turned faces, drawn in details with their fleshiness and vitality present in the line–wrinkles are detailed, hair and eyebrows drawn in detail, even women's caps are included.[87] These heavily lined drawings are included alongside the minimal contours of profile drawings and the blackened forms of the silhouette, the latter recommended by Lavater himself as the most

[87] In including these heavily lined drawings within his physiognomic treatise, Lavater was presenting cartographic representations of the face, mapping it out to provide the viewer with a concept of the depth and detail of the face to be 'read'. This concept of mapping the body is one which this chapter will return to, below, in its analysis and discussion of the work of Francis Galton.

perfect documents for physiognomic reading (Figures 2.3 and 2.9). In its variety of visual representations, *Essays* demonstrates that even with the form of illustrations, Lavater had a fragmentary approach, one which was both "cumulative and patchy" (Percival 1999, 162).

Yet even with the multiple different visual representations through which Lavater structured his physiognomic theory, his structure of physiognomical interpretations drew in the structural paradigms of knowledge established by the *Encyclopédie* and the classificatory models of biological taxonomy to establish nested structures, as Lavater's own discussion on foreheads demonstrates:

> Foreheads, viewed in profile, may be reduced to three general classes ... Each of these classes admits of an infinite subdivision, which it is easy to distinguish by species .... (Lavater 1797, 213)

The use of division, classes and species thus leads to eighty-one types of nose, fifty-eight types of foreheads, forty-three types of eyes, fifty types of chins and eighteen types of mouths, all of which can be found through a nested structure of the feature, whose own structure was mimetic of the classification systems of natural history (Magli 1989, 92).[88] In dividing the face up into units, each of which were imbued with specific meaning and value, Lavater was creating the scriptural units of the body from which those practising physiognomy could read an individual's personality.

Phrenological Writing

As physiognomy became increasingly popular in the late eighteenth century, another (somewhat parallel) practice of writing and reading the body emerged.[89] Formulated by Franz-Joseph Gall (1758-1828), a German physician working in Vienna, 'Schädellehre' (translated as the physiology of the brain) came from an observation by the schoolboy Gall that the only other student to gain higher grades in his school was a boy with unusually large protruding eyes, who always seemed to prevail at memory-based tasks (Twine 2002, 74-75). In an attempt to articulate the success of his classmate, Gall proposed a direct correlation between physical features and mental capabilities, a correlation that the Viennese doctor believed could be mapped.[90] Having completed a medical degree in Vienna in 1785 and established himself as a private physician, Gall began collecting human and animal skulls, plaster casts of heads, and plaster and wax moulds, developing his Schädellehre theory as a sideline to his paid employment.[91] He pursued his investigations into the relationship between the head, brain and

[88] Patrizia Magli describes how the nose is sub-divided into "root, spine and type" and then "by the way in which its features combine – long/short, convex/straight, lean/fleshy " to produce eighty-one different types of nose (Magli 1989, 92).

[89] Phrenology can be understood as related to other mind sciences that also came out of Vienna, mesmerism and psychoanalysis. For mesmerism see Winter 1994; Winter 1998; Kurshan 2006; Monroe 2008.

[90] Gall's intent to ascribe credit on the only student who performed better than him not on any innate quality of the other schoolboy, but on the necessity of his intellectual prowess in this particular field, due to a particular physical characteristic, shows how eager Gall was in his own self-assertion. Gall believed that his fellow student had a better capability for memory-based tasks, as his brain had to be that much larger in the frontal cortex–the classical location for intellectual prowess–and therefore pushed his eyes much further forward in his face.

[91] Interesting to explore is the relationship between craniology, a form of knowledge, and craniometry, which supposes itself as a science of skull measurement, but was in the nineteenth century a method of supporting and justifying the hierarchy of the social order, both in terms of gender and race. The classification of human types according to race was begun by German philosopher Christoph Meiners (1747-1810), who divided the human race into four categories, as four distinct species. The subsequent classification by the German naturalist Johann Frederich Blumenbach (1752-1840) divided the human species up into five races: Caucasian, Mongolian, Malayan, Negroid and American. Although he did not explicitly make his classification system hierarchical, he did note that he ascribed the term Caucasian, derived from the region that is now Georgia in Russia underneath the Caucasia Mountain, to the white European race because the skulls of this region were 'most beautiful.' For Blumenbach's collection of skulls, see his *Collectionis suae craniorum*

mind through a variety of methods, but in a manner that accorded with his training as a doctor; that is, through the analysis of skulls (the 'long-dead'), through the dissection of cadavers (the recently dead), and through the collection of head data from asylums, schools and prisons (the lowly) (Paulson 1993, 11). His collection of data was facilitated by his work as physician to the Viennese Lunatic Asylum, his professional and social position which gave him access to schools and hospitals, as well as his self-documented propensity for tracking down individuals with a prominent reputations in particular fields, in order to identify the pathognomic types of skulls (Gall 1835, 6). The results of his investigations led to a collection of over 300 human skulls and 120 plaster casts, and the publication of the first two chapters of an uncompleted book *The Anatomy and Physiology of the Nervous System in General, and of the Brain in Particular* in 1791 (Paulson 1993, 8; and van Wyhe 2002, 22).

Gall's system was based on the tenet that the brain was the organ of the mind and thus the shape of the skull, as the inverted form of the brain, could be 'read' for the qualities of the mind that resided in the space.[92] Historian Arthur Wrobel notes the inherent materialism of the mind that appeared in phrenology, a materialism that converted the mind from surface to object,

> The phrenologists, led by Franz Josef Gall, the founder of phrenology, replaced the *tabula rasa* idea of the mind with a theory postulating that the mind is a composite of innate and inherited instincts transmitted in the form of cerebral organs whose activity varied according to size. (Wrobel 1975, 40)

Whilst Gall acknowledged Lavater's method of facial analysis as fundamental to work on human character, he believed that individual character was more accurately read from the brain than from the face (Staum 2003, 54).[93] Gall's work began with the Classical model of brain localisation, a structure that was split into three broad areas: the anterior of the brain was assigned with the sensation and imagination section of the mind; the central area of the brain was assigned with reason; and the posterior area of the brain was assigned with memory (Young 1970, 2). In the medieval period, three further sections, language, judgement and will, were added (Paulson 1993, 8). Gall took the latest model of brain localisation further, by dividing the mind–and thus the brain, and thus the skull–into 27 individual areas that he mapped onto 27 human characteristics (Figure 2.10) (van Wyhe 2002). These characteristics were,

diversarum gentium illustratae decades (Göttingen, 1790-1828). For further on skull classification, see Gould 1996. However it was not the absolute size of the brain regions that were taken into account, but rather their size relative to each other.

[92] While Gall argued for the uniqueness of his theory, the intellectual roots of phrenology were common currency in intellectual circles of Germany, a factor which no doubt helped to ease its presentation and absorption into popular culture. Historian of science John van Whye argues that Gall was not unique in his theorising; for he built his work on the shoulders of four Germanic intellectuals, thus placing his work within the emerging tradition of philosophy, physiology, education and religion, as set out in the philosophy of mind put forward by the German romantic philosopher Johann Gottfried von Herder (1744-1803), the physiological system of the Professor of Anatomy, Physiology and Ophthalmology at the Universities of Prague and Vienna Georgius Prochâska (1749-1820), the deism of the German philosopher Hermann Samuel Reimarus (1694-1768) and the German educationalist Joachim Heinrich Campe (1746-1818) (van Wyhe 2004, 15). Historian Arthur Wrobel argues that phrenology also drew heavily on the Scottish common-sense philosophers, such as Francis Bacon, Ralph Cudworth, Francis Hutcheson, Dugald Stewart, Thomas Brown and Thomas Reid (Wrobel 1975, 41). The work of van Whye and Wrobel demonstrates that phrenology was not just based on classical and medieval ideas, but that it also reflected the ideology of its time, as the product of various discourses around the human body and human mind, both physiological and philosophical.

[93] So, for example, Gall dismissed Camper's facial angle as, he argued, it only gave an indication of brain capacity, rather than individual faculties. For more on the relationship between Gall's phrenology and Camper's facial angle, see Ewen and Ewen 2006, 69-81.

I. Impulse for Propagation
II. Parental Love
III. Fidelity; Friendship
IV. Valour; Self-Defense
V. Murder; Carnivorousness
VI. Sense of Cunning
VII. Larceny; Sense of Property
VIII. Pride; Arrogance; Love of Authority
IX. Ambition; Vanity
X. Circumspection
XI. Aptness to receive Education; Perfectibility
XII. Sense of Locality
XIII. Recollection of Persons
XIV. Faculty for Words; Verbal Memory
XV. Faculty of Language
XVI. Disposition for Colouring; Delight in Colours
XVII. Sense of Sounds; Musical Talent
XVIII. Arithmetic; Counting; Time
XIX. Mechanical Skill
XX. Comparative Perspicuity; Sagacity
XXI. Metaphysical Perspicuity
XXII. Wit; Causality; Sense of Inference
XXIII. Poetic Talent
XXIV. Good-nature; Compassion;
XXV. Moral Sense
XXVI. Mimic
XXVII. Theosophy; Sense of God and Religion
XXVIII. Perseverance; Firmness

These phrenological categories at once demonstrate important continuances from physiognomy as well as how phrenology pushed the physiognomic imperative to fragment the body further forward. Firstly, although phrenological categories included sensorial characteristics, such as sound and space, they were largely dominated by moral value categories–some of which might now be termed facets of emotional intelligence–such as friendship, parental love, and valour and pride. Therefore, although Gall and his subsequent followers and phrenological practitioners Johann Caspar Spurzheim (1776-1832), George Combe (1788-1858) and the Fowler brothers, Lorenzo and Orson (1811-1896; 1809-1887), materialised the mind, by interpreting the physical skull as expressive of human characteristics, values and aptitudes, phrenology remained firmly within the hermeneutic tradition. Secondly, in localising values and aptitudes within the skull, Gall's theory created firm and clear boundaries of phrenological categories, creating discretely bounded individual areas. (For Gall's phrenological schemata, see Figure 2.10; for Spurzheim's schemata, see Figure 2.11.) And in its discreteness, phrenology was noted by two leading late nineteenth-century practitioners, Nelson Sizer and Herbert Drayton, as being a practice inextricably linked to other discrete writing systems, other scriptural systems; for,

> As eight musical notes contain, by their very repetitions and combinations, the whole realm of music; as twenty-six letters in the English alphabet by their combinations makes its whole literature so [the] ... faculties of the human mind ... make and maintain all the variety of the character, talent, propensity, and peculiarity which is seen in the different persons whom we meet. (Sizer and Drayton 1892, 118. Quoted in Stern 1971, xiii)

This understanding of phrenological practice by Sizer and Drayton as a concatenation of signs demonstrates not only that individuals could be read, as if reading a musical score or a line of alphabetic text, but also that an individual was written in code, a code of discrete, identifiable and locatable units. Thus a phrenological reading of the human body can be seen to be a proto-

DNA interpretation of the human form, where a small number of discrete units are arranged in seemingly infinite combinations to produce a unique individual.

Conclusion: The Analytical Eye's Move to Type

The birth and development of physiognomy and phrenology during the eighteenth and nineteenth centuries mark an epistemological evolution in the analysis and interpretation of the human body. Undoubtedly both practices were aimed to counter the "ontological insecurity" produced in burgeoning industrialising societies, societies in which cities and strangers only grew ever larger (Ewen and Ewen 2006, 46; Sekula 1986, 12; Twine 2002, 73; Wechsler 1982, 23-24; and Pearl 2010, 9-13).[94] In these societies, where increasing industrialisation was a thread tied to increasing literacy, understanding others became an exercise in reading other bodies (Figures 2.12 and 2.13). However, to read the body, the two practices of physiognomy and phrenology had to first create the body's codes and symbols, to establish a system of codification by translating an individual's physical features into types; as Twine describes, "Physiognomy promoted the idea of a generalized notional physiognomy and character type" (Twine 2002, 74).

The codification and categorisation of the human form through physiognomy that had begun with zoognomic analogy materialised the metaphor. Through phrenology, the human body became further defined, by the practice's focus on the head; with phrenology an individual was analysed according to discrete sections of the skull, sections that were first written and then read as indicative of particular human characteristics. In the move from physiognomy to phrenology, the interpretative framework applied to the body was broken down into its constitutive parts, made more rigorous, particularised, pathologised, segmented into a code; whether that code appeared as gesture, or as physical feature, it was indicative of a type. In conjunction with the epistemological shift from a humoral impression to materialist location, the segmentation of individuals into types created an individuated, fragmented and bounded notion of the body.

Although photographic historian Suren Lalvani argues that with physiognomy and phrenology "the surface of the body is raised to the visibility of a text", this section has argued that physiognomic and phrenological practices are better understood as attempts to textualise bodies (Lalvani 1996, 48). The following section will explore how the process of textualising of bodies was further embedded and reinforced through anthropometry and Bertillonage.

[94] As historian of science Roger Cooter notes: "... the amount of intellectual and emotional heat generated by Combe's book far surpassed that raised by the publication in 1859 of Darwin's *Origin of Species*" (Cooter 2001, 10). Its popularity not only answered a growing demand for but also fuelled a thirst for knowledge about phrenology. Phrenological books, not only like physiognomy guides, but also as part of the physiognomic project for bodily knowledge, became a vital part of a gentleman's library, drawn on by its readers for guidance when dealing in business, hiring servants or looking for a spouse. Examples of such publications include George Cohen's 1889 *The Modern Self-Instructor in Phrenology, Physiology and Physiognomy* or Mary Olmsted Stanton's 1890 *A System of Practical and Scientific Physiognomy; or, How to Read Faces. Being a Manual of Instruction in the Knowledge of the Human Physiognomy and Organism, Embracing the Discoveries of Located Signs of Character in the Body and Face, as shown by the Five Natural Divisions of the Countenance* (Cohen 1889; and Olmsted Stanton 1890).

2.2 Measuring Body Space: Constructing the Body Fragment

The second section of the chapter traces the history of the two nineteenth century body classification systems, Francis Galton's anthropometry and Alphonse Bertillon's Bertillonage. The work of these two men, the former a Victorian gentleman-scientist, the latter a clerk in the French police service, classified individuals through their bodies by analysing them into discrete parts; and yet how each typed the body was quite different, and for subtly different purposes. Therefore this section will produce an analysis of these two systems to expose the bodily paradigms within burgeoning capitalist Western societies through close attention to anthropometric methodology of Galton and Bertillon, and to the documents and systems into which they placed the bodies under analysis. It will argue that the bodily systems as set out in physiognomy and phrenology became, through Galton and Bertillon's classificatory systems, not only spread out over the whole body, but also instrumental in society's administration, both as epistemological possible and administratively actual. This section, therefore, will argue that through anthropometrics and Bertillonage, the fragmented body in the late nineteenth century became situated more centrally into the politics of power. In demonstrating the argument about the fragmented body in the late nineteenth-century, this section will also show that this only became possible because Galton and Bertillon's systems were essentially textual, in that they analysed the human body into bits, conceptually binding those bits into discrete units, and then entering them as text into the archive.

Francis Galton and the Birth of Anthropometrics

One of the key figures in the nineteenth century history of the body was Sir Francis Galton (1822-1911) whose interest in rationalisation, productivity and the human body can be seen as a direct product of the Enlightenment and the beginnings of industrialisation. Grandson of Erasmus Darwin, cousin to Charles Darwin, with the Wedgwood family as his near relations, Francis Galton's extended family has a history of innovative and influential scientific enquiry, and interest in economic and scientific progress. Less frequently noted is that both Francis' grandfather Samuel Galton Snr. and, for a short time, his father Samuel Galton Jnr., were leading British gun-makers, whose business was heavily involved in the slave trade. Under the company name of Farmer & Galton, British slave traders took Galton muskets to Africa, to exchange with tribal chiefs for slave bodies, a biographical factor which must have made Samuel Jnr.'s son acutely aware of the classification of bodies and their economic worth.[95]

Accounts of Francis Galton demonstrate a seemingly obsessive compulsion to count, an obsession which saw him work in the fields of meteorology, physiology, psychology, criminology and biology, amongst others.[96] On graduating from Cambridge in Mathematics in 1844, in the

[95] In the eighteenth century, Birmingham was the leading arms production centre in the world, with three large gun making firms based in the city, Farmers, Whateley and Galton, all of which were heavily involved with trade in Africa. In the eighteenth century, it has been estimated that the firm Farmers & Galton, later to become Galton & Sons, was the largest gun making firm in Birmingham, being the main supplier of the Committee of the Company of Merchants Trading to Africa. This Company was a slave trading business based on the Gold Coast that at its height exported 10,000 slaves a year (Smith 1967; Richards 1972; Richards 1980; and Inikori 1981).

[96] Martin Brookes notes in his biography of Galton how this obsession with counting manifested itself, and how his greatest strength was also his greatest fault:

> Many of his studies were measuring for measuring's sake, the product of an obsessive drive he possessed from childhood. Galton's obsession unwittingly turned him into one of the Victorian era's chief exponents of scientific folly. (Brookes 2004, xiv)

Brookes goes on to note that his obsession turned itself also to the mathematisation of tea making and cake cutting. The tea-making work appears in the UCL Galton Papers, Misc. Papers, Item No. 173. For the results of his work on cake cutting, 'Cutting a round cake on scientific principles,' see Galton 1906. For more on obsession and Francis Galton, see Davis 2008, 86-94.

same year as his father died, the newly financially independent Galton spent the remainder of the 1840s travelling through Eastern Europe and the Arabian peninsular. In the early 1850s, Galton travelled further afield, following the trend for African exploration when he left Britain in April 1851 to explore the African interior. After nearly two years exploring and mapping the land of the southwest African interior, now known as Namibia, his return to Britain saw him awarded the gold medal from the Royal Geographic Society in 1853 for his cartographic surveys of the land. During the 1850s, Galton followed his cartographic work in Africa by turning to other geographical, cartographical and meteorological problems. However, in 1859, Galton found his work's central focus on the human body with the publication of his cousin Charles Darwin's book, *On the Origin of Species by Means of Natural Selection, Or The Preservation of Favoured Races in the Struggle for Life*; after reading this book, Galton switched his attention from mapping the territory of colonised lands to mapping the territory of the human body.

Galton was clear about the intention of his work on the human form from the outset: it was to systematise, under a scientific methodology, the general body-reading techniques of physiognomy and phrenology, noting that he intended to "study those groups of men who are sufficiently similar in their mental characters or in their physiognomy, or in both, to admit to classification" (Galton 1877, 344).[97] With Galton's technique for the analysis and classification of the human form, the physical form of the human body became broken down into parts, recorded, or rather reconstituted as written document, and the individual body became classified into the system. In laying the ontological foundations for the classification of the human population, Galton, in an echo of Lavater albeit one hundred years later, promoted 'writers of the higher works of fiction' as proto-anthropometricians, because they "are ever on the watch to discriminate varieties of character, and who have the art of describing them" (Galton 1877, 345).[98] In his promotion, Galton is re-urging Lavater's instruction to his physiognomists-in-training to master 'natural' language, in order to translate the 'language of Nature' more effectively.

Whilst physiognomy and phrenology had been framed as ways of informing oneself as to the 'true' characters of one's fellow human beings, Galton framed his analytic system of the human body within the terms of economic capitalism, stressing the finite nature of human energy and advocating his system as a methodology to "check the balance" of energy of one's own body, having their bodies and those of their children "accurately appraised" (Galton 1882, 333). This discussion of the body's energy framed through the language of capitalism makes explicit Galton's economic approach to the body, advocating the worth of his methodology in demonstrating the worth of an individual; for,

> They would measure the excess of waste over repair consequent upon any given effort, and would furnish the indications of a loss of capital which, if persevered in, must infallibly lead to vital bankruptcy. (Galton 1882, 334-5)

[97] Galton submitted himself to a phrenological reading at the London Phrenological Institution in 1849, where he was given the reading "skull measured twenty-two inches around, that he possessed a sanguine temperament with considerable self-will, self-regard and no small share of obstinacy" (Kerles 1985, 6-7). Whether he thought this accurate or not has not been documented.

[98] Galton continues: "It would, I think, be a valuable service to anthropology if some person well versed in literature were to compile a volume of extracts from novels and plays that should illustrate the prevalent types of human character and temperament" (Galton 1877, 345). Daniel Pick, in his book *Faces of Degeneration: A European Disorder 1848-1918*, draws heavily on literature of the time as well as criminal anthropological and psychiatric sources in his exploration of degeneracy, a prominent late-nineteenth century discourse. Amongst the authors that Pick draws on are Emile Zola, Conan Doyle. H. G. Wells, Joseph Conrad, George Gissing, Robert Louis Stevenson and Bram Stoker (Pick 1989).

Galton's discussion of the economised human body draws in his knowledge of cartography, to suggest that anthropometry would show the worth of the individual body in society in its very translation into inscriptive form, just as a specific type of cartographic map, a cadastral, displays the value of property on the land it surveys.

> If everything should be stated by which anthropometry might profit, the effect would be not unlike the map of some partially settled country drawn on a scale so large as to show the cadastral survey of its principal town lands. (Galton 1882, 333)

In Galton's initial chartings of human bodies, he used University of Cambridge and Oxford graduates, public school children, and members of the Royal Society as his data set, as his territory (Galton 1875). By 1882, Galton's system of bodily classification had become distilled and refined in its methodology, sufficient enough to warrant its own committee, the Anthropometric Committee, within the British Association for the Advancement of Science (BAAS). Eager to disseminate his work more widely, Galton proposed the establishment of an Anthropometric Laboratory to the BAAS, so that his methodology could be used by those wishing to 'know' their correct and appropriate position within society, one that accorded with their bodily capabilities and measurements. In his proposal for an Anthropometric Laboratory Galton laid out his intention to measure height, weight, chest girth ("to be taken by a 'skilled observer'"), lung capacity, hair colour and eye colour. Alongside this data, Galton also wanted to gather biographical data, including birthplace, the individual's residence ("Town or country"), parents' residence ("Town or country"), and race ("English, Scottish, Irish, etc.") (Galton 1882, 334). To these two lists of formal and biographical data, Galton added a list of bodily skills he wanted to measure, including "endurance; strength; agility; co-ordination; and sense discrimination or sense sensitivity, comprising sight, sound, touch and muscular sense", as well as some specific bodily behaviours, including "response to stimulus, time to judge from two signals and the effect of after-images" (Galton 1882, 337). These latter experiments were included as sets of information that Galton suggested could be used to locate and situate individuals within a social hierarchy. For example, through testing the effects of after-images by asking experimental subjects to gaze at a red wafer for a time and then asked if they see an after-image, Galton suggested he would be able to discern all of those who had an "artistic temperament", as the ability to see an after-image is "the base of the enhanced susceptibility to conditions of contrast and harmony of colours" (Galton 1882, 337). Therefore, much as phrenology had become in the late-nineteenth century, through the work of Combe and the Fowler brothers, a method of positioning one's potentiality in society through the shape of one's skull (for satire on this practice, see Figures 2.12 and 2.13), Galton was proposing the positioning of the individual through their bodily measurements and capabilities.

The Anthropometric Laboratory

During this period, Galton was pursuing a larger, more varied data set in answer to numerous contemporary criticisms of his work, criticisms that identified his focus on specific homogenous data sets as severely problematic in testing scientific hypotheses. In 1883, Galton heard of the proposal for an International Health Exhibition (IHE) to be held in the grounds of the Royal Horticultural Society in South Kensington (Figure 2.14), and immediately saw an opportunity to expand his data and answer his critics. Through his successful proposal to join the IHE

exhibitors, Galton set up an Anthropometric Laboratory at the exhibition that ran from 8 May to 30 October 1884.[99]

The aim of the IHE was to locate Britain at the heart of modernising civilisation, through formalising and popularising a scientific attitude towards the body, as noted in the 1884 *Report on the Exhibition to Parliament*,

> During the last quarter of a century the attention of civilised nations has been devoted in a very marked degree to the scientific study of all questions relating to the preservation of the health of human beings. (International Health Exhibition 1884)

Running for six months from 30 October 1884 to 8 May 1885 on what is now the site of the Science Museum and the Natural History Museum in South Kensington, the IHE exhibition attracted 4.1 million visitors.[100] In setting out the intention of the IHE, the promotional literature shows in its use of the word 'civilised' and the phrase 'preservation of health', neuroses of both the individual and social body and a fear of infection from the uncivilised (the unclean). Broadly divided into 'Health' and 'Education', the sections of the exhibition exposed different material forms with which the body interacted (for map of the exhibition, see Figure 2.15). Firstly there were the spaces of the body, with sections named the Dwelling, the School and the Workshop. Then there were the more intimate material forms, sections marked as Food and Dress. Thirdly, the most intimate of all was that of the Laboratory, which focused on the body itself, the body as body. Within this Laboratory, there were sub-sections, sub-laboratories such as the Biological Research Laboratory and the Hygienic Laboratory.[101] It was alongside these sub-laboratories that Francis Galton's Anthropometric Laboratory took its place, set up in the South Gallery, as a sectioned off part of the corridor (Figure 2.16). The Anthropometric Laboratory, six feet wide and thirty-six feet long, processed 9,337 individuals during the six months of the exhibition. Individuals who went through Galton's anthropometric process had their bodies typed through an assembly line analysis of their form and function, by the use of eleven different workstations, to all intents and purposes very similar to those he had outlined to the Anthropometric Committee of the BAAS some three years earlier (Galton 1885, 214-7).[102]

By submitting their bodies to this analysis, in this space, the visitors were assessed as an assemblage of parts, in marked contrast to the humoral interpretation of the body as a holistic whole that was still widely practised by medical practitioners. For the Anthropometric Laboratory broke down the 9,337 bodies' forms and functions into fixed areas of analysis, by the use of distinct workstations. In recording the data of the examined bodies, Galton created a form for each individual to complete, of which the Laboratory kept a duplicate, created through the use of carbon paper underneath the original document. Through visitors' submission to

[99] Following the IHE, Galton's Anthropometric Laboratory moved to the South Kensington Museum as a semi-permanent installation and then was located on some unoccupied land, belonging to the 1851 Commissioners. It finally closed in the early 1890s, when the Imperial Institute was built on this tract of land (Gillham 2001, 213).
[100] The IHE claimed in its exhibition literature to follow 'naturally' on from the 1883 Fisheries Exhibition, held at the same location. Where the Science Museum now stands was then the grounds of the Royal Horticultural Society, and it was here that the IHE took place. Half the visitors paid at the door and the other half bought 'railway' tickets; the exhibition made a profit of nearly £100,000 (International Health Exhibition 1884).
[101] The other scientists involved with the Laboratory were George Buchanan, William Watson Cheyne (Biological Research), Prof. W.H. Corfield (Hygienic Laboratory), Professor M. Foster, Captain Douglas Galton, Ernest Hart, Sir Joseph Lister, Sir James Paget, G.W. Moore, Prof. J. Burden Sanderson, and R. Angus Smith (International Health Exhibition 1884, xxv, 25). As complementary events to the exhibition itself, there was a musical programme as well as lecture and conference series.
[102] Such were the numbers of examined bodies that submitted themselves to the Laboratory that the most appropriate tools for statistical analysis of the documents were not invented nor applied until the 1920s and 1930s (Tredoux 2009).

body measurement practices and in allowing the Laboratory to retain an impressed copy of the results of their analysis, every visitor was kept as a ghost of themselves, an impression of their material form in data (Figure 2.17). As to which particular parts of their bodies, what impression they left behind, the anthropometric form itself provides the structure into which each body was imprinted. This structure was, reading from the top of the form to the bottom, from left to right:

1. Sex
2. Eye Colour
3. Eyesight–Distance
4. Eyesight–Colour Ability
5. Judgement of Eye–Division of a line into three and two parts
6. Judgement of Eye–Estimation of squareness
7. Hearing–Highest audible note
8. Breathing Power
9. Swiftness of Hand
10. Strength of Hand–Squeezing of right and left hand; and Pulling.
11. Span of Arms
12. Height–Seated
13. Height–Standing
14. Height–Heel of Shoe
15. Weight

In performing this analysis over the eleven workstations, a visitor proceeded through the Laboratory as follows:

I. Desk where the individual was instructed on how to proceed and was relieved of their entrance fee
II. Colour of Eyes and Hair (Form sections 1 and 2)
III. Sight, including keenness, colour-sense, judgement of the eye as to length and squareness (Form sections 3, 4, 5 and 6)
IV. Hearing including keenness and highest audible note. (Form section 7)
V. Touch[103]
VI. Breathing capacity (Form section 8)
VII. Swiftness of blow. (Form section 9)
VIII. Strength of pull and squeeze. (Form section 10)
IX. Span of arms. (Form section 11)
X. Height above seat of chair, standing in shoes and heel height. (Form section 12, 13 and 14)
XI. Weight. (Form section 15)

(From Galton 1885, 214-7)

The fifteen measurements taken of an individual body in the Anthropometric Laboratory reveal Galton's own particular operational paradigm at work, a paradigm in which measurements appear on a range, and are thus able to be ordered form highest to lowest. This organisational structure, and potential ordering along a variety of bodily skills, capacities and forms results in

[103] It has not possible to ascertain what the 'Touch' section of the Laboratory measured, as no data on the form would seem to correspond.

the scientific typologies of bodies. For Galton compounded his analyses of the features of the body as object, such as the measurement of height and noting of eye colour, and the features of the body as subject, such as the ability to estimate squareness or the swiftness of one's hand, into one unified whole; Galton's anthropometric methodology is another articulation of the 'cumulative and patchy' physiognomic methodology. Galton did not differentiate the body as object from the body as subject; rather he placed each element on an equal footing and thereby induced a totalising effect for the body, much as phrenology had for human characteristics and skills. Although Galton noted that these measurements were not fixed–that a person was an inch taller in the morning than in the evening, that children will become adults and bodies will grow and change within their environments–he amalgamated his individual data points into sets to prove their relativity (Galton 1885, 205).[104] This mix of objective materialised form and subjective bodily skill provided a snapshot of the person tested, albeit in data form rather than as a pictorial image.

Set perpendicular to the main bulk of an individual's anthropometric measurements were further information categories–age, marital status, birthplace, occupation and residence in town, suburb, or country (Figure 2.17). The inclusion of information about social position alongside bodily measurement would imply that Galton's project was biologically deterministic in nature, in attempting to establish a relation between social position and bodily attributes and skills. However this section of the form only appeared on the examinee's copy; the duplicate kept by the Laboratory contained just the bare data.[105]

The instruments that Galton used to take anthropometric measurements were a mixture of those invented by Galton himself, or those bought in from instrument makers. They include instruments such as the head spanner, spirometer, hand and arm dynamometer and apparatus for measuring swiftness of hand blow (Figures 2.18 and 2.20).[106] These instruments became, for Galton, the measure of man, translating not just three dimensional form into written system, but reading the man, to locating his social position, past, present and future. In an newspaper article titled 'A Morning with the Anthropometric Detectives: An Interview with Mr Francis Galton FRS', Galton tells his interviewer "dumb though they are, what splendid detectives our

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[104] Galton acknowledged that the data could never be absolute, noting that:

> One object [in considering what should be measured] is to ascertain what may be called the personal constants of mature life. This phrase must not be taken in too strict a sense, because there is nothing absolutely constant in a living body. Life is a condition of perpetual change. (Galton 1885, 205)

The absolute rather than relative measurement of the human body was an objection that Galton raised to Bertillon's system, writing that "The incorrectness [of Bertillon's system] lay in treating the measures of different dimensions of the same person as if they were *independent* variables, which they are not" (Pearson 1924, 251).

[105] What is immediately apparent on these ephemeral paper forms from the Anthropometric Laboratory is that there is no category in the framework for a name. Instead the individual is assigned a number, on the top left hand corner of the form. However, as evidenced from the completed form in the Galton Papers of William K. Russell, whose details were measured and taken on 5 September 1884, some examined individuals found the omission peculiar–his name is (mistakenly) inserted into the 'Age last birthday?' section of the form.

The lack of an individual's name in conjunction with the person's social details, such as marital status and occupation, sets up a peculiar relationship between the examiner and examined, being at once both intimate and distant. To be described in all one's details and attributes, but to remain nameless is to leave the examined individual on the threshold of the imagination, to be liminal, lying on the border between subject and object, product and process. As a set of descriptors, the individual becomes akin to an object in Jorge Luis Borges' short story 'Tlön, Uqbar, Orbis Tertius', a story describing an imagined land where language has no nouns and objects exist in linguistic terms as a series of adjectives or impersonal verbs. One of the central points that this short story makes is that naming is a necessary condition to material existence. On reading this form, the viewer is left with the feeling, perhaps with post-twentieth-century hindsight, that the lack of a name robs individuals of themselves, reducing the self to a series of descriptors, by creating a typology of human form that is, in practice, a series of little killings of the self as a subject (Borges 1962).

[106] Later, in 1904, the Italian criminologist and anthropologist Cesare Lombroso expanded this list of instruments, to include cardiographs, ergographs, pneumographs, mylographs and sphygmographs. This list demonstrates how Lombroso used a compilation of Galton's anthropometric instruments with Marey's physiological machines to describe and contain the criminal body, a body which Lombroso saw as atavistic (Horn 2003, 85). For more on Lombroso, see Pick 1989, 111-126; and Horn 2003.

instruments might prove to be" (Galton 1888, 2). Galton's anthropometric instruments were therefore detecting inscription devices, devices that wrote the human body into the archive as abstract form to extract bodies' location with the social hierarchy.[107] The detective work Galton refers to was to detect faults in the individual body, such as poor eyesight, or to detect an individual's overall health in relation to the social health, or, in Galton's words, allow the individual "to make such comparisons as enable him to see whether he is advancing or retrograding" (Galton 1888, 1-2).

However, even in the use of these instruments, Galton felt some measurements were still too intimate to be made directly. To solve this problem, Galton devised strategies to distance the anthropometrical evaluator from the body he was measuring, a strategy exemplified by the height measurement section of the form. In this part of the examination process, the individual's full height is first measured, and then the heel of their shoe; subsequently a calculation is performed to determine the height of the individual's body. This process was set up so that no visitor would be required to remove his or her shoes; the removal of footwear was so abhorrent to Galton–even though Galton was not carrying out this measurement himself.[108] Thus the examiner could measure the body without coming into any position of material intimacy with it.

Galton's specific typology of human form, shown through the categories of anthropometric measurement he used, reveals his tendency to detect and formalise the defective body. Whilst Galton claims that Breathing Power, in which the examined body was required to blow into a machine, was a marker for overall physical strength, it also acted as a detector of tuberculosis.[109] Another test for defectiveness was Galton's use of Professor Holmgren's Test For Colour Blindness, in which five pieces of coloured wool were presented to the person under examination in a shuttered box and he was required to identify the four strands that were tinted green (Figure 2.19).[110] As Galton noted in his Rede Lecture, given at the University of Cambridge

[107] Galton's belief in the power of the instruments as the most accurate devices for writing the body was such that subsequent to the IHE, Galton worked with his cousin Charles Darwin's son Horace's business Cambridge Scientific Instrument Company to produce commercially available devices for anthropometric measurements. For the instrumentalisation of knowledge and the establishing of objectivity through representational strategies, see Daston and Galison 1992.

[108] The measurement of the bodies within the Anthropometric Laboratory was left to the attending warden, Serjeant Williams. Other attendants to the Anthropometric Laboratory were a doorkeeper, who admitted visitors, took their 3d entrance fee, gave them the blank form, and made sure the forms were completed in the correct manner; and a Mr Gammage, who maintained the instruments and generally assisted the laboratory visitors each evening (Galton 1885, 216).

[109] The measurement of lung capacity is noted in an article by Galton six years after the Anthropometric Laboratory was set up to be indicative of the overall strength of the body.

> Lung capacity has to be treated on parallel lines to strength. The human body is a locomotive worked by a chemical engine. It is stoked with food, and pumps in air to burn waste products; then it pumps out the air after it has been vitiated by the burnt products, doing this in alternate rhythm. A respiratory apparatus, that is amply large enough for a small human body, may be altogether inadequate for a larger one. Therefore it is the lung capacity relatively to the size of the body that concern us, and not the lung capacity in an absolute sense. (Galton 1890, 23)

However it can be argued that those with tuberculosis were a group of individuals of particular interest to Galton, specifically through his work with composite photography and resulting in a special report on the phthisis (tubercular) 'type' (Galton 1882). Two years prior to IHE, Robert Koch, a German doctor, had isolated the bacillus that caused tuberculosis, thus sweeping aside the disease's romantic idealisation as it was confirmed to be a disease of human contact rather than a characteristic of a person's disposition.

[110] The problem of using green to detect colour-blindness was pointed out to Galton by a Mr Roberts, in the discussion following Galton's presentation of his paper 'On the Anthropometric Laboratory of the late International Health Exhibition' at the meeting of the Anthropological Institute in 1885. Aside from noting that different types of people will be more skilled at some of the tests Galton had devised, such as a grocer having a finer sense of handling weights, Mr. Smith points out that green is only able to detect a defect in colour-sense, rather than colour-blindness. He points out that purple is the colour that should have been used, as it appears blue to the red-blind, grey to the green-blind and red to the violet-blind. Mr Roberts' comment demonstrates how Galton made erroneous assumptions in his experimentation techniques (Ibid., 220).

in June 1884, anthropometry could reveal a man's "hidden faults in his rearing which would detract from his future efficiency as a man" (Galton 1884, 34-35).

In these ways Galton's typing of human form provided a snapshot of an individual, a snapshot of data, noting both bodily form and bodily skill. Galton's capturing of human form at the IHE was also for larger political and social aims than simply expanding his data, as his notes for the Rede Lecture show (Galton 1884); it was to demonstrate anthropometric analysis as an essential part of the examination of applicants to the labour market, specifically the British Civil Service. Galton was already conscious of America's use of this kind of analysis of applicants to its government's bureaucracy and in its educational programme (Galton 1884; and Mussey Hartwell 1893). Thus the particular manner in which Galton typed bodies was constructed in order to expose defective bodies, the consumptive, the colour-blind, whilst identifying the strong, those swift of hand and sharp of eye.

Alphonse Bertillon's Criminal Library

This idea of the snapshot was more literally used by Alphonse Bertillon (1853-1914) in the construction of his police record cards and system. Bertillon was the son of the physician and anthropologist Louis Adolphe Bertillon, one of the founding members of the Society and School of Anthropology and his close friend of the physician and anthropologist Pierre Paul Broca. Working first as a bank clerk in London, a teacher in the French school, a private tutor and, subsequently being conscripted into the French Army in 1875, Alphonse's career path was somewhat unfocussed, until his father secured a clerical post for him in the Prefecture of Police in 1879. In this clerical position, Alphonse Bertillon began his police career processing arrest documentation. Drawing on his knowledge of emergent body sciences of the nineteenth century that had formed the central part of his father's work, and mindful of the failures of the police system for identifying and arresting criminals, Bertillon created a methodology for classifying the body, both individually and collectively, for use by the French State. Under Bertillon's system, the human body became three sets of signals: anthropometric, biographical and photographic. After eight months working for the Prefecture of Police, Bertillon submitted his report to the Prefect, recommending his method for practical use, as his biographer Henry H.T. Rhodes notes,

> These measurements reduced to formulae could be recorded upon a form which was really significant, because it was the essential portrait of the person described and none other. (Rhodes 1956, 75)

In 1888, the Department of Judicial Identity was formally established with Bertillon as its Director. In setting up his signaletic methodology, a study of two of Bertillon's identification cards can provide some insight to the structure of Bertillon's identification system (Figures 2.24-2.27). Whilst one side of the card contained the individual's social particulars, such as their name, any pseudonyms they used, their occupation and where they lived, the other side of the card, the side which stood with its back to the user of the filing system, takes the measure of the man in more objective manner, featuring none of the bodily skill measurements Galton used in his construction of human form. Initially, as shown by the card of Eugene Durand compiled in 8 February 1888, the 'back' of the card was separated into three sections: anthropometric measurements; descriptive measurements; and other observations of particular marks and

characteristics (Figures 2.22 and 2.23).[111] Beginning with Bertillon's bodily typing system, the anthropometric measurements noted on the Bertillon cards were, reading from top to bottom, left to right:

1. Height
2. Dome of skull
3. Arm Span
4. Chest
5. Head–Length
6. Head–Width
7. Right Ear–Length
8. Right Ear–Width
9. Length of Left Foot
10. Length of Left Middle Finger
11. Length of Left Little Finger
12. Length of Left Forearm
13. Left Iris Colour
14. Central zone
15. Exterior zone
16. *Parter*[112]
17. Age
18. Date of Birth
19. Place of Birth
20. Area no.

These categories are derived from a specific lemma of Bertillon's anthropometrical theory, namely that there were seven measurements of the body that did not change after the individual reached twenty years of age–body height, length of head, width of heard, length of middle left fingers, length of left foot, arm span and colour of left eye.[113]

In a formal analysis of the Bertillon cards, it can be seen that the uniformed size of the cards and the printed type of the categories provide the framework into which each body was to fit, exactly as Galton's paper forms did for visitors to the Anthropometric Laboratory. The examining individual handwrote the measurements for each category; the individual data set of an individual body was expressed through the individual examining hand. As critic Allan Sekula has noted,

[111] These three sections are the signals, the *signalements*, part of the *système biomètrographique* invented by Louis Mathurin Moreau-Christophe in the 1850s. Moreau-Christopher's system used four signals to establish identity, specifically of the criminal class: the *signalement photographique*, *signalement graphométrique*, *signalement biographique* and *signalement pénitentière*, which were four groups of signs about the individual, the photographic signs, the anthropometric signs, the biographical signs and the prison history signs. However, with no interest in how to organise the signals he collected, the Moreau-Christophe system soon floundered. Andreas Broeckmann has described these four signal groups as forming an "identificational net from which the delinquent would be unable to flee ..." (Broeckmann 1995).

[112] It has not been possible to translate this particular entry, but it is some measurement of the eye.

[113] There are a number of items of note about Bertillon's anthropometric system. First it that the body is a living organism, and therefore changes its shape through time, a fact which undermines Bertillon's system. Secondly, the colour of one's eye becomes a measurement, a signal, of identity. Thirdly the measurements of the limbs, digits and eyes are all of those on the left hand side, the reason for which is undocumented, but which is of interest in consideration of the sinister nature of anything associated with the left hand side of the body. Two reasons for this could be: the individuals performing the measurements on the individual's body could be assumed to be right handed, thus making measurement of the left hand side of the body easier; or the left hand side of the body, because it is less used that the right hand side, is more likely to remain constant over a period of time.

> For Bertillon, the mastery of the criminal body necessitated a massive campaign of *inscription*, a transformation of the body's signs into a *text*, a text that pared verbal description down to a denotative shorthand, which was then linked to a numerical series. (Sekula 1986, 33)

With the latter cards, the replacement of some of the measurements with a photograph adds to the idea that the cards show an impression of an individual; for as light photons create a re-presentation of an individual body by striking the chemical coating of the photographic plate, so the Bertillon cards hold an impression of a distinct body, of the individual, through the written data of bodily measurements and observations. The addition of photographic portraits to later experiments with these cards makes more explicit, in its re-presentational image form, that the cards provide a snapshot of an individual (Figures 2.24-2.27). However, the cards displayed the individual not only as a collation of physical measurements and bodily and social descriptions, as data, but also as a collation of different inscriptive technologies, as printed type, handwritten information and a photograph.

These cards did not exist as solitary descriptors but through their organisation, en masse, within a filing system. It can be seen from the surrounding green dividers around the cards for Durand and Pimpeterre that they were extracted straight from an organised system (Figure 2.28). Yet these were not organised arbitrarily, or alphabetically. This database of materialised individuals were organised in the first instance by wrist measurement; this can be seen from the tab on the first of the file dividers, which reads 'Coudée petite, a-43.5' translating as 'Small forearm' (Figure 2.29). In the second instance, the cards were organised by body height, as can be read from a tab on the left side of the divider on which is written, perpendicularly to the display of the card, the phrase 'Taille moyenne 1m62-67', translated as 'Medium Height 1m 62-67' (Figure 2.29). This is confirmed on noting that the tabs of the card have both, through exposure to light, faded to brown; the remainder of the card retains its original green, indicating that these tabs were exposed from the main material bulk of the cards, to navigate the filing system.

So it can be seen that the classificatory system Bertillon used was one that divided a measurement into three categories–small, medium or large:

1.	Length of Head	Small, Medium or Large	Three categories	(3^1)
2.	Width of Head	Small, Medium or Large	Nine categories	(3^2)
3.	Left Middle Finger	Small, Medium or Large	Twenty-seven categories	(3^3)
4.	Left Little Finger	Small, Medium or Large	Eighty-one categories	(3^4)

(From Rhodes 1956, 90)

The files were stored in a cabinet that had nine horizontal and nine vertical rows. Therefore the body was placed into the grid, an individual filed into the physical matrix of a filing system. In order that each of the eighty-one drawers held a similar number of cards, according to laws of general population variation, Bertillon's segmentation of small, medium or large was such that a third of the population would fall under and below that point in a normal distribution curve (Rhodes 1956, 91).

The organisation of the cards into a filing system formed of three networks of the archive, overlaid one on top of the other. Firstly the anthropometric and descriptive data on the

card form the network of the individual's body, a network of nodes and relations of embodied selfhood, historically specified. Secondly the card as a single item within a filing system is a node within a network of criminalised (deviant) bodies. And finally, in the use of the card in the assignment of criminal acts to individual bodies, of effects to causes, these cards themselves are within the network of the social body, as items which patrol the borders of the society. For Bertillon's typing of the body and his subsequent deconstruction of the deviant body was directed to be used, from its very conception, as a tool of state bureaucracy and was explicitly a tool of state control of the individual.[114] However in the process of exercising control, Bertillon was textualising bodies, a move made clear from his discussion of those instances where one is searching for an individual among the masses, the signal amongst the noise, which Bertillon describes as searching for the spelling of a word in a dictionary,

> When one or more of the measurements taken anew on the individual fall on the limits of the divisions of the classification, the investigation should be pursued in the various adjoining compartments, exactly as in a dictionary one looks in different places for a word the exact spelling of which he does not know. (Bertillon and McClaughry 1896, 22)

Bertillon attempted to make his archive more widely used, beyond the physical limitations of his office in Paris, by devising another language into which he translated an individual's anthropometric details and then training police officers in its use. In placing an individual's bodily form into this other language, his purpose was clear – to be able to communicate a body more clearly through the dominant communication technological network of the age, the telegraph. However Bertillon did not draw upon the standardised measurements of an individual, but rather the individual's so-called peculiar marks. Under this new snapshot of an individual, the notational system of writing the individuated, particular body became, for example,

$$cic.\ r.\ of\ 1b\ \varepsilon,\ ml.\ 2^{d}f.\ M.\ g.\ \rho$$

translating as "cicatrix [scar], rectilinear, of a dimension of one centimetre, oblique external, on middle of second phalanx of middle finger, left side, posterior face" (Bertillon 1896, 61). This line of text formalised bodily marks, drawing on the notations of mathematics in its inscription.[115] And yet in its graphical formulation, Bertillon was attempting to make the individual body more legible and therefore more communicable; following in this vein of constructing a model for describing individual bodies within the crowd, Bertillon referred to his new language as stenography, the nineteenth century term for shorthand writing. Through the desire for transparent communication, for medium transparency, Bertillon was searching for a technology of the body that was not only superior to human speech, but that was in its inscriptive form superior to written language, noting that,

[114] Galton's collection of data at the IHE can also be regarded in this light; Galton himself saw the collection of data as at least twofold in this account, in line with the following taken from the IHE catalogue, where the authors note that "The use of periodical measurements is two-fold, personal and statistical. The one shows the progress of the individual; the other that of portions of the nation, or of the nation as a whole" (Galton 1885, 213).

[115] The notation is defined by Bertillon as "...the word *scar* (technically *cicatrix*) is represented by the letters *cic.*, and the word oblique by a simple *b*; *c* signifies curved, and the letter *r*, rectilinear; *a* is read *anterior*, and *ρ* (the Greek rho), *posterior*; *ε*, external, and *ι*, internal; *d* (for droit), right and *g* (for gauche), left; *f* is read phalanx; each finger of the hand is indicated by its initial in a capital letter, etc." (Bertillon 1896, 61).

> It can be seen that the daily use of these stenographic signs gives to the writing a rapidity equal and even superior to that of speech. The officers who make use of it even go so far as to say that they can read more quickly and comprehend more easily than ordinary writing. (Bertillon 1896, 61)

But more than stenographic marks, these descriptions of individual human bodies were also known as a 'portrait parlés' or speaking portraits, demonstrating a curious elision of orality and inscription, between image and text. However, Bertillon's portraits were not spoken portraits in the physiognomical tradition–they were not literary descriptions–but were precisely a series of short words or phrases archived and/or communicated in written form, to identify the individual from the noise of the masses, the signal from the noise.[116] With Bertillon's christening of this new form of body classification as speaking portraits, a period of inscriptive uncertainty in the late nineteenth century is revealed, as writing and speech become somehow discursively interchangeable.[117]

Conclusion: The Laboratory and the Library

As a result of Darwin's work on evolution and his publication *On the Origin of Species*, Francis Galton's created the bodily classification system of anthropometry; in its practical application, his establishment of the Anthropometric Laboratory resulted in an archiving of the body. However in order to create the archive, the bodies under analysis had to be converted into written form. This act of translation, from embodied form to textual re-presentation, necessarily required the separation of the body into defined areas. These defined areas were not just physical properties but also skills and abilities, reflective of the categories of phrenological analysis; at the same time, as an act of translation from the body into text, Galton's anthropometry can be seen to be part of the physiognomic project. However, Galton's system of anthropometry was to define the normative and thereby the pathognomic. In contrast Bertillon's intention in creating a more abstract system of body analysis was to establish a method for unique identification, to draw the individual out of the crowd. To establish identity, Bertillon's system noted only the physical properties of the body, not its skills or abilities; and in noting these properties, Bertillon broke the body into "small, standardized units" so that "unskilled clerks [could] file and retrieve criminal photographs" (Warner Marien 2011, 224). However, as a system of anthropometry, Bertillon's method was still an act of translation, converting the physical body into textual description, epitomised by his creation of speaking portraits. The following section will focus on another inscriptive form of bodily representation of the period used by Bertillon and Galton, photography, to explore in more detail how the translation of the body into an object that could be archived through photographic practice was, in its own way, part of the textual imperative of the late nineteenth century.

[116] Bertillon's speaking portraits were used well into the twentieth century. In Len Deighton's *Funeral in Berlin*, a cold war thriller from 1964, instructions are given to Interpol to find a Bertillon, which Deighton explains in a footnote as a speaking portrait system for identifying individuals, run alongside a synoptic index with colour tags for each sixth of the face (Deighton 1964).

[117] Bertillon's speaking portraits are another articulation of the terminology of Ouija boards, or 'talking boards' as they were better known throughout the nineteenth century. These boards will be explored in Chapter 4, 'Spirit (Writing) Media.'

2.3 Photographic Ordering: Graphs, Grids, Composites and Mugshots

This section explores how photography constructed through representation the conceptually fragmented bodies of the late nineteenth century. It begins with an analysis of the photographic work of Étienne-Jules Marey who, like his Anglo-American counterpoint Eadweard Muybridge, initially developed a photographic method to trace animal physiology in movement, before focussing on the human body. It then moves on to examine Francis Galton and Alphonse Bertillon's use of photographic techniques in their classificatory systems, through composite photography and the mugshot. This section will argue that through the particular photographic technologies, techniques and intents of these three men–Marey's chronophotography, Galton's composite photography, and Bertillon's mugshot–photography was not just expressive of but also formative to the fragmented body of modernity. By documenting the body as structure, it will argue that photography was able to do this by flattening the form of flesh into a document, restructuring identity into particular discrete forms and thereby producing the body fragment as a synecdoche for the total body. Furthermore this section will explore the claim of photography as a media productive and constitutive of a universal language, through examining precisely how the image was constructed and interpreted as text.[118] In this way, this section will argue that photography articulated the same inscriptive discourse as that of typewriting.

Étienne-Jules Marey's Graphical Abstractions

The nineteenth century French physiologist Étienne-Jules Marey (1830-1904) began his photographic work as part of his medical practice, experimenting on bodies in motion. With a propensity for engineering and the technical, and pressed by his parents into the medical profession, historian of photography Marta Braun has argued that the newly emerging field of physiology was perfect for Marey's interests, training and skills (Braun 1992, 3). After completing his medical studies at the Paris Faculté de Médécine in 1859, with a thesis on the circulation of blood (revealing his mechanistic approach to the human body) and following a short term as an intern at the Hôpital Cochin, Marey spent the next nine years experimenting with physiological recordings in his living quarters/laboratory.[119]

Marey began his physiological investigations almost immediately after his medical studies, with an attempt to draw out the hidden movements of the body through the invention of a variety of physiology machines. In devising machines that would make visible the internal movement of bodies, Marey established two different technological functions of any possible machines, fusing them into one device. The first function was to capture the movement of the body under examination, to extract the information from the body; the second function was the inscription of the movement into material form, to inscribe this extracted movement. Driven by a desire to 'capture' the movement of birds, one of Marey's first machines was tied onto a bird's body and then connected to an inscription device that performed out the movement into graphic form (Figures 2.30-2.33). It was from this inscriptive form that Marey saw he could read the

[118] Allan Sekula argues that the claim of photography as a 'universal language', which has been prominent in writings about photography since its inception in 1839, is so ubiquitous as to be a cliché. However he goes on to situate photography amongst the array of pictorial representations, rather than also including, or concentrating on, the change in language and writing representation and thereby dismisses the claim, writing that the "'laws" that are "special" to photography turn out to be those of chemistry and optics' (Sekula 1981, 16, 18). For the development of language, specifically universal languages, and writing representation in the late nineteenth century, see section 2.4, 'Writing States: The Late Nineteenth Century Reconstruction of Babel.'

[119] Marey's work on the circulation of blood can be tied to the failed attempt by Vaucanson to build an automaton of human form with circulating blood, through the use of rubber tubing. For more on Vaucanson, see section 1.1, 'Copying Bodies (Sometimes Writing).'

movement of bodies; and he called this process chronography, or time-writing (Figure 2.34). From these early experiments, Marey extended these devices' application to other physiological features of other moving bodies, devising other forms of physiological machines. These devices include the sphygmograph for measuring the pulse, first presented to the Société de Biologie in 1859, and described by a contemporary reviewer as "an exquisitely designed instrument, by the aid of which the pulse is armed with a pen, and at every beat writes its own diagram, and registers its own characters" (Figure 2.35); the cardiograph for measuring heart movements (Figure 2.36); and the polygraph for the synchronous measurement of heart and lungs (Figure 2.37) (The Lancet, November 1865; Quoted in Frank 1988, 211-212). And yet even with his technological and engineering skill, Marey was perpetually faced with the central problem in capturing movement; the interference of the movement Marey was attempting to capture by the inscription part of the machines. Yet in attempting to capture the movement of animate life, Marey was clear that his drive towards instruments, and a form of instrumentality, was not to supplement to the senses in their apprehension of the world, but was to construct 'new sensory modalities', as he made explicit in contrasting the failing human body with his newly invented machines,

> Not only are these instruments destined to take the place now and then of the observer, and in these circumstances to acquit themselves of their role with an incontestable superiority; but they also have their own domain where nothing can replace them. When the eye ceases to see, the ear to hear, touch to feel, or indeed when our senses give deceptive appearances, these instruments are like new senses of astonishing precision. (Marey 1878, 108)[120]

Therefore, in attempting to solve this problem, Marey needed to use a methodology of inscription in which there would be a (assumed) lack of human sense mediation between the observed phenomenon and its record; as historian and philosopher of science John Douard argues "What Marey added to the history of graphics were mechanical devices that could capture movement directly, rather than representing information *about* movement contained in verbal descriptions or tables of numbers" (Douard 1995, 179). And yet while all Marey's instruments were inscription devices, even if the modality of inscription was graphical line rather than written word or number, both the inscription and the movement impinged upon one another.[121] Braun's analysis of Marey's graphical method demonstrates how Marey was attempting to 'write' down the body through representational inscription; for,

> The lines that undulated without interruption across a piece of smoke-blackened paper were a kind of writing whose language, as Marey put it, was that of life itself. From this

[120] The phrase 'new sensory modalities' (Douard 1995, 176) draws on the work of visual culture theorists Lisa Cartwright and Jonathan Crary in establishing that the invention of particular visual technologies as not supplementing vision, but rather providing new ways of seeing (Cartwright 1992; Crary 1992; and Crary 2001). Such examples of these technologies include the telescope and microscope, which do not behave prosthetically–there is not a one-to-one correspondence between the technology of the instrument and that sense of the body. Douard describes these new sensory modalities through machines "that involved not simply extending the senses, but creating new, artificial senses that also eliminated contingent properties of processes from the display" (Douard 1995, 180).

[121] In some of his early experiments on the movement of horses, Marey fixed pneumatic devices to the bottom of the horse's hoofs, which triggered an inscription device. Marey himself noted how the form of the writing of the human horse in motion resembled musical notation (Douard 1995, 184-185). For more on the relationship between mechanised writing and music, see Chapter 1, 'Copying Hands, Copying Bodies, for a discussion of eighteenth century automata of music and writing; and see Chapter 3, 'Sinister Bodies, Dexterous Hands', for an argument that the typewriter and typewriting was a remediation of the piano and piano playing.

> writing he could make interpretations and he could measure; he could calculate the force of the movement and the work expended in executing it. Each surge, squiggle, and loop he deciphered like an 'archaeologist ... deciphering inscriptions traced in an unknown language, ... [who tried], turn by turn, several different meanings for each sign'. (Braun 1992, 61-2)

However Marey wanted to purify his methodology so that it was not a translation of physical movement into graphical representation; the inherent weakness in his chronography was that there was a limitation in the graphical notation as it caught only the particularities, not the totality, of movement.[122] For Marey, written and spoken language failed as the language of scientific description, because writing reveals "the defectiveness of our senses for discovering truths, and secondly the inadequacies of language for expressing and transmitting the truths that we have acquired" (Marey 1878, quoted in Frank 1988, 218). In its place Marey argued for graphical notation as the 'correct' language of scientific discourse; for,

> ... it is not doubtful that the graphic form of expression will not soon substitute itself for all other, each time it acts to define a movement or a change of state, in a word a phenomenon of a sort. (Marey 1878, iii)

The inscriptive capabilities of Marey's methodology were fundamental to a new representational strategy that can be considered to underlie modern capitalism, as,

> For Marey, the condition for the possibility of the graphic method as a simple, clear, and universal medium of scientific exchange derived not just from its logical clarity but also from its capacity to inscribe, and thereby represent, mechanical work, or energy. (Brain 2002, 157)

And yet Marey's machines of the graphical method could never 'capture' movement directly, could not directly apprehend the world, due to the inherent ontological contradiction between reality and representation; movement is a property not just of space, but also of time, and in being 'caught' by an inscription device, it is only ever re-presented, a re-enactment, as it writes of a time already past.[123] Additionally, in these machines' attempts to capture movement, the moving body is decontextualized, and by its capture in graphical form, the movement is abstracted from its embedded worldliness. Therefore, in recognition of this problem, Marey pursued a still 'purer' form of recording, one that would detach further the observation from the observed, to make the movement more transparent for the observer to read. As philosopher and physiologist François Dagognet has noted, Marey's problem was "how to go on improving methods of capturing and translating phenomena in a web of inscription, where it became first visible, and then readable" (Dagognet 1987, 43). For the solution, Marey returned to the movement of birds, almost a paradigm of motion problems because of their movement within

[122] Douard contrasts the assumption of movement between Marey and Henri Bergson, noting that whereas the latter believed in continuity, writing that "The moving body is never really in any of the points [or positions of the moving body]; the most we can say is that it passes through them", the former believed in discrete moments, with the belief that "movement, like complex objects, is composed of discriminable fragments" (Douard 1995, 195-196).
[123] Douard quotes Henri Bergson and goes on to argue that with Marey's photographic experiments, "chronophotography produces the illusion [of reality] precisely because it simulates the mechanism of the eye. The illusion is not continuity, but the visual representation of time as separated into distinct phases. This is time spatialized" (Douard 1995, 195).

three-dimensional space. However in trying to find an answer to his inscriptive issues through the problem of the motion of birds in flight, he did not arrive at the answer through rational and measured reflection; rather the solution came to him in a dream–he would shoot the movement and 'capture' the movement of the bird with a photographic gun, or *fusil photographique* (Figure 2.38).[124] Through the use of the gun, Marey was capturing his prey in another manner; although not literally killing his object of study, Marey was fixing it in a moment, or series of moments, of time.[125]

The success of Marey's *fusil photographique* in capturing the movement of bodies led to his shift from a 'pure' graphical method to a photographic one–from 'time writing' (chronography) to 'light time writing' (chronophotography)–in a medium move argued as being an expansion, rather than an abandonment of the graphical method (Braun 1992, 47).[126] Having seen (printed) reproductions of Eadweard Muybridge's horse photographs in *La Nature* in 1878, Marey set to work in a task of technical imitation, although with different intentions, techniques and technologies.[127] His photographic work was later assisted by the establishment of a Physiological Station, financed by the Ministry of Public Education and the city of Paris, to which Marey was appointed as director (Figures 2.40 and 2.41).[128] The Physiological Station was intended to be the scientific laboratory of the discipline of physiology that would provide the theory with which the State could improve the body of French citizen–at a time when the discourse of degeneration was prominent–through physical education training, to be carried out in schools and the army. However between 1878 and 1882, Marey conducted his experiments in whichever space was available, including the École de Joinville, the physical training centre for military gymnasts and athletes; with the Physiology Station, Marey, with his assistant Georges Demeny (1850-1918), an ardent proponent of gymnastics and arguably more interested in the

[124] While Marey's inspiration to use a gun to create photographic images of bodies in movement came to him through a dream, the photographic gun already existed in the form of astronomer Pierre-César Jules Janssen's 'photographic revolver', used to photograph another type of moving bodies, planets. In materialising his dream, Marey adapted Janssen's revolver so that it could photograph the moving human body at a faster rate than the 1.5 seconds Janssen had achieved. For more on Janssen's work, see Janssen 1873; and Janssen 1874. Fire arms technology appears throughout the history of writing, including the aforementioned involvement of the Galton family in Birmingham as arms manufacturers, and the Sholes & Glidden Type-Writer being developed and manufactured by the arms manufacturer Remington & Sons, whose workmen used the same tools and techniques to make writing machines that they had used to make guns for the American Civil War.

[125] Sekula contrasts the photographic work of scientists with that of technicians, to show how this fed into the construction of the criminal body of late-nineteenth century, writing:

> Thus the would-be scientists of crime sought a knowledge and mastery of an elusive "criminal type." And the "technicians" of crime sought knowledge and mastery of individual criminals. Herein lies a terminological distinction and a division of labor, between "criminology" and "criminalistics." Criminology hunted "the" criminal body. Criminalistics hunted "this" or "that" criminal body. (Sekula 1986, 18)

What is interesting to note is Sekula's use of metaphor 'hunt' in this extract, which taken in conjunction with Marey's dream of a photographic gun, and the common parlance of a camera shot, tie bodies, media and machines in the late nineteenth century into a discourse of hunting and shooting, of capture and killing. Marey later developed his *Fusil Photographique* into a single-shot photographic gun, *fusil à munition*. (Fig. 47)

[126] Braun records that the term chronophotography was fixed as the name of this photographic process at the International Congress of Photography in 1889, at the urging of Marey, but confirmed through a commission led by Janssen (Braun 1992, 66, f.n. 46).

[127] Another chronophotographer of the era, who also made use of the grid and was in photographic conversation with Marey was Eadweard Muybridge. Held as the paradigmatic nineteenth century photographer of the body, Muybridge developed his chronophotographic systems for taking images of a horse running, under the commission of Leland Stanford, the wealthy Californian governor who ran a number of racing stables, to improve Stanford's success on the racecourse. Crucial to understanding how revolutionary Muybridge's work was is its relationship to time. For what chronophotography did was to shatter the continuum of time, to break the continuum into moments, moments that were allegedly equidistant from each other, in order to map out movement as a series of discrete steps. However, certainly in the horse photographs, the time gap between images was not uniform; by having a camera break a wire to trigger a camera shot, the horse's movement itself dictated the time interval. This, in combination with his use of multiple cameras, meant that his work was not 'scientific', as "his subjects were not photographed from a constant perspective or from a single point of view" and so was viewed as having "failed to represent the trajectory of movement" (Braun 1992, 53).

[128] On the site of Marey's Physiological Institution now stands Roland-Garros Tennis Stadium.

practical application of Marey's work than Marey himself, was able to develop ideas, techniques and technologies of capturing movement within a dedicated space.[129]

To understand how Marey 'wrote' the body, it is necessary to understand Marey's specific photographic methodology–how he fractured the body, and then how that fracturing became representation. Firstly Marey fractured the continuous into the discrete, capturing the body at an instant or, more often, across a selection of instants of time–an essential feature of the chronophotography method. Secondly, Marey captured the serial images of the body not as a series of individual shots, as Muybridge's photographic work did, but in one frame, as a single image.[130] Therefore Marey's photographic method resulted in a fracturing that was at one and the same time a compression of fragmented representations of the body into one visual field, rather than the production of a series of cells, cells in which Eadweard Muybridge placed the captured body in movement. Thirdly, Marey worked to refine his photographic methodology at the Physiological Station, in order to focus more singularly on the body as fragment. Marey began his experiments at the Physiological Station in 1882 photographing men dressed head to toe in white clothing on a black velvet background (Figure 2.42). In 1883 Marey pursued greater legibility in the images he produced, almost inverting–or, perhaps more accurately, purifying–the representations his methods produced. To achieve greater legibility, Marey changed the dress of the model bodies from white to black, covering his models in a tight-fitting black body suit, covering the feet and head, with 'shiny' buttons sewn onto the various profile joint locations (e.g. elbow, knee), between which were placed 'metal bands' (Figure 2.43). Marey then photographed the moving body in profile, thus capturing the movement of the individual segments of the body marked–the head, the arm, the leg (Figures 2.44, 2.45 and 2.46). In moving from photographing white bodies to black bodies with highlights, Marey collapsed the body further. A process that had begun with the collapse of the three-dimensional form of the body to the two dimensional plane through photography became reduced to the one-dimensional, to the dimension of the line and point.[131] In reducing the body in movement to

[129] The Physiological Station was attached to Marey's Chair in Physiology at the Collège de France. When the initial proposal for the Station had been submitted, the plot where the Eiffel Tower now stands was originally proposed, as it belonged to the Ministry of War, one of the state departments interested in and supportive of Marey's work (Braun 1992, 70-71).

[130] This methodological differentiation demonstrates how the differing intentions of Marey and Muybridge bleed into the construction of images themselves. For Muybridge was a technical and spectacular photographer rather than a scientist like Marey, who was using photography as a technique for the production of scientific evidence. While Muybridge was eager for his work to be used as foundational to aesthetic practices, whether high (as in archives and templates for painters and sculptors) or low (as adapted into zoetropes for mass entertainment and spectacle), Marey was not interested in these application of his work, but rather in its pure abstraction: he was interested in photography as theory.

There are other notable distinctions between the work of Muybridge and Marey. Firstly, in his pursuit of the aesthetic, Muybridge used his chronophotographic technique for "narrative representation" rather than to provide a methodology for analysing the abstract human form. Muybridge displayed those elements of life which Braun notes as being invisible to the human eye, not because of the failure of the human body, but rather because of "social conventions and morality dictated that they remain concealed except in the imaginative world of private fantasy" (Braun 1992, 249). Secondly Muybridge took chronophotographs in the round, using two or three cameras to shoot the movement from a variety of different angles at the same time, to provide the full perspective of the 'scene'. By shooting the image in the round, he was also presenting the human body theatrically. Pursuing the vein of narrative representation which provides a framework for understanding Muybridge's life and work, what also marks him apart from Marey was his role as editor–he often removed frames, or replaced them with earlier prints in the time sequence. Muybridge was a photographic storyteller; Marey was a photographic writer. However the central tenets of chronophotography remain clear in Muybridge's work, as they do in Marey, even if they are more loosely applied: the fragmentation of time and space through multiple singular exposures, and the use of a grid, dimensionally marked to read the movement of the body through. Yet as narrative, they do not present the fragment, the abstracted part, so much as the whole, the contextualised, and oftentimes eroticized, entity. For more on Muybridge, see Solnit 2003; Prodger 2003; Herbert 2004; Clegg 2007.

[131] Braun calls Marey's method a "denuding" of "the body of its flesh and volume" (Braun 1992, 81). When Marey photographed moving blacked out bodies against a black background, the resultant images were, like the profile drawings that appear in Lavater's *Essays on Physiognomy*, the reduction of the body of points and lines; and like the silhouette, Lavater's preferred document for physiognomic reading, Marey's chronophotographic images provided a form into which the viewer of the image could create the fully fleshed three-dimensional form in his mind.

line, Marey's photographic work can be understood as part of his graphical method for "the graphical method, which in reality was and is only a means of study, became, through Marey's scientific research, an end in itself" (Toulouse 1904). Finally, in reading the image, the eye switches between registers, from apprehending the totality of form of a single point in time, to reading the movement of a single section of form across the totality of time.[132] In the two dimensions of these images and the one dimension of the body, Marey laid a conceptual grid over moving bodies to form discrete, singular and abstracted fragments, which, through the proposed transparency of the medium, could be a synecdoche for the 'every body'.

Francis Galton's Composite Faces

Whilst Marey was producing photographs of the moving body as nodes and lines on a graph, Francis Galton produced a different type of photograph as part of his project to map the body. Stemming from, and subsequently forming a key strand of his work on anthropometry, Galton began his explorations into photography as a means of reproducing the individual for abstract study, advocating its ability to see what could not be measured, as it was a "great convenience ... in conveying those subtle yet clearly visible peculiarities of outline which almost elude measurement" (Galton 1877, 346). Galton understood the limitations of photography in its reduction of the three-dimensional to a two-dimensional representation, but suggested its use in anthropometry could be similar to the use of architectural sketches in the construction of buildings, in that it could produce multiple viewpoints, for,

> No single view can possibly exhibit the whole of a solid, but we require for that purpose views to be taken from three points at right angles to one another. Just as the architect requires to know the elevation, side view, and plan of a house, so the anthropologist ought to have the full face, profile, and view of the head from above of the individual whose features he is studying. (Galton 1877, 346)

By drawing upon the metaphor of the architectural practice, Galton was again mapping space onto the body, suggesting the nineteenth century anthropologist as an architect of 'The Body', explicitly noting that composite photography addressed the same concerns as an architect in drawing up plans for a house; for as he later notes,

> There are two, and only two, aspects that practically admit of strict definition. These are the perfect full face, looking straight in front at the camera, and the perfect profile (either right or left), also looking straight in front. They correspond to the elevation and side view of a house, and give hard and accurate physiognomical facts in a patent, outspoken manner, in a way that enables each portrait in a series to be studied on precisely equal terms with all the rest. (Galton 1882, 27)

The concept of the body as a constructed form in physical space and the image maker (in this case Galton) as the architect of the form appear again five years later in a suggestion to *Photographic News* (1887) for the mass production of commercial photographic portraits. His suggestion was to (re)produce the eighteenth-century fashion for silhouettes, utilising the photograph as the die stamp in a process to produce multiple copies of the form of the face, to

[132] The apprehension of the static vertical and the dynamic horizontal could be understood, at one and the same time, as a combination of line reading (as in everyday reading practice) and vertical reading (as in speed reading).

produce multiple prints of a profile from a photograph of an individual (Galton 1887). Galton's idea was to halt the photographic development process before the image became fixed to the surface and from the photograph's underdeveloped form, produce multiple images through the use of a lithographic surface. Aside from the production of multiple copies, a key stage in this multiple image process was to cut out the photographic profile from the total image with scissors, to create a definitive line of the face and so define the face by removing it from its context. In this method, Galton's process is similar to that used to create silhouettes, the paradigmatic document for physiognomic reading. Two weeks later, Galton followed up his article with a letter about his experiments on lithographic silhouette production, enclosing his own silhouette produced from his technique (Galton 1887). At the end of his letter, he notes that instead of black silhouettes, he used architectural paper to produce blue silhouettes.[133] Galton's use of the paper technology of architecture and engineering, the blue print, to multiply the human form expanded architectural space into the body, at the same time as it expanded the understanding of the body as structure (Galton 1887, 462). Thus the metaphor of architectural space became used as a methodology in Galton's analyses and mapping of the human body, much like his geographical metaphors of exploration and territory found their way into his anthropometric system.

However, Galton is better known for another photographic technique, one in which his work on mapping and typing bodies found its representational zenith: composite photography. Acknowledging the idea had arisen in conversation with the nineteenth century British psychologist Herbert Spencer, the concept of superimposing photographic images on top of one another allowed clear expression for Galton's purpose and intent for his work on mapping the human body; to "extract typical characteristics" (Galton 1878, 97). In this process of the extraction of identity, the technology and techniques Galton developed to create composite photographs drew through those technologies and techniques he used as an explorer and meteorologist, as he himself notes,

> It was while endeavouring to elicit the principal criminal types by methods of optical superimposition of the portraits, such as I had frequently employed with maps and meteorological traces, that the idea of composite figures first occurred to me. (Galton 1879, 133)

With this explanation of his technique, Galton's metaphorical use of architectural space and materials becomes further solidified as part of the argument towards Galton's mapping of bodies; for he is drawing on the techniques he used as a gentleman explorer and meteorologist, in his mapping of territory and weather patterns to map the territory and patterns of the human form.

In creating composite photography, Galton combined the central tenet of physiognomy, that character could be read from the face, with the technology of the camera to demonstrate in a technique through which there was an "apparent consistency with the empiricist assumptions and methodological procedures of naturalism," the presence of a physical essence (Green 1984, 3). However, composite photography was not just a technology to produce the ideal form of a particular groups of individuals, or ideal type as Galton called the "pictorial averages" (Galton

[133] Like Galton, Muybridge was engaged with landscape before turning his attention to bodies; Muybridge's early photographic work documented the American interior. Galton's use of architectural paper also echoes Muybridge's chronophotographic work, with his use of cyanotypes.

1882, 478); composite photography was another inscription method of the body, processing it through a technology and technique to produce a standardised form, just as Galton's anthropometric instruments and methodology had done through his Anthropometric Laboratory. Yet, in its technological processing, Galton recognised his method of composite portraiture as producing something of a figment, as it,

> ... enables us to obtain with mechanical precision a generalised picture; one that represents no man in particular, but portrays an imaginary figure, possessing the average features of any given group of men. (Galton 1878, 97)

With composite photography, Galton exposed faint images of individual photographic portraits onto a sensitised photographic plate, layering one face over another, and then another face, again and again, to find the face of, for example, a typical criminal (Figure 2.47).[134] In order to produce these ideal types of faces, Galton had to align the faces in some manner, to form at least one fixed point or feature on the face that would be the same across his sample. Galton answer was to construct a projecting and image-capturing device, a machine that could enlarge or reduce the size of the projected image so that all of images were approximately the same size (Figure 2.48). However this adjustment in size did not keep the ratio of the dimensions fixed; rather image width and image height could be manipulated independently (Figure 2.50). For in order to measure certain features, he decided to assume certain other fixed proportions of the face. In this assumption, he drew a cross, with lines marked at right angles to the two vertices, to mark points at which certain features of the face would have to appear (Figure 2.49). The first line, the horizontal was to be aligned with the centre of the two pupils; on this line, two small perpendiculars were marked, to be aligned with the centre of each pupil. The second line, the vertical, was to be aligned with the centre of the face; on this line, a perpendicular marked out the position of the mouth. Through this technique, Galton was standardising the distance between the eyes, the position of the mouth, and the relative spatial relation between the eyes and the mouth. Thus Galton was manipulating the dimensions of the faces in order to make them fit his schemata, to produce legible images.

To superimpose the images on top of one another accurately, Galton placed small pinholes in the corner of each image, so that the images could then be aligned up to produce a composite (Figures 2.52). This alignment technique, known as registration, was taken from the printing trade, with Galton using the printer's terminology of 'register marks' in his description of the methodology he used to 'write' these imaginary bodies, these stereotyped men and women (Galton 1878, 97).[135] Galton's technique of composite photography was one of distilling the 'noise' of individual and irregular features into a physiognomic interpretation, a photographic intent echoing Marey's purifying of the representation of the body to point and line. This distillation process was to discover a type of physical form, a set of identifiable particular features that would be the 'pure' expression of type amongst the noise of the society.

[134] Galton analysed his criminal bodies into three classes of recidivist: the murderer, the rapist and the robber (Galton 1877, 347).

[135] Galton describes the composite technique in detail, expanding on his use of a printing technique in his composition of ideal types to refer to the collection of images of individuals, from which he will distil the pictorial average, as a book,

> Holding it [the transparency of the individual] firmly in this position, I pressed a bar that carried two needle points done on the portrait; they pricked two holes, which afterwards served as "register-marks". After all the portraits had been similarly treated in turn, I strung them together like leaves in a book, by threads passing through the two holes; then they were ready to be operated on. (Galton 1881, 140)

Whilst Galton had begun his anthropometric studies in recording the bodies of "men who have been the glory of mankind," he developed his technique to analyse the bodies of criminals, those individuals Galton calls "mankind's disgrace" (Galton 1877, 346).[136] Explicit in his definition of criminals as forming a homogenous class, and of criminality as inheritable and therefore a biological rather than social category, Galton promoted his methodology to be the most appropriate to investigate what he calls "vicious traits," in order to stop these traits from becoming the norm so that "the normal characteristics of a healthy race, just as the sheep-dog, the retriever, the pointer, and the bull-dog have their several instincts" (Galton 1877, 346). To discover what these 'vicious traits' were, Galton worked with Sir Edmund Du Cane, the Surveyor-General of Prisons, who secured Galton access to British Home Office's photographic archive of criminals in British penal system, as well as access to the prisons themselves where Galton photographically recorded their inmates.

In a display of post-rationalisation, Galton notes that in familiarising himself with the photographic archive he had built up "certain natural classes began to appear" and that "three groups of criminals contributed in very different proportions to the different physiognomic classes" (Galton 1877, 347). These three groups were those who had committed murder, manslaughter, and burglary; those who were imprisoned for felony and forgery; and those who had committed sexual crimes. That these 'natural classes' of images adhered around 'natural classes' of crimes only re-enforced Galton's belief in the legibility of type–in this case criminal class–from an individual body. Pursuing his investigations into natural classes, or types, Galton quickly expanded his data set from the mere criminal to include photographs of Jewish men, women and children, and of asylum patients (although he later discarded these images as he could not 'get' meaningful composite images) (Figure 2.51).[137]

In moving from the anthropometric measurement of bodies to their photographic representation through composite portraiture, Galton was attempting to formalise physiognomy, drawing through a personalised intimate practice of reading the face into a scientific discourse, verifiable by the new 'passive' technology of photography (Green 1984, 4).[138] At the start of his experiments with photography, Galton advocated his technique for producing an average face of a particular type, not least because of photography's 'mechanical' process, noting in 1878 that,

> The special villainous irregularities in the latter [individual portrait] have disappeared and the common humanity that underlies them has prevailed. They represent, not the criminal, but the man who is liable to fall into crime. All composites are better looking

[136] Galton reports that Herbert Spencer had constructed a device to trace 'mechanically' the sections of the head on transparent paper, a device that seems to be a reconstruction of Hawkins' physiognotrace. However there is an important difference to be noted in the two techniques: Spencer's technique was to trace the head shapes onto paper, whilst Galton's was to capture the images through projected photographs onto light-sensitive paper (Galton 1878, 97).
[137] Working from the UCL Galton Papers catalogue, the groups Galton photographed included: Miscellaneous, including violent criminals (File Ref 158/2B); criminals (File Ref 158/2C); Bethlem Royal Hospital patients (File Ref 158/2D); Hanwell Asylum patients (File Ref 158/2E and F); Family Likenesses (File Ref 158/2G); American scientific men (File Ref 158/2H); Westminster schoolboys and Chatham privates (File Ref 158/2J); Millbank prisoners (File Ref 158/2K); The Jewish Type (File Ref 158/2L); Various, including criminals, and family, Tichborne (File Ref 158/2M); Baptist ministers, Greeks and Romans, Napoleon I, Queen Victoria and family (File Ref 158/2N); and Phthsis patients, criminals and skulls (File Ref 158/2P). Galton's photographs of Jewish men and women were taken through the Free School, in the East End of London. Images of phthisis patients (tuberculosis) were collected from the outpatients of Guy's, Brompton Consumptive Hospital and Victoria Park Hospital for Diseases of the Chest (Galton 1882, 28).
[138] In this attempt at formalisation, Galton promoted his new empirical technology in a presentation to the BAAS in 1881, as a process suited to anthropologists, in that it produced a "pictorial definition of races", in that it is ideal for producing the average face, in definite and definitive form (Galton 1881).

> than their components, because the averaged portrait of many persons is free from the irregularities that variously blemish the looks of each of them. (Galton 1878, 97-8)

However, during the 1880s, Galton's definition of the results of his composite portraiture process evolved from a "pictorial average", to an image that was "an aggregate of all its components, and a pictorial average of them" in 1885, and finally in 1888 came his rejection the composite portrait as a pictorial average, writing that "A composite portrait is not the *means* of its components, but an *aggregate* of it ..." (Galton 1888, 237).[139] Galton's rejection of composite portraiture as a pictorial average, as a mean, resulted from images being too blurred to produce legible types. However this supposed problem did not reside in human body but was the result of his technique. For the illegibility Galton found in his images was partly a necessary result of the process's alignment of the pupils and mouth of each individual portrait. It was acknowledged from the start of Galton's experimentation because, by aligning specific features, he was letting the outline of the face take care of itself; he was creating a "best fit" (Galton 1888).[140]

But in creating this 'best fit', in letting the outline of the faces take care of themselves, Galton created ghost images, a representation of his 'imaginary figure', noting that his method of composite photography was one of capturing ghosts, the ghost of the murderer, the ghost of the forger, the ghost of the rapist.[141] For as Galton writes, "The effect of composite portraiture is to bring into evidence all the traits in which there is agreement, and to leave but a ghost of a trace of individual peculiarities" (Galton 1883, 10). With these traces of individual peculiarities, in their undefined and blurred state, the composite portrait is a ghosted, haunted image, at one and the same time representing an individual, albeit manipulated, while at the same time obliterating him. The strength of this haunting was clearly felt by Galton in his later work, as he wrote that "These ghosts are often too conspicuous" (Galton 1888, 237).

However Galton was convinced of the validity of his photographic method, continuing his work on composite photography by continual experimentation in the creation of images, testing the portraits to try to 'pre-see' the human type. However, his technique required so much manipulation that Galton wished for a photographic technique whereby he could " ... judge of the effect of a photographic composite before making it" (Galton 1885, 244). To solve this problem, he constructed an expanded stereoscope that combined five or six separate images to produce one composite image. This device, that seems to have taken the form of a modified kaleidoscope, placed "a mosaic of pieces [portraits] cut in the form of equilateral triangles"; this

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[139] Galton continues,

> If it were a mean, its outlines would be sharp, but being an aggregate, they are not; only those shades or lines that are common to all the components are as intense, or as well defined, as they would be in an ordinary portrait, while ghosts and shades of other lines are distributed variously about. (Galton 1888)

The 'means' in this context refers not to the methodological sense of the word but its mathematical sense, as a statistical term for the average. However, the double reading of the sentence gives the sentence meant as an expression of mathematical definition an undercurrent of fixity and fluidity.

[140] Galton's photographic method involved substantial manipulation of the image, running contra to the supposed passivity and empirical nature of photography. In addition to manipulating the scale of the images, both horizontally and vertically, he also manipulated the symmetry of the face, writing that in his method each face that is asymmetrical should be straightened into a symmetrical one by "inclining the portrait to the optical axis of the camera [so] as to foreshorten the side that was too long" (Galton 1888). Finally, he manipulated the strength of the images; in his use of composite photography to prove (his) theory of heritability, he "assigned different 'weights' to the individual constituents of each composite portrait; thus each grandparent, uncle and aunt, brother or sister, and each parent would be given greater or lesser exposure in the final composite photograph" (Green 1984, 12).

[141] If Galton was pursuing his ends of find the average face of his data set, it would be more appropriate to argue that Galton was attempting to capture the ghost of the ideal murder, the ideal forger, the ideal rapist. However, if we take Galton as finding the aggregate face of his data set, as he argues for later in his writings, then it would be more appropriate to argue that he was attempting to capture the ghost of the typical murder, the typical forger, or the typical rapist. Therefore the difference between the average and the aggregate is a difference between the ideal and the typical.

mosaic was then fixed to the end of a small telescope around the diameter and leaning in to the centre of device (Figure 2.53) (Galton 1885, 244). Another method Galton experimented with in producing composite images was the further condensation of the human; he proposed and constructed images that overlaid composite image with composite image, producing what he called co-composites (Figure 2.54). Yet this was not the end of the matter, as he also saw this condensation as being able to be extended *ad infinitum*, producing co-co-composites, co-co-co-composites, etc.[142]

Whilst Galton was instrumental in producing a representation of the body as type through composite photography, he also produced composite photographic images of alphabetic forms, of type itself. For Galton applied his method of composite portraiture to crude cut-out letterforms of F and G, variously combining the positive and negative images of each letter to produce four slides (Figures 2.55–2.60) (Galton 1900). Although loosely catalogued in the UCL Galton Papers' archive, these six slides are part of Galton's experiments that appear in his article of 1900, variously titled 'Analytical Photography' or 'Analytical Portraiture', in which he proposes a photographic technique to isolate and expose difference, to isolate and expose uniqueness (Galton 1900). To produce his theory Galton experimented with both positive and negative images of letterforms, human faces and abstract shapes, projecting them to create a singular photographic image in which that which is unique stands isolated. In explaining his technique, Galton framed and expressed the problem of uniqueness mathematically (see, for example, Galton 1906). But in use of shapes, human faces, and most notably for this thesis, alphabetic letters, Galton was implicitly binding late nineteenth century facial analysis with writing, conceptually mapping face onto letter and vice versa, in their abstraction, whilst experimenting with the technique of superimposing, and with function of the alphabetic letter as image. Furthermore, Galton's experimentation was not unique; for his work seems to mirror that of Marey, who similarly experimented with positive and negative images of the human form, creating two types of image through the clothing of his subjects and the dressing of the stage. And in their experimentation, both men can be seen as working to produce legible images of the body in the late nineteenth century.

Alphonse Bertillon's Mugshots

In anthropometric conversation with Galton, Alphonse Bertillon also exploited photography in the work of his criminal archive. In this turn towards incorporating the photographic image within textual description, Bertillon was leveraging the 'truth' content of the photographic image, as a means for capturing his subjects, a truth he believed could not be found in natural language but only in visual representation,

> The nose affords us an analogous illustration in the matter of shape. Common language tells us of a turned up or pug nose, of an aquiline or hooked nose, but it would be incapable of furnishing us with expressions for the multitude of noses which are neither distinctly turned up nor distinctly aquiline. We might multiply these examples, which would all tend to prove that the public does not seek to describe but merely to depict, which is not the same thing, by means of a comparison or an image, those shapes that strike it, that is to say, the exceptional shapes. (Bertillon and McClaughry 1896, 34)

[142] In producing these co-composites, Galton sometimes combined as many as 200 separate images, each one manipulated for a "best fit" into an individual image (Green 1984, 12).

Even though Bertillon marked the distinction between description and depiction, his textual system of bodily measurement can be argued to be visual representation because of its standardised and abstracted formulation, with his biographer noting that "These measurements, reduced to formulae, could be recorded upon a form which was really significant, because it was the essential portrait of the person described and none other" (Rhodes 1956, 75).[143] The probability of Bertillon's system of eleven separate measurements had a probability of producing two individuals with the same measurements was 1 to 177,147 (3^{11}). Whilst this statistic might suggest precision in the identification system, there was still substantial room for error, not least due to errors in measurement; for this reason Bertillon realised he needed another data stream in which identity could be situated, and for this he turned to another technology of (supposed) mechanical objectivity, photography.

Bertillon's initial experiments with photography to capture identity reveal that although he was relying on 'truth' of the technology, photographic practice revealed to him the ways in which it could produce an individual and more importantly, ambiguous image, rather than the standardised form he sought. Bertillon himself referred to the 'uselessness' of the photograph for detecting criminals, being only useful "for confirming a suspected identity" (Bertillon and McClaughry 1896, 4). The problem of the photographic signal was that, as Bertillon noted, it could not, by itself, be archived. The two Bertillon cards in the UCL Galton Collection evidence how that the ideal way to photograph the body for making legible its identity was by no means certain. These cards in the name of Georges Desire Henri Pimpeterre–previously examined above–date from the first months of the Photographic Unit of Bertillon's Department of Judicial Identity, and include photographs of a man located in the section of the card that would normally display an individual's descriptive measurements (Figures 2.25 and 2.27).[144] Although part of the data snapshot has been replaced with a pictorial snapshot, the snapshot on these cards shows Pimpeterre in variety of poses; unlike later Bertillon cards, these are not the mugshots Bertillon would use as his standard method of image capture but rather they show an individual casually sitting on a chair, legs crossed, face three-quarter turned to the camera. Wearing what would seem to be a prison or asylum uniform, Pimpeterre is at once shown as casually seated, with the buttons of his jacket undone as he leans back in the chair, a photographic style more in-line with artistic portraiture than that which would be expected for scientific analysis.

Evidently Bertillon's forays into replacing textual description with image led him to standardise and systematize the photographic process. He did this through not just the attitude of the individual, but also with the lighting and with the stage setting in which the subject was placed (Figure 2.61).[145] In his technical instructions for Judicial Photography, Bertillon instructs the reader that the subject should be photographed in full-face and in profile, under four separate conditions: of light, of reduction, of pose, and of mounting. He instructs the photographic operator on lighting conditions, on the distance between the subject and the

[143] The parts of the body which Bertillon measured were those "which could most easily be measured accurately" and included the "length and breadth of the head, and of the right ear, the length from the elbow to the end of the middle finger, that of the middle and ring fingers themselves, the length of the left foot, the height, the length of the trunk ... and that of the outstretched arms from middle to middle finger-end" (Rhodes 1956, 81-2). Notable in this group of measurements is that the concentration was on the left hand side of the body for those parts of the bodies 'used' the most, the arm, the hand and the foot. However in the focus on the least used body sections, Bertillon was expressly focussing on the fact that the majority of the population were (are) right handed.

[144] The descriptive measurements section has been removed and the notes section for unique characteristics and marks has moved to the front of the card. It was in this remaining space that a double photograph of the individual appears.

[145] Rhodes earlier claims that "No one in the history of photography did more to destroy the fallacy that the camera never lies than Bertillon" (Rhodes 1956, 103).

camera, on which part of the face to focus the lens on when taking the photographs and on the ways in which the subject should be presented to the camera (Bertillon 1896, 239-240).[146] Yet he is also keen to maintain the integrity of the process, telling his readers firmly "no retouching" (Bertillon 1896, 242).

Bertillon's turn from the early photographic experiments towards standardisation, towards the mugshot, was an attempt to ensure greater legibility in photographic representation. This move towards standardisation was for purposes of identification, in response to Bertillon's understanding of photographic images' ever potential ambiguity in their re-presentation of the "truth." In his battle against ambiguity, Bertillon was attempting to make the photographic image more transparent, so that a photograph of an individual criminal taken face on and in profile would expose the face as largely as possible to being read, because it allowed for "the design of face and features [to be] accurately described" by the image (Rhodes 1956, 83). By establishing this form of image, one analysis of why it was that profile photographs were taken was that expression, the form of the face in an emotional state, was "neutralized", so that physiognomy was foregrounded and pathognomy slipped into the background (Rhodes 1956, 106).

Although photography could not form an archival category on its own terms, the value of photography lied in its ability to be a standardised document through which a standardised description of an individual could be articulated–albeit a process of articulation available only to those possessed of the 'correct' technique of reading the image. For, Bertillon notes,

> It has long been said that we really think only what we are able to express in words. It is the same way with *visual memory*; we can behold in thought only what we are able to describe. The detective charged with so difficult a mission as the discovery and arrest of a criminal by means of a photograph should be able to analyse and describe from memory the face of him whom he is pursuing, to make of him, in others words, a kind of verbal portrait. (Bertillon 1896, 4-5)

As his work on photography, identity and notation continued, Bertillon became more precise about the ways in which photography could act, as a form which could be translated by the 'officer' into text as portraits *parlés*, with Bertillon writing on judicial photography and the translation process that,

> We give the name of *verbal portrait* to the minute description of an individual made especially with a view to seeking and identifying him on the public street. The officer should be able to repeat this particular signalement on the spur of the moment and without hesitation; hence its name of verbal portrait. And yet that of *written portrait* would suit it quite as well, since, before being learned by heart, it ought to be drawn up with the mind in repose and committed to writing. (Bertillon 1896, 250)

[146] For full face shots, the light "should come from the left of the subject, the right side remaining in comparative shadow"; for profile, the light "should fall perpendicularly upon the subject's face". For camera distance, "a length of 28 centimetres passing vertically through the external angle of the left eye of the subject to be photographed gives on the plate an image reduced to 4 centimetres, with a millimetre more or less". With regard to the focus, "the external angle of the left eye that the apparatus should be focused for the full-face photograph; while for the profile photograph the external angle of the right eye is taken, these two parts corresponding respectively to the most illuminated median position of each pose." On how to fix the camera and subject "it will be sufficient to fix once and for all on the floor of the studio two small cleats, which will allow the chair and camera to be replaced immediately in their respective positions" (Bertillon 1896, 239-240).

Bertillon segmented the body's attitudes further, to produce individual fragments of the body for examination, such as 'half the profile, the forehead alone, the forehead including the eyes, the ears, the eyes alone, and the nose alone' and then to organise a number of different individuals' sections into a board to 'show comparison and contrast' (Figures 2.62 and 2.63). In this way, the body became read, it became broken down into parts, that in their fragmented and defined forms were comparable to an alphabet; this alphabet was then used to train policemen to read faces, by reference to their memory of the fragmented and defined features (Figure 2.64).

Conclusion: A Multitude of Photographic Moments and Intents

In the late nineteenth century, French physiologist Étienne-Jules Marey, British gentleman amateur-scientist Francis Galton, and French police administrator Alphonse Bertillon all used photography to describe the human body. However, each used photography in subtly different ways. For Marey, photography was a method for exposing the invisible, the movement of bodies in motion, and thus offered new ways of seeing and being seen. For Galton, photography was able to capture the physical essence of a group of individuals, an inheritable pathognomic trace. For Bertillon, photography was one signal in a network of signals, to identify–or rather, to confirm the identity of–an individual body within the social body, as well as to be the 'objective' image through which a standardised description could be made.

For Marey, photography was an extension of his graphical method, a technique to capture the movement of the body in two-dimensional form, to abstract the movement of body by fracturing time, and distilling movement from continuity to a line. The value of photography was that it was a recording of the body that did not 'touch' what it was measuring, so reducing, to Marey's belief, the interference of the observer with what was being observed; it was a drive towards a purity of writing the body, in the production of "mechanically produced graphic maps of the body" (Douard 1995, 183). Whilst Galton decided to use full face and profile images as a method for standardising the human face, his decision to do so was to produce equivalences between the human bodies in his archive. However Bertillon's use of the same method for photographing the human face was in order to see individuality, to see irregularities and peculiarities. Bertillon standardised to see the individual, Galton to see the typical. Each was typing their faces to see the visual extreme, the particular and the generalised.

And yet what each man was doing was establishing the fragment of body as representative of the whole, as being able to articulate for the entire body, as being able to be 'read' for the whole body; it was built on the supposed 'truth' of photography. And in its supposed truth, photography became a way to capture, contain and identify the individual, thereby establishing the truth of the bodily fragment. Furthermore, each man was using photography as a form of writing, one that would make visible and thus transparent that which remained opaque. For Marey photography was a method in which a new language could be constructed, one which 'solved' the problems of natural language in scientific discourse; for Galton, photography was a technology that which could be used as a form of printing, to find the alphabet of the human race; whilst for Bertillon, photography was the signal of identification, the mark of the identifiable individual, the body's most visually verifiable signature, situated alongside its bodily measurements and its biography.

2.4 Writing States: The Late Nineteenth Century Reconstruction of Babel

Following this account of how bodies were typed through technologies and techniques of visual representation, this section explores the reverse relationship: how type was embodied. Drawing through Bertillon's work on the body fragment as the synecdoche of the body, in the form of large posters of a multitude of ears, eyes, and noses, through to his subsequent work on handwriting, and the practice for handwriting analysis in the late nineteenth century, both as evidential (as in a new form of expert knowledge in the law) and as psychological (as in the new science of graphology), this section produces an understanding of how the hand became the tool of the unconscious, a unique unconscious, and in its craft, how the unconscious became legible through an individual's writing. As handwriting became psychologically legible, so the analytical eye claimed to have been trained to demonstrate that which was already there; the analytical eye was a tool for the demonstration of transparency in the written language. In examining the notion of language transparency this section then explores the explosion of International Auxiliary Languages (IAL) in the last quarter of the nineteenth century, to show how elements common to the material form of language also resided in its conceptual content. Through the work of one of the leading proponents of a specific IAL, Pastor Rasmus Malling-Hansen's work on Volapük, this section will contend that the linguistic drive of IAL was also reflected in its material form, through arguing that Malling-Hansen's drive towards language transparency as a dedicated Volapykist went hand-in-hand with his invention of the Writing Ball, one of the first commercially successful typewriters.

Detecting Writing, Characterising Handwriting

In 1894, Bertillon extended his system of analysing human bodies onto handwriting, as an expert witness in the notorious Dreyfus Affair. Testifying on the authorship of a traitorous memo at two courts-martial of Alfred Dreyfus in 1894 and 1899, Bertillon's testimony for the prosecution was called on to position against the handwriting expert for the defence, M. Gobert, a clerk from the Bank of France.[147] Called to testify because of his status as a scientist and his analytical practice of identification–although it has also been claimed he was also called because of his Anti-Semitism–Bertillon used his methodology of the comparative chart, previously used for noses, ears, and eyes, for handwritten letters of the alphabet (Derfler 2002, 78). Used to express the different types of body parts in order to train police officers in Bertillon's analytic method, these comparative charts were constructed around one individual feature of the body, such as the nose, and comprise a large number of different images of that feature, arranged serially, in a grid structure. Bertillon adapted his comparative charts, substituting the bodily feature for a feature of handwriting, identifying and isolating a particular element of a handwritten letterform, and then arranging them serially, and in a grid, for comparative analysis (for some of the analytic work Bertillon performed on the bordereau at the centre of the Dreyfus Affair, see Figures 2.65 and 2.66). Just as Bertillon's work on archiving the body was not to analyse the types of bodily forms but rather for identification, so Bertillon's work on handwriting was to identify an individual from the mass, to identify the author of a disputed sample of writing (Rhodes 1956, 128).

[147] The etymology of the word "testify" seems to be rooted in the same branch as testes, the implication being that any witness was required to have testicles in order to be allowed to take part in a legal case, as S. Levin notes "In Roman times a pair of testes (witness to virility; Latin) qualified one – as it did not a eunuch – to testify, give testimony, provide a testament, in court. Among the Hebrews an oath could be taken while grasping the testes, a rite translated as placing one's hand under the thigh. (Re Abraham, Genesis 24:2; re Jacob, Genesis 47:29)" (Levin 1997, 13).

Whilst handwriting in the late nineteenth century became, like the fragment of the body, the identifier of identity, used to detect the individual within the social body, Bertillon was somewhat late in turning to handwriting in his detecting method. Handwriting experts had been working in America since at least the 1860s and although their techniques of analysis were often somewhat suspect, it was their claim as experts that saw them frequently testifying in legal cases involving handwriting (Mnookin 2001, 1786-1787).[148] Nineteenth century handwriting experts came from two separate practices: one practice was that of handwriting teachers and penmanship experts, such as Daniel Ames, a New York based penman and typography designer; the other practice was that of scientists, such as Dr. Persifor Frazer, a professor of chemistry and geology at the University of Pennsylvania, the chemist David Cavalho or the physician Richard Upton Piper. Whilst handwriting teachers and penmanship experts, such as Ames, were frequently called as experts in identifying handwriting samples, it was the latter group, the scientifically trained individuals, who prevailed as experts in the field, due to their rhetoric of scientific discourse and their (alleged) superior training in analytic methodologies (Mnookin 2001, 1785-1788).[149] However the claim for expertise came not just from their analytical superiority, but also from their ability to demonstrate their analysis–like physiognomy, handwriting identification expertise was premised on high analytic skills combined with the ability to translate (and therefore communicate) their analysis into 'natural' language (Mnookin 2001, 1788).[150]

The use of the analytic method by nineteenth century handwriting experts echoes Galton's work on composite photography, an echo that is in fact a thread–for following the publication of Galton's technique of composite photography in the journal *Science* in 1888, Dr. Frazer used the composite method as a technique for testing the validity of the handwriting in a probate dispute for the Orphans Court (Frazer 1886).[151] In overlaying specimens of signatures taken from suspect cheques, Dr. Frazer attempted to ascertain the authenticity of the handwritten signature, and thereby the authenticity of the hand (for an example of the application of this method, see Figure 2.67). Furthermore, one strand of Galton's work on composite photography became central to Dr. Frazer's work, that of 'Analytical Photography.' Galton's technique of establishing degrees and directions of resemblance between two inscriptive marks–whether they be abstract shapes, alphabetic symbols or photographic representations–was seized upon by Dr. Frazer as a method to discriminate between handwriting samples, so that "a numerical expression of each characteristic near to the ideal which the writer always strove without success to attain" (Frazer quoted in Mnookin 2001, 1792; Galton 1900; Galton 1900; and Galton 1906). Dr. Frazer, like Galton, understood the technique as not revelatory, in that it produced the true mark of identity, but that it produced the idealised, possibly unattainable, signature, one that could only be approached but never reached,

[148] In 1859, handwriting experts were the 'exception rather than the rule,' citing the example of the famous Barrel Mystery of Chicago, in 1859. This mystery began with the discovery of chopped up body of Sophie Werner in a barrel, intended for a fictitious address in New York. Subsequently her lover, Henry Jumpertz, was arrested, tried and convicted of her murder, only to have his conviction then quashed. The case revolved around the authenticity of a letter allegedly from Werner, in the possession of Jumpertz, which he claimed demonstrated her suicidal tendencies. Mnookin notes an 'expert' was called to testify as to the authenticity of the hand (Mnookin 2001, 1748-1751).

[149] Daniel Ames estimated that he testified in over 1,800 cases of handwriting disputes from between 1860 and 1900 (Ames 1901, 119).

[150] For more on nineteenth century handwriting analysis see Piper 1879; Piper 1882; Frazer 1894; and Ames 1901.

[151] Dr. Frazer was investigating the accounts of Samuel Clerk Jr., the administrator of the estate of his father, a mill owner

> Upon the principles in ordinary use in determining weight or observation in physical science, I should suppose that the accuracy of this "standard" would be proportional to the square root of the number of signatures use in forming it. Thus, if twenty-five signatures are used in composing the "standard", the result would be five times as accurate or five times nearer the ideal signature, than any individual signature. (UCL Special Collections)[152]

In establishing a scientific methodology of resemblance, Frazer raised the status of handwriting to that of the body, as an individual marker of identity, both of which were to be approached through an analytical methodology, and both of which were fundamental practices to be used in the legal system for ascertaining innocence or guilt.

At the same time, handwriting was used as evidence of a subtly different sort. For whilst handwriting in the late nineteenth century became evidence of an individual identity, it also became, in another sense, an expression of individual identity that was able to stand by itself, to be read for character analysis. Although the link between handwriting and character began in the seventeenth century, increasing literacy in the eighteenth and nineteenth century led to an increased interest in how the form of the handwriting might reflect the character of the writer (Gaur 1992, 159-160). However until 1872, the reading of handwriting for character was led by paradigm of eminence, and practised as a form of divination: early graphology books were collections of handwriting samples (supposedly) from eminent individuals, those held as exemplary of character and virtue.[153] As discussed in the previous chapter, to have a 'good hand' was essential for those (men) wishing to secure positions in business houses, the legal profession and government offices, as it spoke of the individual writer's 'good character' and, by reflection, the 'good character' of their employer. By the nineteenth century, industrialising Western economies saw an exponential increase in the demand for a 'good hand' that was paralleled by an exponential increase in the popularity of handwriting manuals and courses.[154]

In 1868, the same year as the Sholes, Glidden and Soulé patented their first writing machine, the French priest and archaeologist Abbé Jean-Hippolyte Michon explained his analytic method for reading an individual's character from their writing to the chirologist Adolphe Desbarolles at a Parisian salon (Landau 2007, 5). Seeking to follow up his palm reading book, *Mystères de la main révélés et expliqués* with a new publication, Desbarolles persuaded Abbé Michon to co-publish his system of handwriting analysis with him, and in 1872 Abbé Michon's system, which he called *la graphologie*, was made public in *Les Mystères de l'écriture* (Desbarolles 1859; and Desbarolles 1872). Written in conjunction with Abbé Michon, with Michon writing the section of the book that outlined specific writing styles and how they could be read for specific personality traits. Desbarolles wrote the introductory essay. However, Desbarolles still held to the divination model of graphology against Abbé Michon, who saw the new graphology as being empirically grounded (Desbarolles; Panchasi 1996, 11). Unhappy at the

[152] A newspaper clipping titled 'Identification of Disputed Signatures' sent to Galton "With compliments of Treasurer Linnaean Society of London, Secretary Royal Microscopical Society, Ashwise, Morris, Crisp, LCO, 6 Bld Jewry, London EC." (UCL Special Collections N.d.).

[153] That the eminence argument was the dominant paradigm in the reading of handwriting for character reflects the pedagogy of handwriting as a process of imitation, as argued in the previous chapter, 'Copying Hands, Copying Bodies.'

[154] As Thornton has argued, the nineteenth century saw a publishing boom in penmanship books, with an increase in the number of different books, and that also went through multiple reprints. Such books include John Jenkins' *The Art of Writing* (1791), Henry Dean's *Dean's Analytical Guide to the Art of Penmanship* (1808), Hopkins and Bayard, (1808); Potter's *Penmanship Explained* (1111); B.H. Rand's *The American Penman* (1833); Thomas E. Hill's *Hill's Manual of Social and Business Forms* (1875); *The Scholar's Plan and Easy Guide to the Art of Penmanship* (1878); J. W. Payson, S. Dunton, W. M. Scribner, G. H. Shattuck, and A. S. Manson's *The Payson, Dunton and Scribner Manual of Penmanship* (1873); and J.L. Burrit's *How to Teach Penmanship in Public Schools* (1886). Spencer (1800-1864).

inclusion of his analytic methodology alongside Desbarolles' divinatory one, Michon expanded his essay into a book which he published in 1878 under the title *Système de Graphologie: L'art de connaître les hommes d'après leur écriture* (Michon 1878).[155]

Michon's graphology system rejected the 'eminence' argument, focussing instead on how the shape of the individual letter, how it was started, its pressure points on the page, how it was finished, how any second marks (such as the cross on the *t*, or the dot over the *i*) were made were indicative of character points of the individual. He contextualised these shapes and forms through a schemata of interpretation, one which was first divided into classes ('Faculties' and 'Instincts'), orders (for Faculties, these were 'Intellect', 'Emotion', and 'Character'; for Instincts, these were 'Benevolent' and 'Malicious') and genres (such as 'Pure Intuition', 'Pure Deduction', 'Sensibility' and 'Gentleness') (Michon 1878). This analytical methodology for understanding handwriting is the same as that for physiognomy and phrenology; just as an individual's body could be analysed and placed into a hierarchical schemata of values, organised through the taxonomic categories of classes, orders and genres, so Michon proposed the same analytical methodology for an individual's handwriting. In reading the writing analytically, reading back from the mark, to the hand and the movement of the individual, back into the brain and thus the mind, Michon was aware that his method of reading character from the material form of writing resembled physiognomy and phrenology.[156] And even though he noted this relation, Michon argued for the superiority of his analytical system as,

> It is not necessary to feel the head like Gall, to lose oneself like Lavater in the nebulous observation of facial features; all that is needed for these revelations are free scribblings. (Desbarolles , xxix)

The analysis of handwriting to read for 'character' was a radical shift in reading practice, one that affected both the subject under analysis and the person performing the analysis, as the material body could not only be absent, but never encountered. The analytical observer could, therefore, concentrate on the abstraction of the individual, rather than lose himself in the context of another person's presence. Through this mode of operation, graphology was unlike the other interpretative frameworks of identity of the period, physiognomy and phrenology. For both the visual analysis of the individual through physiognomy and the tactile analysis of phrenology required a body to be present, in order that it could be read. The anthropometric analysis of bodies, through Galton's anthropometry or Bertillonage, also required the presence of the material body to be present at least once, in order that it be analysed, written and then archived. However with Michon's system of *la graphologie*, the analysis and reading of the individual did not require the presence of the body, but merely a trace, a remainder, a mark

[155] Roxanne Panchasi traces the pre-history of graphology noting the work of François Demelle, Camillo Baldi in the seventeenth century, Johann Caspar Lavater in the eighteenth century and Edouard Hocquart, Adolf Henze and J.-B. Delestre in the nineteenth century. But she notes that Michon can be considered the first graphologist, as while he was not the first to link psychology to handwriting, he was the first to process handwriting samples into a system (Panchasi 1996).

[156] For those readers who dismiss the idea of graphology holding any position of validity in contemporary culture, there are a number of contemporary accounts, particularly in France, of large corporations hiring graphological experts to examine handwritten job applications (see Panchasi 1996, 1-2). As Roger Cohen notes in his 1993 New York Times article, 'In France, It's How You Cross the t's', in France "almost all advertisements for jobs request a handwritten letter" and "it would be very badly viewed if a job applicant sent a typewritten letter" (Cohen 1993). Companies that Cohen reports as using graphology included Air France, Seita (the state owned cigarette manufacturer), FNAC (the large book and record seller) and Moulinex, the household appliance manufacturer (Cohen 1993). In 2004, another NYT reporter, Abby Ellin, reported that American graphologists were reporting substantial increases in their business in the first few years of the new millennium, and that some companies retained individuals to perform graphological analysis under the somewhat bizarre job title of 'chief graphology officer' (Ellin 2004).

from which the expert produces an analysis of the writing individual–an individual could be read out of his handwriting.[157] Handwriting therefore became identity in the absence of the body.

In the 1860s handwriting became evidence, not only of identity *per se*, through the work of handwriting experts in the court trials, but of character, through the new science of graphology. During the same period, handwriting pedagogy was becoming more 'scientific', through the systems of Platt Rogers Spencer (1800-1864) and his successor A.N.Palmer (1860-1927).[158] Interestingly, the handwriting pedagogies of Spencer and Palmer, and of their followers, accorded to a new methodology of teaching handwriting based on splitting individual letter forms into parts–into curves, lines and swirls, or what Thornton calls "the aesthetic building blocks of the alphabet" (Thornton 1996, 47). This fragmentation of the form of a handwritten letter was also in part so that a student would then to be able to orally recount the shape of the letter; thus the lowercase letter 'q' became, and was spoken out as "Element IV., Fourth Principle, and Elements I., II., IV.", an echo of Bertillon's portraits parlés (Thornton 1996, 47). This nineteenth century pedagogy of handwriting, most often called Spencerian, articulates not only the theme of fragment around which this chapter is based, but also the curious blending of writing and speaking, in that Spencerian handwriting pedagogy advocated speaking the act of writing.

Language Content Transparency

With the mythical fall of the Tower of Babel came the search for linguistic perfection, a search carried out within a variety of cultures to meliorate the long-time perceived absence of an Edenic mode of communication. As Umberto Eco outlines in his history of this search, *The Search for the Perfect Language* (1997), it has been involved primarily with either the (re)construction of the 'first' language, the *Ur-language*, the uncovering of the mythical nature of supposed perfect languages; or the construction of philosophical languages, languages that would express the world as it truly is. However in the nineteenth century the search for a perfect language took a more pragmatic turn; for far from the continuation of the argument about whether Hebrew or Greek was the more perfect, and following in the wake of Enlightenment experiments with new philosophical languages of Leibniz et al., there was an increase in the invention of universal languages called *a posteriori* languages. These languages were attempts to construct a language after the fact, by syncretising the grammar of the languages of Western industrialising economies, whether Teutonic or Romance, to produce a practical everyday language, a syncretic language.

The search for a perfect *a posteriori* language has been pinpointed as beginning in 1839, with the publication of a Universal Language System by A. Grosselin, which was followed by four other attempts at a new universal language in the 1840s and 1850s.[159] However, after a

[157] Roxanne Panchasi notes the relationship between readings and traces in a section entitled 'Not Written in the Cards: Graphology the "Science" vs. Divination' in Panchasi 1996, 10-18. Additionally, in Walter Benjamin's article, 'Graphology: Old and New', he outlines three distinct strands of graphological theory of the 1920s and 30s, and complains about the lack of an academic chair of graphology. The three strands are that of the psychologist Ludwig Klages, a member of the George circle, whose analysis rested on handwriting as a gestural act; the psychophysical interpretation by the Bohemian graphologist Robert Saudek; and the unconscious graphical readings, following Freud, of Anja Mendelssohn, director of the Central Institute of Scientific Graphology at the Lessing-Hochschule in Berlin, and Max Pulver, a Swiss graphologist who taught at the Institute for Applied Psychology in Zurich (Benjamin 2008; also see Ley Roff 2004, 123-4; and Leslie 2007, 111).

[158] A.N.Palmer's method was an evolution in Spencer's system of penmanship in that Palmer stressed the necessity to train the body and muscle movement (Palmer 1894).

[159] Following Grosselin, E.T.T. Vidal proposed a Universal and Analytic Language in 1844, who was followed in 1850 by C.L.A. Letellier 's own proposal for a Universal Language. These proposals were subsequently added to by Bonifacio Sotos Ochando own proposal in 1855 for what he too called a Universal Language. Couturat and Leau do not record any

hiatus, there came a glut of proposals for a new universal language in the 1880s. Beginning with Johann Schelyer's Volapük in 1880 and followed by Volk and Fuchs' Weltsprache in 1883, the trickle was followed in 1884 by Meriggi's Blaia Zimondial and Courtonne's Language Internationale Neo-Latine in 1885; Sébastien Verheggen's Nal Bino, Charles Menet's Universal Language and Georg Bauer's Spelin all in 1886; in 1887, came Maldant's Langue Naturelle, Steiner's Pasilingua and Eichhorn's Weltsprache, St. De Max Streiff's Bopal, Frederick William Dyer's Lingualumina, and Dr Ledger Ludwik Zamenhof published *The International Language. Preface and Complete Manual (for Russians)*–which came to be known under the pseudonym Zamenhof used in publishing the book as 'Esperanto'; Bernhard's Lingua Franca Nuova, Eugen Lauda's Kosmos and Henderson's Lingua were proposed all in 1888; in 1889, Hoinix's Anglo-Franca and Stempfl's Myrana were introduced; and finally in 1890 came Rosa's Nov Latin, Lott's Mundolingue and Lipray's A Catholic Language (Couturat and Leau 1903; and Drummond 2006).[160]

Such was the flood of artificial language proposals in the late nineteenth century that in 1900 an association called La Délégation pour l'Adoption d'une Langue Auxiliaire Internationale was established to analyse and evaluate them. This analysis and evaluation was carried out by the founders of La Délégation, Louis Couturat and Léopold Leau, who then proceeded to publish the history of this fledgling movement (Couturat and Leau 1903).[161] The founding of La Délégation and the publication of a history of universal languages were attempts to promote, in general, a universal language for scientific discourse–one that could be adopted by the newly formed international scientific organisations–and for high-level inter-governmental politics; and to evaluate the strengths and weaknesses of particular constructed languages, with a view to one of the language's subsequent promotion as the most ideal form of communication.[162] Both these intentions fed from and into a more general desire for a fitting medium to capture and communicate the new knowledge of the period; in order to do this, Couturat and Leau argued that "Sous peine de revenir à la tour de Babel" (Eco 1997, 317).

Of all the artificial languages of the late nineteenth century, one of the more successful was Volapük. Constructed by the German Catholic priest Johann Schleyer and launched in 1878, it received its first published grammar in 1880 (1888, 353).[163] Named from the German word *Volk*, meaning folk, and a clipped and re-expressed version of the English word speak, *pük*,

proposals in the 1860s and 1870s but start their history again in the 1880s (Couturat and Leau 1903). Umberto Eco argues that German linguist Joseph Schipfer's invention of 'Communicationssprache' in 1839 that was the first attempt at a full alternative language (Eco 1997, 321-322).

[160] There were also a number of languages invented in the 1890s, but not nearly so many as in the 1880s. These were Emily Dormoy's Balta and Jose Guardiola's Orba in 1893; Fieweger's Dil in 1894; Wilhem von Armin's Veltparl of 1896; Abbé Marchand's Dilpok of 1898 and Leon Bollack's Bolak in 1899 (Couturat and Leau 1903; Eco 1997, 320).

[161] In 1827, F. Sudre invented a language based on the musical scale, a peculiar logic that seems mimetical of the history of early typewriters as being derived from musical instruments; Sudre's language was structured so that individual words were composed of the syllables 'so, re, mi, fa, doh, etc., so that 'redoremi' meant universal (Staller 1994, 340 , f.n. 59). Here the use of the technology of music, the musical score, as a basis for an artificial language echoes the use of the technology of music, the keyboard, as a basis for the mechanism of typewriting. Eco notes only two attempts prior to this date in the creation of these so-called *a posteriori languages*, languages derived from natural language, and designed for use rather than philosophical investigation. The first of these universal languages was in 1734, published under the name Carpophorophilus; the second was a direct result of the *Encyclopédie* project, written as a coda to the entry *Langue*–the 'Langue Nouvelle' proposed by Joachim Faiguet (Eco 1997, 329). For more on how the technologies and techniques of music and typewriting are intertwined, see section 1.1, 'Copying Bodies (Sometimes Writing)' and section 3.2, 'Superfluous Women and Their Accomplishments.'

[162] Eco specifically ties the 'tide' of new languages with an increase in technological interconnectedness and subsequent increase in capitalism, both geographically, socially and culturally, noting that "... the telephone and the wireless knitted Europe together and as communication became faster, economic relations increased" (Eco 1997, 317).

[163] Volapük is more a Teutonic than Romance language in its stem forms as well as it basic alphabetic forms; like the Teutonic languages, it has eight vowels and nineteen consonants, as well as a variety of diacritical marks. One example of how Volapük operated is this conjugation of the adjective silver, into its adverbial form, its comparative adverbial form, its superlative adverbial form: *Silef*, silver; *silefik*, silvery; *silefiküm*, more silvery; *silefikün*, most silvery; *silefiko*, silverly (1888, 354).

Volapük was an attempt for an artificial language to 'go natural' by calling itself folk-speech ("Volapük, Pasilingua, Spelin, Lingualumina" 1888, 2).[164] Such was its popularity than only ten years after its introduction, there had been three large international Volapük conventions, twenty-five Volapük periodicals were in circulation, there were 183 Volapük societies and the Parisian department store Printemps was offering Volapük courses (Staller 1994, 340; and Eco 1997, 319-321).[165] The success of this artificial language, the explosion in the invention of artificial languages and the more general widespread interest in the new languages that happened most fiercely in the 1880s can be seen as both a contribution to and a result of the so-called 'Language Crisis' of the late nineteenth century, the result of language having "fallen prey to its own philosophical history and its entanglement with objective knowledge" (Strathausen 2003, 414). It was precisely the rising claims of objectivity by other media forms, such as photography, and by 'non-linguistic' practices such as the sciences in the last decades on the nineteenth century, a claim articulated through the work of Galton and Bertillon, Marey and Muybridge, that began to shake 'natural' language's epistemological roots (Strathausen 2003, 414). This rising claim on the objectivity of science, and the objectivity of its technologies and techniques, shone a light on natural language, to illuminate it as almost necessarily "unsuitable, illogical, capricious, and complicated", a description given by an artificial language investigative committee of the time (Couturat, Jespersen et al. 1910, 12-13). Therefore, the identification of language as a media form, as a technology practised through a technique, was found, in its practice, to be lacking in its ability to describe 'truth'.[166] The drive towards artificial languages therefore reverberates with the concept of media transparency encountered throughout this chapter, in that the aim of language creators and of those whose learnt and used these artificial languages was to 'speak' a language that would be transparent, so that the meaning would be immediate.

The Malling-Hansen Writing Ball

When the philosopher Friedrich Nietzsche took delivery of his new writing technology, he had purchased the 1867 model machine Malling-Hansen Writing Ball, with serial number 125 (Figure 0.1) (Avnskog 2009).[167] Although only 185 of this make of writing machine were

[164] Although, as Staller notes, Volapük was invented and promoted as being beneficial for its ability to allow communication between individuals of different nations to occur more easily, there were also undoubtedly a desire for a more 'nationalistic' universal language, more akin to the eugenic pursuits of Galton. For example, in 1887 the American Philosophical Society appointed committee members D.G. Brinton, Henry Phillips and Munroe B. Snyder to investigate and evaluate whether the Society should adopt a universal language, what its characteristics should be and whether Schleyer's Volapük would fit their criteria. In their report, this group notes of the ideal universal language that,

> We begin by the observation that the Aryan stock is now, and has been for 2,000 years, the standard-bearer of the civilization of the world; hence, a universal language should be based upon the general linguistics of that stock. In the Aryan stock the six principal living tongues in the order of their importance and extent may be ranged as follows: English, French, German, Spanish, Italian and Russian. It should be the aim of the proposed general tongue to ally itself to these somewhat in the order noted, as thus being more readily acquired by the greater number of active workers in the world at the present time. (1888, 352).

[165] The General Assemblies were held in 1884 in Friedrichshafen, in 1887 in Munich and 1889 in Paris. Of the twenty-five periodicals, eleven were published in Volapük; they were based in Constance, Breslau, Madrid, Paris, Vienna, Munich, Puerto-Rico, Stockholm, Aabybro and Antwerp. One of its key proponents, Professor Kerckhoff, claimed in 1888 that it had 210,000 followers, and a Volapük bibliography produced in the same year listed 96 books in 13 languages (Drummond 2006).

[166] The understanding of language as a technology by those of the IAL movement can be seen in the following comment on language's operation in 1888, by a critic of Volapük, who writes,

> Languages, the adherents of Volapük seem to say, are all wonderful machines, but, if we could only have been consulted by the original framers of human speech, how many little irregularities might have been eliminated, how much might the whole working of the machine have been simplified, and what a saving of fuel might have been effected if instead of a thousand of these linguistic machines, each having its own gauge, there had been one engine only, taking us from Fireland to Iceland without any change of carriages. ("Volapük, Pasilingua, Spelin, Lingualumina" 1888, 1)

[167] Nietzsche's typewriter is part of the Nietzsche Bestand at the Klassik Stifung Weimar, Germany.

manufactured, by the time Nietzsche had bought his typewriter in 1882, Malling-Hansen's invention had been in production for seventeen years. The invention of a Danish rector Hans Rasmus Malling-Hansen, the headmaster of Copenhagen's School for Deaf-Mutes since 1865, his arrival as head of this school also saw his first attempts at inventing a writing machine. Malling-Hansen Society Vice-Chairman Sverre Avnskog has suggested that Malling-Hansen's drive towards mechanised writing was a technological attempt to translate the speed of sign-language used by his students into writing (Avnskog 2006). This act of translation performed through a technological object and bodily technique, through which 'speaking', as Avnskog notes sign language to be, could be turned into writing. In fact, because the speed of the typist was the operating paradigm for the Writing Ball–unlike the Sholes & Glidden Type-Writer, whose operating paradigm was the speed of the machine–Malling-Hansen is reported as experimenting with a porcelain hemisphere, on which he drew different layouts of the alphabet, and then had himself timed 'typing' by his brother-in-law (Avnskog 2006).[168]

In 1870, Malling-Hansen filed his first patent for his Writing Ball in Denmark, followed in the same year by patents in France, Sweden, Austria, Germany and the UK, and in 1872 he filed his patent in America (Eberwein 2009). This explosion in patent filing began the machine's promotion in earnest, and saw him exhibiting his Writing Ball at a number of European International Exhibitions and World Fairs during the 1870s, on the back of which he took orders and began production.[169] Therefore although the production of the machine was in the low hundreds, rather than the thousands of the Remington & Sons Ilion Armoury, the Writing Ball can certainly be considered to be the first commercially produced machine.[170]

Alongside the invention of the machine, Malling-Hansen was also one of the leading proponents of Volapük in Denmark. Not only did he translate articles and books into this new language, but he also held dinner evenings where it was the only language spoken, and was a frequent contributor to the national Volapük publication. As the headmaster of a school for the deaf and mute, Malling-Hansen was acutely aware of the problems of communication, both oral and written, problems which he attempted to address through participation in the new modes of language made possible in the nineteenth century. And in working with those who could not hear, who could not see, who could not speak, Malling-Hansen understood the need for the writing technologies and the technology of language to be as transparent as possible, in order for the communication to be foregrounded, for it to have an immediacy over and above the form of

[168] Malling Hansen's experimentation with the layout of the 'keyboard' of the Writing Ball was resulted in the vowels on one 'side' of the machine and the consonants on the other. The well-known story of the QWERTY keyboard's arrangement as one which was to ensure the smooth operation of the Type Writing Machine has no such evidence to support it; rather it is an apocryphal story, given credence in later typewriter histories. For example, there is at least one Sholes and Glidden machine, from the Onondaga Collection, whose keyboard is organised along a different lines - TGJMNSHU/DPLWRVXJ/QKF<.I/ABCDEOIY (Mantelli and Roberts 2005).

On the question of prototypes of the Sholes and Glidden Type Writer, in a letter from Thomas Edison to the editor of the Pittsburgh Chronicle-Telegraph, dated 1920, Edison claims that Sholes bought him the original wooden model, and that he, Edison, improved the machine on the urging of the machine's promoters, producing 12 prototype models (Letter reproduced in Weller 1918, 30). Historian Richard Current notes that during the machines development from initial filing in 1868 up until September 1871, approximately 40 different prototype machines had been produced (Current 1949, 400-401). After signing the agreement with Remington & Sons to develop further the machine for mass production, manufacture the first 1,000 units and 24,000 more 'at their discretion', the machine only went through three more prototype stages before it was released on to the general market, to become the 'typewriter' (Current 1949, 404-5).

[169] In 1871, Malling-Hansen exhibited the Writing Ball at the International Exhibition, in South Kensington, London; in 1872, he was at the Scandinavian Art, Agricultural and Industrial Exhibition in Copenhagen; in 1873, the Writing Ball was at the World Exhibition, in Vienna, Austria. In 1876, Malling-Hansen was presenting his writing machine at the Philadelphia Centennial; at the Exposition Universell in 1878 and finally at The Scandinavian Exhibition in 1888, in Denmark (Avnskog 2006).

[170] The Malling-Hansen Society lists 185 individual Writing Ball machines that were produced between 1865 and 1890, when Malling-Hansen died and his typewriting machine operation was closed down. Only 46 Writing Balls are recorded as having survived (Avnskog 2009).

the technology. It was Malling-Hansen's pursuit of media transparency in communication technology that led to his dual pursuits of a new universal language and a mechanised writing machine. For both the language and the machine broke down communication into discrete, repeatable, standardised parts. And in their standardisation, and their ability to be absorbed into the body as repertoire, as gesture, they, Malling-Hansen believed, promised to herald peace and co-operation.

However, even as it attempted to make communication transparent, the form and function of Malling-Hansen Writing Ball holds within it some key connotations. Firstly, the machine's shape, and the form of its 'keyboard' in particular, reveal some of the significant characteristics of typewriter (Figure 2.67). Comprising 52 brass pins arranged perpendicularly to a brass hemisphere, the keyboard is sometimes referred to as a pin cushion, a description that necessarily draws through ideas of femininity and domesticity, a relation that will be explored in the following chapter. The shape the hands have to take in using the machine mirror the hemispherical shape of the keyboard and thus typewriting on a Malling-Hansen Writing Ball has similarities to the methodology of phrenological head reading, albeit in reverse; the Malling-Hansen Writing Ball typist is writing not reading. Finally, like most (later) typewriters, each key of the Danish typewriter is discrete, fragmented, and separate; but in its specific hemispherical form, the Malling-Hansen Writing Ball's fragmentation of the alphabet into separate keys connotes phrenology, with each key implicating each of the phrenological categories of the skull, so reflecting how writing machines embody particular understandings of the body.

The paper is held in cylindrical form at the centre of the point where all the pins meet. If the use of the machine connotes a phrenological head reading in reverse, the paper is a reminder of Locke's *tabula rasa*; it is the literal blank sheet on which the writer impresses his ideas onto the page. Therefore the Malling-Hansen Writing Ball can be seen as more imitative than illustrative of the relationship between the act of writing and the mind, as the metaphor of the *tabula rasa* elides with the physical construction of the skull. This elision was clearly felt by the Nietzsche in first two weeks of the machine's use when, as noted in the opening paragraphs of this thesis, he wrote "Perhaps our writing machines influence how we think" (Nietzsche 16 February 1882).

The intents behind Malling Hansen's design for his writing machine remain undocumented, an intriguing gap in the archive of the typewriter, made more notable because of its significant differences to the more well-known keyboard/typebar writing machines that dominated nineteenth century typewriter design.[171] However the design of the Writing Sphere was arrived at, undoubtedly Malling Hansen was part of the group of typewriter inventors whose intention in inventing their writing machines was for them to be prosthetic objects for the blind, supplements to fill the gap in otherwise functioning bodies–even though it is clear that Malling-Hansen marketed his Writing Ball to the general rather than the specialist market.

In the year following Nietzsche's observation on thinking and the new writing machine, the status of typewriting shifted seismically, albeit in a seemingly minor way. On 9 March 1883, Judge York of the Connecticut Probate Court changed the legal definition of writing to include 'printing'–that is, to include typewriting–in order that the typewritten will of East Haven resident James Willey could be declared valid (Will Written on a Type-Writer 1883). The ruling of Judge York, who is noted as following a Massachusetts' precedent, is an example of the 1880s reorientation in the understanding of what a typewriter was and what it did. For it was during the 1880s that the machine shifted from being a novelty machine to being absorbed into the

[171] Private communication with Sverre Anskvog of the International Malling Hansen Society.

cultural body of late-nineteenth century Western capitalism, as a result of its increasing use in businesses and homes and its promotion through International Exhibitions, World Fairs and a dedicated marketing campaign.[172] This absorption of the typewriter into the cultural landscape of the late nineteenth century, not least because its fragmentary process of writing reflected the fragment of the body, meant that the typewriter began to be understood not as a printing machine as it had previously been classified–a machine whose use was primarily seen as prosthetic–but as a writing machine, filed under the writing category of the Patent Office, to be used as a new method of linguistic transparency.

[172] In 1885, Remington & Sons sold the typewriter business to a new type of business, an advertising and marketing agency called Wyckoff, Seamans & Benedict of Brooklyn, NY. In 1878, Remington & Sons outsourced the sales of their typewriters to Fairbanks & Company, an arrangement which lasted until 1880, when it was brought back in-house, to be headed by Clarence Seamans, Fairbanks' leading typewriter salesman. Two years later, in 1882, Seamans formed the partnership of Wyckoff, Seamans and Benedict, with William Wyckoff, a stenographer at the Supreme Court (N.Y.) and owner of the New York's marketing rights to the machine, and Henry Benedict, one of the directors of Remington & Sons, to take over all sales and marketing of the new writing machine, although the manufacture of the machines remained at the Ilion armoury (Current 1954, 103-105). Three years later Remington & Sons sold the entire business including manufacturing to Wyckoff, Seamans & Benedict. One of Wyckoff, Seamans & Benedict's first marketing strategies was to pay skilled typewriter operators and stenographers (always female) in the best hotels in major cities, so that "top-flight business executives [who] were so sold on typewriting [could be persuaded] that they needed a typewriter's service when they were travelling" (Bliven 1954, 74).

Conclusion: Readable Bodies and Transparent Writing

In the late eighteenth century and early nineteenth century, the foundations of bodily analysis and classification were laid with the development of the practices of physiognomy and phrenology. These two practices, although deeply hermeneutic, were hugely influential in constructing a language of the material human body and in their promotion as ways of reading the language of Nature, were expressive of the search for a universal language, a search that had begun in earnest in the Enlightenment when there was "exceptional attention to linguistic questions" (Rosenfeld 2004, 5). The physiognomical and phrenological projects therefore attempted to establish the body as a transparent medium, one where the "signifier became effaced" so that the 'meaning' of an individual would, with the correct application of the theory, be transparently present to be read by an other (Percival 1999, 162).

Although by the mid-to-late nineteenth century, physiognomy and phrenology had become absorbed into mass popular culture, and somewhat derided in scholarly fields, their methodology of writing and reading the human body–its surface, its angles, its crevices–was one which seeped through into the new bodily sciences of the period. These practices formed the foundation to two influential 'sciences' of the nineteenth century, anthropometry and Bertillonage, whose purpose was to identify individuals within the social body–whether that be for inclusion or exclusion. So whilst Galton was searching for the defective body, Bertillon was categorising the deviant body, the body of those on the margins of mainstream society, and by assigning the habitual criminal (the 'recidivist') a fixed identity, the system would be able to identify the individual even if he should go by another name.[173] However, with anthropometry and Bertillonage, the fleshy body was translated into alpha-numeric text, translated from its four-dimensional embodied form into a two-dimensional textual representation.

In pursuit of better, more representative inscriptive technologies for the human body, these sciences developed to include photography, which was both expressive of and constructive in furthering the project to textualise the body through scientific practice, as it was discursively located by Galton, Bertillon and Marey as a form of writing technology. As with physiognomy and phrenology, as with anthropometry and Bertillonage, there was a supposed effacement of the signifier, resulting from the supposed objectivity of the photographic medium. At the same time, there was an attempt to efface language itself, both materially and conceptually. Materially the written word became the uncomplicated and clear sign of the individual, with the birth of contemporary graphology in 1872 through the work of Abbé Michon, a 'science' that like physiognomy and phrenology, like anthropometry and Bertillonage, like the use of photography in documenting the human body, was a transparent medium of an individual human being. Conceptually, in an attempt to construct and establish a universal language that would become the world speak, there was the explosion of International Auxiliary Languages.

Through the dominance of tropes of the fragmented body and the transparent medium, the typewriter gained purchase on the cultural landscape of modernity. However, as these writing technologies became increasingly ubiquitous in businesses and government offices, handwriting did not decline but became re-articulated through the fragment, and became a

[173] As media theorist Andreas Broeckmann notes that "Although he [Bertillon] showed interest in the work of the Italian criminologists, in his signaletic system Bertillon never saw criminality as the habitual, quasi-instinctive behaviour of 'born criminals', but as a series of acts committed by an identical individual. Unlike Lombroso, who sought to locate the cause of criminal behaviour itself in the specific morphology of the individual body, Bertillon tried to find the anthropometric key that would unerringly chain the individual to its punishable body" (Broeckmann 1995).

more valued and valuable skill directly which one of the first typewriter historians, George Carl Mares, notes is a direct result of the typewriter's success,

> "And it is a strange sequence of this demand that as the call for manual handwriting decreases, the requirement for a better, more legible, and superior penmanship increases. The eyes, grown accustomed to the clearly marked characters of the typewriter, will no longer tolerate schoolboy scrawl, and coincidentally with mechanical beauty, manual elegance will obtain a fresh lease of life and the demand for a good handwriting become stronger and stronger." (Mares 1909, 10)

"Amongst all nations–from "Indus to the pole"–the hand
of woman is the index of intellectual and moral
superiority, as well as of subtlety, impulsiveness, and
tenderness."

Richard Beamish, *The Psychonomy of the Hand* (1865)[174]

"A woman who does not know how to sew is as deficient
in her education as a man who cannot write."

Eliza Ware Farrar, *The Young Lady's Friend* (1837)[175]

"Yet thinking about gestures has often been a way of
thinking about words."

Sophie A. Rosenfeld, *Revolution in Language: The Problem of Signs in Late Eighteenth-Century France* (2004)[176]

"That is why a rather ubiquitous metaphor identified
women with naturally or virginally white sheets
whereupon a very male slate-pencil would write the glory
of its authorship."

Friedrich Kittler, 'The Mechanized Philosopher' (1990)[177]

"The poet, when his heart is weighted, writes a sonnet,
and the painter paints a picture, and the thinker throws
himself into the world of action, and the publican and
man of business may throw themselves into the world of
action; but the woman who is only a woman, what has
she but her needle?... Has the pen or pencil dipped so
deep in the blood of the human race as the needle?"

Olive Schriener, *From Man to Man* (1926)[178]

"By the way
The works of women are symbolical.
We sew, sew, prick our fingers, dull our sight,
Producing what?..."

Elizabeth Barrett Browning, *Aurora Leigh* (1857)[179]

Introduction

The successful absorption of mechanised writing into the body of the labour market in the late nineteenth century drew with it the bodies of women, who quickly became the machines'

[174] Beamish 1865, 89.
[175] Farrar 1836, 122.
[176] Rosenfeld 2004, 9.
[177] Kittler 1990, 195.
[178] Schreiner 1982, 301.
[179] Barrett Browning 1993 [1857], lines 456-459.

'natural' operators.[180] The rapid naturalisation of typewriting as a feminine practice would seem to be a historical anomaly; for under the Victorian ideology of separate spheres, woman and machine were constructed in 'logical opposition', with women described and proscribed as natural, passive and fragile; and machines as artificial, active and powerful (Stubbs 1995, 142).[181] However, with the exponential rise of typewriting and the typewriter that began in 1880s, women–more specifically, middle-class women–became the bodies whose place was at the typewriter (Davies 1982). At the same time, the reason often cited for the shift of women from home to office was that these women possessed the necessary dexterity to operate these machines, a dexterity that was described as an ability of their 'other' bodies. Due to its ubiquity in nineteenth century sources, this explanation has since become a touchstone in the debate around history of labour and gender, as well as machine and media histories of the period. References to women's 'natural' dexterity are therefore scattered throughout the histories of the typewriter, often as an aside that is tacitly understood, with typewriter historian Bruce Bliven noting that "women were said to have a peculiar aptitude for work requiring finger dexterity" and the historian Maxine Berg noting somewhat pointedly, that "women are particularly sought out by employers for their 'nimble fingers'" (Bliven 1954, 12; and Berg 1994, 151-2). However, in this scattering, the concept of dexterity remains largely under-interrogated.

In the late twentieth century, historians whose work focused on the histories of labour and gender also reference women's 'natural' dexterity but either deny or denigrate its validity as an explanatory strategy because seemingly, it forms part of the biological deterministic understanding of women. Instead, these historians prefer to lay the explanation of women's move into the office on the shoulders of the labour and pay structures of nineteenth century capitalism; the supply and demand structures of the rapidly expanding commercial and administrative industries; and the gender neutrality of this new machine (Hoke 1979; Davies 1982; Lewis 1988; Anderson 1988; Fine 1990; Strom 1992; Zimmeck 1995; and Schrover 1995).[182] However, these arguments seem not only to sideline the historical documentation around the typewriter of the 1880s and 1890s that testifies to its gendering, but also to perform an erasure of the female body that is at odds with the political agenda of this group of largely feminist historians, seeking to reclaim a female history of labour. By denying or denigrating any bodily explanation for women's typewriting, these historians' attempts to claim back women's identity and story within the history of labour, and address the history of women's social and economic conditions, does so at the loss of women's bodies, the same bodies that necessarily positioned them within these social and economic conditions.

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[180] There are a number of different statistics used to support the argument for the rapid feminisation of typewriting in the late nineteenth and early twentieth century. In 1870, only 4.5% of the category 'stenographers and typists' from the US Census were women. However, by 1880, this had increased to 40%; in 1890 to 63.6%; in 1900 to 76.6%; and by 1910 was 83.1% (Davies 1982, Table 1). Another set of data is provided by Lisa Fine, whose work centres on the development of the office in Chicago between 1870 and 1930. The statistics she has collected show that in 1870 the category clerical workers –a broader one than 'stenographers and typists'–comprised only 5.8% women. However, in 1880, this increased to 11.1%; in 1890, to 21%; in 1900, to 29.9%; and by 1910, was 40.6%. As a caveat to the 1870 figures, Fine notes that these returns were artificially low, as only clerical workers in the manufacturing industries were included, with no clerks in trade, transportation, or professional service, and no so-called stenographer-typists (Table 1, from Fine 1990, 30).

[181] The concept of separate spheres is a historically slippery one, provoking fervent adherents and deniers. This difficulty arises from its contemporary use as a metaphor, one that was subsequently (over)used to such an extent that it led to its reification as a particular model for women's history, a model which itself began to dictate the terms of academic discourse, as historian Linda K. Kerber argues "... widespread usage [of this metaphor] in the nineteenth century directed the choices made by twentieth-century historians about what to study and how to tell the stories they reconstructed" (Kerber 1988, 11). Kerber goes on to note that "When they used the metaphor of separate spheres, historians referred, often interchangeably, to an ideology *imposed on* women, a culture *created by* women, a set of boundaries *expected to be observed* by women" (Kerber 1988, 17). To read more on the issue of separate spheres, see Welter 1966; Davidoff and Hall 1987; Kerber 1988; and Vickery 1998.

[182] The sociologist Margery Davies argues that although period documents often refer to women's 'natural' dexterity as part of the argument about them being a more 'natural' fit to be typewriter operators than men–who were 'handicapped by their "extremely large and strong fingers"'–this naturalisation occurred because firstly the machine was not 'sex-typed' as masculine, and that secondly women were cheaper than men, an argument supported by other historians of the office (Davies 1982, 90-91; also see Anderson 1988, 6).

This chapter addresses the apparent dichotomy between women and machines with an account and analysis of the 'naturalisation' of women's labour on the typewriter at the end of the nineteenth century. In addressing this dichotomy, it explores the concept of the dexterity as applied to women of the period, in an attempt to reclaim the bodies that have frequently found themselves put to one side. It will first explore how this binary relation between women and machines was established in the nineteenth century, and then argue that the results of the same conditions of this supposed opposition of woman and machine did, in fact, produce its partial dissolution, albeit tacitly, sufficient for women to begin to break down the ideology of separate spheres.

To understand how the relationship between woman and machine was constructed, the first section of this chapter, 'Constructing the Female Stereotype', examines how the sex 'woman' was constructed and understood in the nineteenth century, through an account of the shape and content of female stereotype in the natural sciences.[183] In focusing on the ideological construction of woman in the emergent fields of the natural sciences–specifically in the work of the evolutionary biologists Charles Darwin and Ernst Haeckel–this section will argue that the new scientific theories of biology empirically underpinned the female stereotype as it was already circulating in the Victorian culture of western industrialising nations. It will argue that the project of the natural sciences in attending to 'woman' was not only an attempt to formalise the category of 'woman' as part of the project to formalise 'man', but to also testify to the validity of nineteenth century science itself, by defining it scientifically those cultural norms taken to be self-evident. In its articulation of the female stereotype, the natural sciences of the mid-to-late nineteenth century expressed both the confidence and anxiety of the period, expressions articulated through women's bodies that became the sites of social, ideological and political tensions (Russett 1989, 63).

The second section of this chapter, 'Superfluous Women and their Accomplishments,' traces the female stereotype from its scientific expression through to its social one, in an exploration of the exemplary articulation of the uncertainty of woman's position in Western industrialising nations: The Redundant or Superfluous Woman Question. Although the 'problem' of woman was millennia old–and to a large extent is still part of contemporary culture–it acquired an impetus under nineteenth century Western industrialisation, most notably when the 1851 UK Census returns showed an increasing proportion of unmarried eligible women in society, as well as, more worryingly to Victorian society, a high ratio of women to men (Helsinger, Sheets et al. 1983; Stanton 1970; Welter 1973; and Crosby 1991). This section will therefore explore the articulation of this problem in relation to female labour, a practice implied in the formulation of the name of this debate itself, with its referents to the terms of modern capitalism: women were 'out of work' and of 'surplus value'. In tying together types of bodies and types of labour, this section will explore the category of work held as the paradigm practice of Victorian woman, so-called accomplishments. Through an analysis of the histories and meanings of the two leading accomplishments of the Victorian middle-classes, needlework and piano playing, this section will show how the female stereotype articulated in the natural sciences and through The Redundant or Superfluous Woman Question established forms of labour suitable for the female body. It will argue that the concept of dexterity plays a crucial role in understanding the relationship between women, their bodies and work in this period; and that the ascription of dexterity as a female ability, rather than a skill, meant that the question of what to do with women was an attempt to position them at a distance from

[183] The term stereotype is used retrospectively, as it was first coined in its contemporary definition–as a widely held, fixed and over-simplified understanding of an individual according to the categories of race, gender, sexual orientation or class–by Walter Lippman in 1922. For a more detailed history and analysis of this term, see chapter two 'Typing Bodies.'

economic and political power. In arguing towards dexterity as shorthand for a certain type of embodied knowledge, a learnt skill acquired through the accomplishments of embroidery and piano playing, this section situates dexterity not as a 'natural' ability, but rather a form of embodied knowledge acquired through bodily training and the practice of manual tasks. Each analysis of the history of the practices of these accomplishments will then be followed by an excavation of the concept of dexterity, as both knowledge and practice, through a phenomenological analysis. The aim of these analyses is to produce an understanding of the similarities and differences between needlework and piano playing from the position of bodily knowledge, attending not only to the interface between technology and body, but also how dexterity is distributed over the entire body.[184]

The final section, 'Mechanised Women', explores how the ascription of a particular practice of dexterity as a natural female ability was already being utilised in the labour market of nineteenth century Victorian culture and how this supposed female ability was performed in the first decades of the typewriter's rise. It will draw through the phenomenological analysis of the three practices of needlework, piano playing and typewriting from the previous section into the history of the typewriter and of typewriter training. Through the use of media theorists Jay David Bolter and Robert Grusin's concept of 'remediation', this section will argue that the accomplishments learnt by women of the Victorian period under the ideology of separate spheres were a central strategy in their move out of the home and into the office, albeit largely unrealised and unintended.[185] It will argue that accomplishments were not expressions of a 'natural' ability but were an example of women being trained in a set of skills, skills that armed them to be the most suitable bodies to labour in increasingly industrialised offices. This section ends with an historical account of how women entered the office, the different kinds of activities they performed with the typewriter and how, through these activities, they reconfigured their relationship with machines, implicitly collapsing the dialectic to synthesise with the machines and thereby underpin the network of the industrialising Western economies' labour force.

[184] In *The Craftsman*, sociologist Richard Sennett notes the difficulty of producing a verbal account of embodied knowledge as there is a 'slip' between language and the body, such that the body can only express itself in action, rather than be represented as language, word, grammar, and sentence, writing,

> ... what we can say in words may be more limited than what we can do with things. Craftwork establishes a realm of skill and knowledge perhaps beyond human verbal capacities to explain ... language is not an adequate "mirror-toll" for the physical movements of the human body ... (Sennett 2008, 95).

The aim of the phenomenological analysis is an attempt to somehow 'get at' this knowledge, even if not completely, by stripping it down to its characteristics, by navigating between objective account and subjective experience. The methodology of phenomenological analysis has been used by contemporary theorists to explore a variety of practices such as Jaana Parviainen's application of phenomenology to produce an account of the relation between the dance subject and the cognitive values of dance; and Iris Marion Young's application of phenomenology to explore women's understanding of space, movement and comportment (Parviainen 1998; and Young 1980). Phenomenological analysis is not a new methodology in exploring the typewriter: it has been applied by the philosopher, typewriter historian and collector Richard Polt, in his paper 'Typology: A Phenomenology of Early Typewriters' (Polt 1996). However, Polt's application of phenomenology was to demonstrate the diversity in the forms of early typewriters in the late nineteenth century, rather than to engage with any discursive feature about the bodies that were using the machines.

[185] Remediation is a concept formulated and named by Bolter and Grusin, which itself can be considered a remediation of the work of Marshall McLuhan. Whilst McLuhan proposed that that one medium becomes the content of another, Bolter and Grusin refer to this process of one (newer) medium 'refashioning' another (older) medium (McLuhan 1964, 45; and Bolter and Grusin 2000). As Bolter and Grusin define remediation, its critical features are what they term hypermediacy and transparent immediacy; these two features will be explored below.

3.1 Constructing the Female Stereotype

The first section of this chapter explores the formalisation of the female stereotype through the emerging science of evolutionary biology, examining its influence on and by gendered labour in the economies of nineteenth century industrialising nations. Beginning with the biogenetic law, also known as the recapitulation theory, formulated by Ernst Haeckel (1834-1919) and then moving on to Charles Darwin's work on sexual selection, this section explores how nineteenth century evolutionary theory formalised a female stereotype and demonstrates its impact on its sister disciplines, sociology and psychology. It argues that through these theoretical constructs, the ideological construction of woman in the nineteenth century as mechanism was made possible.

Evolution and its Mechanisms: The Biogenetic Law and Sexual Selection

The German evolutionist and professor of zoology and comparative anatomy Ernst Haeckel defined the biogenetic law, or the principle of recapitulation as it is better known, in his *Generelle Morphologie der Organismen*, published in 1866. Written in response to Charles Darwin's *Origin of Species* (1859) and drawing on the work of Robert Chambers' *Vestiges of the Natural History of Creation* (1844), Haeckel's work sought to provide a theory of the particular mechanism of evolution; much like Galton's work on anthropometry, composite photography and eugenics, Haeckel was seeking to develop Darwin's theory of species development from the general to the particular. Haeckel's claim for the validity of his theory was substantial, describing it as a 'fundamental law' of evolution; and in outlining his theory, the seeming elegance of its expression, 'Ontogeny is a recapitulation of Phylogeny', appeared to support his claims for its truth (Haeckel 1879, 5-6).[186] In other words,

> ... the series of forms through which the Individual Organism passes during its progress from the egg cell to its fully developed state, is a brief, compressed reproduction of the long series of forms through which the animal ancestors of that organism (or the ancestral forms of its species) have passed from the earliest periods of so-called organic creation down to the present time. (Haeckel 1879, 5-6)

Through this somewhat opaque but surprisingly compact theory, the biogenetic law, the biological mechanism of evolution, could be explained not just by making an analogy between the evolutionary history of a species and the development of an individual, but by laying evolution over embryology, so that "every individual organism repeats in its own life history the life history of its race, passing through the lower forms of its ancestors on its way to maturity" (Russett 1989, 50). From observing such features in developing embryos as (what appeared to be) fish gill slits and tails, Haeckel asserted that an embryo passes through the adult stages of its evolutionary predecessors, "in the correct order" (Gould 1996, 143). The principle of recapitulation, as formulated by Haeckel, therefore implies that each individual in every species is the living embodiment of the tree of life, a physical manifestation of the evolution of its own species. Restating his biogenetic law elsewhere, Haeckel developed his theory when he wrote "phylogeny is the mechanical cause of ontogeny", an expression that in its capturing of

[186] Haeckel described it in another seemingly elegant phrase, "the History of the Germ is the epitome of the History of Descent" (Haeckel 1879, 5-6). Haeckel's biographer Robert J. Richards, argues that the principle of recapitulation was nothing new, first appearing in the late eighteenth century in the work of Carl Friedrich Kielmeyer (1765-1844), Johann Heinrich Autenrieth (1772-1835) and Lorenz Oken (1779-1851); and in the beginning of the nineteenth century in the work of Friedrich Tiedemann (1781-1861), Johann Friedrich Meckel (1781-1833) and Gottfried Rienhold Treviranus (1776-1837) (Richards 2008, 148-149).

nature as a machine, was part of "the aggressively mechanistic attitude of Haeckel's time" (Gould 1977, 78; and Rinard 1981, 249).

Haeckel's theory of evolutionary development was, by his own account, indebted to the work of the French naturalist Jean-Baptiste Lamarck (1744-1829).[187] In the first decades of the nineteenth century, Lamarck proposed an evolutionary model based around a theory with two central features. The first feature, called *le pouvoir de la vie*, was the tendency for simple organisms to become more complex; and the second feature, called *l'influence des circonstances*, was the inheritance of acquired characteristics (Burkhardt 1977, 143-185).[188] It was this latter feature of Lamarckian evolution–that the physical changes undergone by an organism within its lifetime could be passed to the organism's next generation–that was to play a key role in Haeckel's evolutionary model, and through his work on embryology, draw him into the discourse around evolution, with a specific focus on the biological role of women.[189]

Like Lamarck, Haeckel's biogenetic law was a two-factor theory–albeit one more materially, mechanistically grounded than Lamarck's theory–made up of the mechanisms of terminal addition and condensation. The first mechanism, terminal addition, was the process through which a species evolved, in that it posited that evolution "proceeds by adding stages to the end of ancestral ontogeny" (Gould 1977, 7). The second mechanism, condensation, established the conditions that made terminal addition possible, in that it concentrated the developmental stages of an embryo into ever-smaller time periods. These mechanisms derived from Haeckel's embryology work, work in which he observed, dissected, analysed and then drew embryos of different species in order to form a more detailed theory of evolutionary theory in its materiality. However, although Haeckel was following a fairly standardised model of scientific enquiry, his theoretical ideas about evolution began to influence his observations and drawings, much as Galton's theoretical ideas influenced his work on composite photography and criminal type as discussed in the previous chapter. Haeckel's embryological observations and drawings, it has been argued, came to be more and more expressive rather than descriptive of his theory of the mechanism of evolution, with some of his drawings exaggerating the developmental features of foetuses so that they more closely resembled the adult phylogeny (Gould 1977; Richardson, Hanken et al. 1997; and Pennisi 1997).[190]

Yet alongside these now-controversial drawings, published as part of the lecture series to a general audience, Haeckel also constructed certain explanatory models of his theories; for his lay audience, his description of ontogeny took the following metaphorical form,

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[187] For Haeckel, Lamarck was one of three founders of 'descent theory' (as he called it), to whom he dedicated the second volume of his *Generelle Morphologie der Organismen*: the other two were Darwin and Goethe (Richards 2008, 118-119).

[188] Lamarck did not use the word evolution to describe his theories, but rather the phrase *la marche de la nature*, the course of nature, or the walk of nature. The word evolution, in its Latin origin, was used to refer to the unrolling of a scroll; the Latin definition of *evolvere* means to unfold or unscroll. It was first used in biology to describe the development of an embryo and, as geneticist and historian of biology Steve Jones points out, it was not until much later, after the publication of Darwin's *Origin*, that the word evolution gained its contemporary scientific meaning of the development of one form into another (Jones 1999, 2000, 299). For more on the history of the word evolution, see Richards 1993, 5-16.

[189] Although natural selection proved to be the better model for the mechanism of evolution, Darwin 'built in' the separation of the species into different sexual groups, as this differentiation was of benefit to the adaptation of function, which historian of science Fiona Erskine sees as "in accordance with the established principle of the physiological division of labour" (Erskine 1995, 97). Here, in Darwin as in Haeckel, scientific theory can be found framed within the terms of industrial capitalism.

[190] The sources cited make the strong claim that because the 'real' data of the developing embryos varies to such a degree from Haeckel's drawings, that Haeckel was guilty of fraud. Against this view, Robert J. Richards argues that whilst there is a difference between the data and the drawings, this does not prove Haeckel was intentionally fraudulent. Rather, Richards draws attention to Haeckel's clearly stated intention to omit certain embryonic features (e.g. yolk sac) as well as standardise the size of the stages for analysis and then shows how it was these decisions that lead to the visual differences (Richards 2009, 150-1). That this debate is still alive is worth noting: Haeckel's drawings are still used to illustrate twenty-first century textbooks on evolution; and this debate has been included as part of the refutation of evolutionary theory more generally by the proponents of intelligent design and creationist beliefs (e.g. see, Grigg March 1998).

> ... the history of evolution, or the Ontogeny of most organisms, shows us only a fragment of this series of forms, so that the interrupted chain of embryonic forms would be represented by something like: A, B, F, H, I, K, L, etc., or, in others cases, thus: B, D, H, L, M, N, etc. Several evolutionary forms have, therefore, usually dropped out of the originally unbroken chain of forms. In many cases also (retaining the figure of the repeated alphabet) one or more letters, representing ancestral forms, are replaced in the corresponding places among the embryonic forms by equivalent letters of another alphabet. Thus for example, in place of the Latin B or D, a Greek β or δ is often found. (Haeckel 1879, 7-8)

This separation of evolutionary stages of development into discrete alphabetic units is but a continuation of the attempts to textualise bodies, both general and particular, previously encountered in the work of Galton, Bertillon and Marey. Haeckel's textualisation of the body was, like the work of Galton, Bertillon and Marey, to make it legible, both to itself within a scientific paradigm but also to an audience, albeit in an expanded field. For, with Haeckel's use of alphabetic forms to describe his theory, the textualisation of bodies moves from the single body, or the body of the population, to mankind in general, to its evolution of mankind; and each human body becomes 'the book of life', as at the same time evolutionary development of the natural world was represented by the tree of life, a hypothesis famously illustrated by Haeckel himself, in different times, in different visual registers in the 1860s and 1870s (Figures 3.1 and 3.2).[191]

The representation of life through a tree, in combination with the biogenetic law, permitted other ways of thinking about the human race to become more solidified. For example, it allowed for the formalistic arrangement of types of individuals as different branches on the evolutionary tree, so that, "adults of inferior groups must be like children of superior groups, for the child represents a primitive adult ancestor" (Gould 1996, 144). This ordering of the human race therefore was able to justify the claim that 'biology is destiny', a claim that upheld and re-articulated the Victorian period's racist ideology; and the adoption and application of Haeckel's theory in the emergent fields of anthropology and psychology translated biological determinism to the cultural sphere. As the sublimation of biological and cultural determinism, the biogenetic law articulated the nineteenth century anxiety about 'other' bodies. For whilst more broadly evolutionary theory suggested that the difference between man and the natural world was not so much a difference of kind as of degree–and therefore challenging man's (supposed) natural right and absolute authority–the biogenetic law went some way towards assuaging this anxiety, by re-asserting man's authority over children, women and other human races.[192]

The principle of recapitulation was not a minor addition to the dominant evolutionary theory; it was supported by a number of well-known nineteenth century scientists, including Thomas H. Huxley, August Weismann, Carl Gegenbaur, and most notably, the most famous and influential of all nineteenth century scientists, Charles Darwin–although Darwin laid down a degree of caution as,

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[191] See chapter 2, 'Typing Bodies: The Science of Body Classification and the Drive towards Mechanised Writing'. An interesting comparison between how the evolution of man and the evolution of language were visually linked through the same tree and branch schemata can be found in August Schleicher's *Die Darwinsche Theorie under die Sprachwissenschaft* of 1863 (Figure 3.3).

[192] Darwin himself uses these terms of 'kind' and 'degree' in summarising his analysis of 'mental powers' and 'moral sense' of the animal world (which included humans) in *Descent*, writing "Nevertheless the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind" (Darwin 2004 [1879], 151).

> ... it should be bourne in mind, that the supposed law of resemblance of ancient forms of life to the embryonic stages of recent forms may be true, but yet, owing to the geological record not extending far enough back in time, may remain for a long time, or for ever, incapable of demonstration. (Darwin 1998, 449)

The support of this group of individuals, and of Darwin in particular, and thus the scientific community of the nineteenth century in general, gave credence to the biogenetic law. Darwin, in *The Descent of Man, and Selection in Relation to Sex* (1871)–written as a follow-up to the hastily published *On The Origin of Species* (1859) and in order to make more explicit that which had remained implicit within *Origin*, namely the evolution of mankind–expanded his evolutionary model to include and map out a secondary mechanism called sexual selection, a mechanism which he had previously referred to as "less rigorous" than natural selection (Darwin 1998, 73).[193] Intended to challenge the polygeneticists, who believed that different races of human beings were different species, *Descent* has been argued to be the product of Darwin's social liberalism and anti-slavery agenda (Moore and Desmond 2004; and Moore and Desmond 2009).[194] Even though it is infused with social liberalism and underscored with a seemingly humanist agenda, *Descent*'s argument that women were inferior to men is clearly articulated.[195] For the model of sexual selection that Darwin outlined rested firmly on the foundations of the Haeckel's biogenetic law, positioning women as developmentally–biologically, physiologically, and psychologically–below men. To support this position, Darwin built his claims on the following propositions: the first was that he unquestioningly accepted certain conclusions of craniometry, notably size, as proof of the biogenetic law, noting that "The female, however, ultimately assumes certain distinctive characters, and in the formation of her skull, is said to be intermediate between child and man" (Darwin 2004 [1879], 623)[196]; the second proposition was his reliance on the eminence argument, arguing that the dearth of female excellence in fields of 'poetry, painting, sculpture, music (inclusive both of composition and performance), history, science, and philosophy ..." is in itself a self-obvious legitimisation of his (biological) argument for women's inferiority (Darwin 2004 [1879], 629).[197] However, for Darwin, success was not just embedded within superior intellectual ability as,

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[193] Man had been peculiarly absent from Darwin's *Origin*, appearing only in the final pages. Furthermore the word evolution does not appear in the book at all, with the word 'evolve' being the last word in the book (Darwin 1998, 396). Darwin uses the term recapitulation in the title of his last chapter in *Origin*. However, he uses the term in its grammatical sense, rather than biological, to mean a 'summary' of ideas (Darwin 1998, 73).

[194] Darwin's biographers have also noted that *Descent* is better understood as work of anthropology than evolutionary biology, as large sections of the book are dedicated to the study of cultural rather than biological characteristics of animate life (Moore and Desmond 2004, xii-xiv). However this does not mean that *Descent* is a work of 'pure' anthropology, just as *Origin* is not a work of 'pure' evolution (Moore and Desmond 2004, xiv). Split into three parts, 'The Descent or Origin of Man', 'Sexual Selection' and 'Sexual Selection in Relation to Man', the last part contains an explicit articulation of the female stereotype, drawing on music, bodily ornamentation and bodily hair in 'savages' as fields of inquiry for proving the relation of all races as one species, as well as proving the lower position of savages and therefore, by analogy, women in society (Darwin 2004 [1879], 621-689). The stress that *Descent* puts on music as an essential marker of the civilised nature of an individual is of note in relation to the discussion of women and piano-playing in the nineteenth century later in this chapter.

[196] Darwin's theories on women's role in evolution sits uneasily within his general theory of evolution, in that his attempt to unify the races into one species at one and the same time argued for the inferiority of part of the species. This contrast is explicit in his theory of sexual selection whose general rule has male animals struggling against each other for females, but with females having the 'opportunity for selecting', whereas with man, this choice became man rather than woman's remit. As Fiona Erskine notes "The transfer to the male of the power to select was a symbol of evolutionary advance" (Erskine 1995, 97-98).

[196] In his unquestioning acceptance of craniometry, Darwin assumes that absolute size rather than relative size of the skull provides accurate data for his conclusions about women's brain size, making it possible for him to reach the conclusion that women were naturally inferior biologically and therefore socially. In drawing this conclusion, Darwin references the work of the polygenetic evolutionist Carl Vogt (1817-1895), who observed "It is a remarkable circumstance that the difference between the sexes, as regards the cranial cavity, increased with the development of the race, so that the male European excels much more the female, than the Negro the Negress" (Vogt 1864; Erskine 1995; Darwin 2004 [1879], 631, f.n.26).

[197] For art historical texts which address the eminence argument in relation to the fine arts, see Linda Nochlin's seminal essay, 'Why Have There Been No Great Women Artists' (Nochlin 1971).

> The chief distinction in the intellectual powers of the two sexes is shewn by man's attaining to a higher eminence, in whatever he takes up, than can woman–whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands. (Darwin 2004 [1879], 629)

This extract explicitly defines the ways in which man was the superior sex, not just intellectually but through his entire body; by extrapolating the eminence argument, particularly centred on the practical arts, Darwin argues for male superiority not just located in the mind and its intellectual abilities, but also infused through every nerve and muscle of the male body. However, those aspects of the body emphasised as superior in man are not those normally referred to–for example, greater physical strength; men's superiority was grounded, in particular, in the ability and skill in the use of the hands, and more generally the ability and skill in the application of the senses. Darwin's body therefore is not the body as object, as abstracted form, but the body in motion, the acting, performing, labouring body. And it is in this acting, performing, and labouring that male superiority is demonstrated by the creative ability of men, rather than by the much more inferior ability of imitation characteristic of women, an ability Darwin aligns with lower orders of humans (Darwin 2004 [1879], 93).[198]

For all of its clear expositions of the order and processes of the natural world, Darwin's evolutionary theory contained a degree of ideological flexibility, as it could be expanded in divergent directions to support and defend various and oftentimes contradictory ideological, political and social positions.[199] On one hand, mid- to late-Victorian feminists used the section of Darwin's theory about the inheritance of acquired characteristics to argue that increased use of mental and physical faculties of women would, in turn, improve women's mental and physical states, and therefore women should be better educated and even employed. However, in doing so, these feminists did so under a naturalistic framework, a fundamental principle which would prove to be their undoing (Richards 1983, 87-97; and Erskine 1995, 98). Certainly, one of the greatest contemporary successes of Darwin's theory of evolution was its defence of patriarchal cultural norms, and its quelling of the rising voice of female emancipation in the mid- to late-nineteenth century (Richards 1983, 61). However, although Darwin's evolutionary theory of women effectively muted the growing voice for female emancipation, it also cemented a stereotype of femininity which, when foregrounded with increasing capitalist industrialisation, formed a surface at which women could, and did, reconcentrate their efforts and their drive towards female liberation (albeit unknowingly, to some degree), an argument that will be explored further (below) in this chapter.

The Shape and Content of the Female Stereotype

Within the emergence of the science of evolutionary biology in the nineteenth century, theoretical propositions were put forward to scientifically underpin stereotypical female characteristics. Through the theory of recapitulation, women's characteristics were the result of a halted evolutionary process, one where the foetus' development was frozen at the female stage of development, before it could fully develop into its ultimate form, a male. Therefore, under the principle of recapitulation, women were underdeveloped men and in their arrested development, were "repositories of both ontogenetic and phylogenetic human traits,"

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[198] Darwin argues that individuals who are mentally ill have an exaggerated imitative ability, like 'savages', noting that,

> The principle of *Imitation* is strong in man, and especially, as I have myself observed, with savages. In certain morbid states of the brain this tendency is exaggerated to an extraordinary degree; some hemiplegic patients and others, at the commencement of inflammatory softening of the brain, unconsciously imitate every word which is uttered, whether in their own or in a foreign language. (Darwin 2004 [1879], 93)

[199] Most famously, Darwin's theory of evolution has been 'misappropriated' to rationalise 'imperialism, laissez-faire economics and racism' (Richards 1983, 58).

structured as the embodiment of the 'adolescent' stage of man's development, childlike even (Russett 1989, 61; and Erskine 1995, 99).[200] In this structure of womanhood, a remarkably consistent model of the 'feminine' repeatedly appears which, although featuring variously emphasised characteristics, was commonly understood as built on the foundations of passivity.[201] From this single foundation stone, a large variety of other characteristics–biological, psychological and physiological–could be built including, for example, woman's speculated upon higher tolerance for pain, her natural domestic drive, her selflessness and most notably, her imitative ability.[202] One example of how a stereotypical female characteristic was underpinned by evolutionary theory can be found in a bizarre proposition put forward to explain woman's (supposed) higher tolerance for pain, a tolerance that Havelock Ellis argued was also present in her psychology, as the result of her subordinate social position (Ellis 1894, 125).[203] This alleged characteristic, it was argued, was due to women's biological affinity with animals further down the evolutionary tree, including 'savages' and children; in making evolutionary links, this insensibility to pain was tied to newts and lizards, because of the reptiles' ability to regrow limbs; although the ability to regrow organs was lost at the higher evolutionary position women occupied over lizards, women still retained this insensibility to pain (Russett 1989, 56-57).

Whilst tolerance for pain was a biological/physiological characteristic, other more physiological/psychological characteristics also became drawn into evolutionary theory. The most notable of these was women's supposed greater perceptive ability, an ability that on initial consideration might be understood positively. However, the explanation given to perception, the reason why it is a feminine (negative) rather than masculine (positive) trait, is that it lies in opposition to the ability to develop intellectually, an ability that was ring-fenced within the male body. In fact the argument put forward against women's education was that intellectual development would induce "... reflection and this in turn retarded perception", running against women's natural, evolutionary role (Russett 1989, 54-57). Therefore, by positioning perception

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[200] Historian Cynthia Russett argues that Darwin positioned men as evolved women, whereas some of Darwin's followers, notably sociologist Herbert Spencer and zoologist/embryologist W.K. Brooks, positioned women as underdeveloped men (Russett 1989, 93).

[201] Nineteenth century criminal anthropologist Cesare Lombroso drew on the theory of recapitulation to produce a stereotype of woman as always potentially criminal, with the lack of criminality only being fulfilled through 'piety, maternity, want of passion, sexual coldness, by weakness and an underdeveloped intelligence.' When active however, the content of the female stereotype for Lombroso was that of the 'vamp', the aspect of womanhood as potentially murderous and fatal, with her 'excessive desire for revenge, cunning, cruelty, love of dress, and untruthfulness' (Lombroso and Ferrero 1895, 157, 187-88). As for particular stereotypes, there were three main forms, each an articulation of a matrix of individual female characteristics: The Angel of the Home; The Vamp/Femme Fatale; and the Madwoman (Lehman 2009 27).

[202] Historian Fione Erskine summarises Darwin's stereotype of femininity as "a greater capacity for religious belief .... tenderer and less selfish .... more emotional and less capable of reasoned thought" (Erskine 1995, 99). Historian Jill Conway's definition of the female stereotype, she begins by contrasting men with women, before addressing the specifics of the female stereotype, noting that,

> Male intelligence is greater than female, men had greater independence and courage than women, and men were able to expend energy in sustained bursts of physical or cerebral activity. Men were thus activists and excelled in the species-preserving capacities of egoism. Women on the other hand possessed the social talents. They were superior to men in constancy of affection and sympathetic imagination. They were patient because of their passivity and the need to store energy [for reproduction] ... (Conway 1972, 147)

In 1968, a test of the characteristics of sex role stereotypes on a group of clinical psychologists at a hospital in Massachusetts adhered to a familiar list: masculine traits consisted of "very aggressive, very independent, not at all emotional, very logical, very direct, very adventurous, very self-confident and very ambitious"; female traits included "very talkative, very tactful, very gentle, very aware of feelings of others, very religious, very quiet, very strong need for security, and enjoys art and literature very much" (Naffziger and Naffziger 1974, 253). Perhaps unsurprisingly, the study revealed that 'male' stereotypical traits were more socially desirable than 'female' traits; however it also revealed that these were the characteristics the clinical psychologists looked for in establishing whether a patient was mentally healthy, with male characteristics indicating health, and female characteristics as ill-health (Naffziger and Naffziger 1974, 254).

[203] Havelock Ellis writes,

> The social life of woman, her subordination to parents and husband and children, the duty of submission and concealment imposed upon her, have all tended to foster tolerance of pain. It is reasonable to suppose that women would not have so generally fallen into this role unless there were some organic basis of diminished sensibility to suffering which made it more natural and less arduous than it would be in man. (Ellis 1894, 124).

against mental labour, the female stereotype was assigned with irrationality, whilst rationality was, in line with the myth of romanticism, assigned to men (Vicinus 1980, 147). Most importantly the central aspect of the female stereotype held fast; women's supposed caring trait, another passively constructed characteristic, was argued to be chiefly derived from woman's socio-biological parenting ability, an ability that Darwin drew out to cover her entire psychological profile, when he wrote "Woman seems to differ from man in mental disposition, chiefly in her great tenderness and less selfishness" (Darwin 2004 [1879], 629).[204]

In attempting to define the mechanism through which evolution occurs at the individual level, Darwin, like Haeckel, subscribed to the Lamarckian theory of the inheritance of acquired characteristics.[205] However he realised that his evolutionary mechanism, which he christened pangenesis, was insufficient to support the natural inferiority of women, as each female child would inherit equally from both parent. Thus his theory of the inheritance of acquired characteristics became gendered, rather than purely generational, with Darwin adding the caveat that heritable characteristics could only ever be achieved in maturity (Darwin 2004 [1879], 631). It was through this economic struggle for the gendered genes that men passed on their superior intellectual abilities. By contrast, women in their construction as evolutionary conduits rather than evolutionary agents, were located outside of the sphere of mental labour, as they could not pass on increased learning and intelligence to male children. With this argument, Darwin was able to argue against the education of girls and women–unless, of course, they were to have many more children than the average–and to define the progress of mankind as the progress of individual man; taken to its conclusion, Darwin concluded that "Thus man has ultimately become superior to woman" (Darwin 2004 [1879], 631).

As evolutionary conduit rather than evolutionary agent, women were "best conceived as a magnificent organ of heredity", as the Darwinian sociologist Havelock Ellis wrote in his 1912 book *Woman and Social Progress: A Discussion of the Biologic, Domestic, Industrial, and Social Possibilities of American Women* (Ellis 1912, 17). Thus the female stereotype fashioned women as pathways, roads and channels, metaphors that positioned and constructed woman as the operating space through which the human species could produce further generations; women became the mere mechanisms of evolution. That nineteenth century (male) scientists laid claim to female reproduction and therefore the entire category of women as the means of progress not just for themselves at a personal level or even national level, but for the entire (civilized) human race, was a universalising claim that had a reductive effect, as it homogenised the female gender into the reproductive body, allowing for the pervasiveness of the female stereotype. This is exemplified by the words of the nineteenth-century obstetrician W. Tyler Smith, one of the founders the Obstetrical Society in 1859, who wrote,

> The uterus has been compared by a distinguished living physiologist to the stomach, as being the organ of nutrition and support of the species. We may, with equal or ever greater justice, say that the uterus is to Race what the heart is to the Individual: it is the organ of circulation to the species. (Tyler Smith 1847, 544)

[204] This feature of the female stereotype was crucial in subsequent debates about what were appropriate types of work for women. Through this locating, women as nurses, teachers, governesses could all be legitimised, whilst any job requiring judgements, such as politics or finance, could be argued to be beyond her capabilities and dangerous to society as a whole.

[205] Darwin included Lamarck's theory of inheritance of acquired characteristics in his theory for the mechanism of evolution, pangenesis (Darwin 1868). Literary historian Matthew Rowlinson argues that although Darwin subscribed to the inheritance of acquired characteristics, he held this theory more softly than Lamarck, as not only did he believe "that most instincts arise from the natural selection of advantageous traits", but also in his view that "those instincts which *are* acquired by habit tend not to be advantageous" (Rowlinson 2010, 541).

Historian Mary Poovey has noted that with Smith's subsequent description "individual women dissolve into one enormous, universal uterus–a disembodied, faintly threatening womb, continuously generating offspring...", women are not just identified with their reproductive capacity, but are reduced to that capacity, and that capacity alone (Poovey 1986, 145). However in their reduction, women's bodies are revealed as the political body, in that their bodies are discussed in terms of being a "female economy" (Tyler Smith 1847, 544); although, as Poovey goes on to note, "the uterus governs the entire female organism whether a woman is pregnant or not, and in spite of her mind, emotions or will" (Poovey 1986, 145). Therefore, the nineteenth century stereotype of women formulated through scientific discourse reveals her to be always potentially pregnant, a metaphorical signal of the always potential bountifulness of the British people, part of the late Victorian nationalist agenda; and in this perpetually potential state of pregnancy, the biogenetic law implied, as each embryo passed through the adult stage of each of its species' evolutionary predecessors, that at certain stages during pregnancy, a woman was pregnant with a fish, with an ape, with a human from another race, until finally the gestating foetus 'becomes' a human baby. Therefore should the foetus–which a woman was always potentially carrying–not develop to full term, there was always the danger, metaphorically at the very least, of women giving birth to a species further down the phylogenetic ladder, of evolution suffering from arrested development. This hypothesis and its implications, led to the formalisation of, and increase in the anxiety around the female body as an 'organ of heredity', in its potential in the female economy as an organ for degeneracy that reflected an anxiety around British nationhood in the political economy. It is in this double anxious state, of the body actual and the body politic, which the sinister body of woman can be found.

The Reproductive Economy of Femininity=Woman as Mechanism

The recapitulation principle that formalised the female stereotype through biological determinism–by positioning women as the channels through which evolution happened–expressed the nineteenth century anxiety around women's bodies. The British Darwinian social and political theorist Herbert Spencer (1820-1903) underpinned his social theory with the principle of recapitulation as a means of arguing for why women's lowly social position could be justified. Whilst for women there was "a somewhat earlier arrest of individual evolution", this was "necessitated by the reservation of vital power to meet the cost of reproduction", for men "individual evolution continues until the physiological cost of self-maintenance very nearly balances what nutrition supplies" (Spencer 1893; Quoted in Conway 1972, 141). By binding biological theory with discourse of late Victorian industrialisation, Spencer was able to translate his theory of gender differences into the language of energy, capitalism and labour. Furthermore, he also ran his stereotype of sexual roles derived from Darwinian evolutionary theory all the way through the body, from its social role in the world, down to the level of each of its individual cells, producing anabolic and katabolic interpretations of gender–for, as historian Jill Conway notes in describing the work of Spencerian advocate, biological researcher and later urban planner Patrick Geddes (1854-1932), "At the level of the cell, maleness was characterised by the tendency to dissipate energy, femaleness by the capacity to store or build up energy" (Conway 1972, 143).[206]

The necessity for the underdevelopment of women was, Spencer argued, because greater energy was needed for women's reproductive economy. It is within this double reading of women's bodies as both reproductive and economic that feminist literary historian

[206] For more on the influence of Herbert Spencer's ideas on Patrick Geddes, specifically his evolutionary theories and their relation to social progress, see Renwick 2009.

Katherine Stubbs argues that a discourse takes place which articulates the mechanization of the female–rather than the more familiar discourse, the feminisation of machines (Stubbs 1995). For, in the economic sense, the growth in the use of machines in industrialising Western economies resulted in the division of productive technologies into two categories, machines (or engines) and mechanisms, a division that came to formulate and express the understanding of women's bodies; as the historian of science W. Norton Wise notes,

> ... [that although] the distinction was sometimes subtle and never entirely consistent, *engine* always implied productive power, as in referring to the differential calculus as 'an engine of analysis,' while 'mechanism,' in its more specific sense, referred to a device for executing a particular form of motion, typically repetitive. (Wise 2007, 169)[207]

This distinction of machinery was also reflected in the identification of physical forces, kinematics and dynamics, with the former being motive and independent of the product, and the latter being the causal force that drove the mechanism. These binaries of machinery types, of physical forces fed into the nineteenth century biological understanding of sexes. In 1899, Geddes set up a series of binaries in his highly influential book *The Evolution of Sex* through which women's essential nature could be read: male rationality and female intuition; katabolism and anabolism; the hungry active male cell and the acquiescent well-fed female cell; male aggression and female passivity (Geddes 1899). In this work, Geddes' theory read the individual biological cell and from this drew out characteristics of the entire organism, the human body, enabling him "to give scientific authority to view of relationships between the sexes which were being questioned in the debate over the Women Question" (Conway 1972, 147). By equating the qualities of the cell with the qualities of the human body, and therefore human being, Geddes empirically grounded the reading of the female body, reframing the Woman Question from a question of social, cultural and political values to one of abstract scientific truth. Yet under this interpretative model, Geddes saw industrial capitalism as a threat to the natural laws, a threat derived precisely from women's employment in the industrialised marketplace. Therefore Geddes drew the laws of biology into the social and cultural world, arguing that the entrance of women in areas of life in which they would become competitors to men would be the undoing of society, an argument which he made through the biological when he wrote: "What was decided among the prehistoric *Protozoa* cannot be annulled by act of parliament" (Quoted in Conway 1972, 146).[208] This biological deterministic approach to the operation of Victorian society reduced women to their reproductive capacity, and that capacity alone that when coupled with their construction as docile, passive and intellectually sub-developmental beings, established woman as mechanism, as a kinematic form. And it was through this definition that women could be attributed a type of biologically determined way of movement, one which "could then be used to justify the objectification of women's bodies within industrial practice" (Stubbs 1995, 151).[209]

However one of the sources of the biogenetic law, the principle that was the starting point for this section, was the British engineer and mathematician Charles Babbage's *On the*

[207] Wise argues that this definition of differences came about as a result of attempts by French engineers in the 1820s and 1830s to articulate "labour value in classical political economy" (Wise 2007, 169).
[208] Following the increasingly 'outmoded' nature of the relationship between biology and sociology, Geddes became a surveyor and town planner, a reverse of Galton's move from geographic/cartographic pursuits as an explorer of the African interior into anthropometry and eugenics, as an explorer of the human body.
[209] Stubbs notes that in the broader discussion of women as machines in the nineteenth and early twentieth century, there is a rhetorical slippage between its definition as industrial entity and type of movement; she argues that consequently it operates at three discursive levels: motion, object and a class of person (Stubbs 1995, 150-1).

Economy of Machinery and Manufactures (1832), in which he explored the relationship between the machines and the political economy of his age (Babbage 1832).[210] In this book, Babbage proposed a model for the division of labour that he called the division of mental labour, a vertical separation of tasks that created a hierarchy of work, so that "the separation of tasks demanding more skill and a higher wage from those demanding only strength or time and a lower wage" (Wise 2007, 173-4).[211] This separation of tasks drew on the observation that in the new industrial 'manufacturies', vast numbers of women were employed at the bottom of the scale to be 'minders' of the machines, whilst a handful of better paid men were employed as 'overseers' or supervisors, of both the women and the machines. This movement of an observed model of division of labour between low paid female minders of the machines and more highly paid male overseers folded back into Babbage's definition of the machines themselves as either mechanisms or engines (Babbage 1832, 15). Thus women were doubly constructed as mechanism, both biologically and socially, as noted by Wise,

> While women's work was associated with mechanism, with repetitive motion of shafts, pulleys, belts, spinning machines and looms moving forever in a cycle, men were the metaphorical engines, driving and controlling the system of production (Wise 2007, 170).

The distinction between engine and mechanism, between dynamic and kinematic physical forces, directly folds conceptually onto anabolic and katabolic function of cells, itself folded into the biological determined differences between the two sexes. This multiplicity of foldings - from engines onto force onto energy dissipating cells onto working men, from mechanisms onto capacities onto cell energy conservation onto labouring women - reveals how the formalised construction of gender stereotypes was possible and how its contents were inextricably linked to the logic of capitalist industrialisation and the romance of the machine age, even as the discourse of human and machine "[revealed] itself as a form of anxious displacement" (Stubbs 1995, 150). Stubbs argues that this "anxious displacement" was an attempt "to deny the progressive dehumanization of the male body under industrialism" to which can be added that it was also an attempt to more firmly situate (Western white) man's natural rightful place as the superior human being in an age when evolution was revealing man's true location in the relation to other species and races as a difference of kind rather than type (Stubbs 1995, 150). This analysis of the male industrialising body reveals the final fold, as the anxiety around and of women's bodies folded into and around men's own anxiety about where the drive to progress would take them.

The biogenetic law constructed woman as the evolutionary mechanism through which man, as an individual, as a society and as a species, progressed. However this construction was also a project of high industrialisation and capitalism, discussing the labouring body–both as part of the political and reproductive economies–with the same vocabulary. However in reducing women to mechanism, the "depicting [of] women as mechanical ... empties the female body of agency" (Stubbs 1995, 149). Consequently, women were "conceptually disembodied, but only to the extent that she was biologized" (Gallagher and Lacquer 1987, viii). And it was as doubly embodied, but strangely disembodied at the same time, that women became the space

[210] Wise notes that the one of the works Haeckel drew on to form his biogenetic law was Robert Chambers' *Vestiges of the Natural History of Creation* (1844), itself built upon the work of Charles Babbage (Wise 2007, 177).
[211] Babbage's model contrasts with the more famous model for the division of labour proposed by the economist Adam Smith; whereas Smith's model was a horizontal one, where work was divided into a series of sequential physical steps, according to a particular act of labour, Babbage's was vertical, separating mental labour out from physical labour. See Smith 1976.

through which the governing powers could control the economic and political economy of nationhood, through which industrialising nations could govern their machines.

3.2 Superfluous Women and Their Accomplishments

Building on the previous section's discussion of the scientifically formalised nineteenth century construction of women, this section begins with an examination of how the abstract conceptualisation of woman influenced and was influenced by her position in the labour market of nineteenth century industrialising economies. It will argue that the ideology of female labour, specifically middle-class female labour, was for women to be domesticated labouring devices, trained to practise female accomplishments, most notably embroidery and piano playing (Cluckie 2008, 57); and whilst ostensibly an expression of Victorian ideology on femininity and the proper social role of women, these accomplished practices formed, in actuality, a vital dialectic component in the construction of nineteenth-century capitalism.

The Odd Women: Excess Population in the Reproductive Economy

Although Britain had been formally surveying its population since 1801 with a decennial national census, the 1851 UK Census was the first 'modern' assessment of the nation, with the introduction of categories for marital status and the detailed categorisation of occupations (Dennis 2008, 51). Through these added details, the 1851 Census returns showed that there were 1,767,194 spinsters and 795,194 widows, revealing the presence of around half a million more eligible single women than men (Lown 1990, 171).[212] This return fed into an increasingly prominent public debate on the 'proper' role of women in contemporary Victorian society, focussing on what should be 'done' with these 'extra' women. In its focus, the debate subsequently evolved into a debate around women and work, soon expanding to encompass women's educational, political and legal rights.

The movement from query (what should be 'done' with these 'extra' women?) to debate can be seen in the debate's title: initially posed as The Redundant or Superfluous Women Question, it was abbreviated to The Woman Question. As the debate on women that drew in every aspect of woman and femininity, undoubtedly the debate's linguistic framing made explicit the implicit premise that underlay women's position in Victorian society–that society was conceived of as an economy in which the presence of women was a supply and demand issue; it revealed the roots of the debate as lying with the twin concerns of the political and reproductive economies of industrialising western countries.[213] And yet, as the nineteenth century proceeded, The Woman Question became a preponderance in these economies as the "place of women in relation to men in a society undergoing rapid economic transformation which undermined traditional expectations and definitions" (Lown 1990, 1). Coupled with this economic transformation was a population explosion between the 1850s and 1870s, which reached its zenith in 1876 (Branca 1975, 114). Even with a higher reported male birth rate, this population explosion led to a higher proportion of women in the population than in 1851, due

[212] However there is some disagreement with one contemporary commentator, William Greg, in his highly influential article 'Why Are Women Redundant?" argued that this figure was closer to three-quarters of a million, writing,

> There were in England and Wales, in 1851, 1,248,000 women in the prime of life, i.e. between the ages of twenty and forty years, who were unmarried, out of a total number of rather less than 3,000,000. According to our assumption there ought only to have been 150,000 (or five per cent) in that condition, which would leave 1,100,000 women in the best and most attractive period of life, who must be classed as unnaturally, if not all unintentionally, single ... unquestionably many women do marry between the ages of twenty and thirty years, we may perhaps reduce the number of those who are spinsters, in consequence of social disorders, or anomalies of some sort, and not from choice, to about 750,000, or three-quarters of a million, - a figure large enough in all conscience. (Greg 1862, 441).

[213] The abbreviation of 'The Redundant or Superfluous Women Question' to 'The Woman Question' is a semantic shift that exposes the root of the question. For if, as would have been more correct, it had been abbreviated to 'The Women Question', then it would seem as if the problem was emanating from women themselves, as in The Question posed by Women, rather than to what it is actually abbreviated to, which reads more like The Question of Woman. This is a shift from debating around the collective, as in a group of women, to debating around an ideal, as in the eternal woman. To read further on The Woman Question and its roots, see Stanton 1970; Welter 1973; Russett 1989; Lown 1990, 172-209; and Crosby 1991.

to a higher male infant mortality rate. Such was this explosion in the number of women that by 1871, the UK National Census revealed a surplus of nearly three quarters of a million female bodies.[214]

This surplus of bodies was a cause of anxiety for mid-nineteenth century society, who saw this as a surplus of goods on the marriage market, the assumption being that these 'extra' bodies were middle- to upper-class ones. For by the mid-nineteenth century, middle-class woman's place was in the home, under the 'wing' of a male householder, whether that be a father or husband (Holloway 2005, 36). The notion of women's bodies as capital and the marriage market as a market of capital is further underlined on finding references to unmarried eligible (i.e. of childbearing age) women as having "failed in business," the business being marriage and the production of children (1859; quoted in Holloway 2005, 36). The American writer and campaigner Charlotte Perkins Gilman summarised this situation succinctly when she wrote, "He is the market. She is the supply" (Gilman 1966, 86).

Victorian ideology worked to situate (middle-to-upper class) women within the domestic space, the so-called domestic or private sphere, in order to locate these women in a distinct and separate space to the public sphere. In the creation of these separate spheres, albeit metaphorical, middle-to-upper class women were thus positioned not just outside intellectual pursuits but crucially labour, supposedly outside of the system of capitalism–at the same time as their marriage prospects and their reproductive capabilities were discussed in capitalist terms. Of course, the establishment of the domestic as a sphere was an idealisation, an attempt to construct a space outside of the everyday concerns of business, labour and capitalism, in order to be a counterfoil to the male dominated world of work. The ideology of separate spheres, and women's necessary positioning within the private domestic one, was argued to be a matter of social progress and high civilization in accordance with Darwin's theory of sexual selection–albeit in an assumed and naturalised manner (Russett 1989, 83).[215]

However, The Woman Question did not simply ask whether women should work or not; it also asked should women do paid work and if so, which women and what type of work. As historian Judy Lown noted, only those fields of work compatible to the domestic ideal were promoted to women, those employments that emphasised "the natural, the caring and the nurturing", such as teaching or nursing (Lown 1990, 34). The American psychologist Edward Thorndike exemplified the view of women's labour as naturally belonging to the caring professions when he wrote,

> The education of women for such professions as administration, statesmanship, philosophy or scientific research, where a few very gifted individuals are what society requires, is far less needed than education for such professions as nursing, teaching, medicine or architecture, where the average level is essential (Thorndike 1906, 213).[216]

[214] James Hammerton goes on to note that there is an uncertainty in the Census reports, in that women frequently misreport their ages, such that "each census revealed disproportionately more women in the 20-24 age group than had appeared in the 10-14 age group ten years earlier. A similar anomaly appeared in the disproportionately low numbers progressing each date from the 20-29 age group to 30-39" (Hammerton 1979, 28-30).

[215] Darwin argued that the increasing divergence of the sexes–the male towards activity and power, and the female towards passivity–was a marker of higher civilisation, drawing on the views of polygenist Carl Vogt, who argued that "the inequality of the sexes increases with the progress of civilization" (Vogt quoted from Richards 1983, 75). This theory was then drawn through into the social sciences, which meant that "So devoutly did Victorian intellectuals cherish the exemption of women from labor that Spencer and other theorists made it the touchstone of high civilization" (Russett 1989, 83).

[216] In making specific reference to the need for a 'few very gifted individuals' and a large number of 'average' individuals, Thorndike is using a model of gendered intellect based on the normal distribution, where men were at the extremes, (as either intellectually gifted or challenged) and women were located as the average, biologically incapable of intellectual excellence. The normal distribution, and its graphic representation, the bell curve, was heavily promoted by Francis Galton as the most perfect model of analysing large populations (Galton 1889, 66).

One answer to The Woman Question was to move women's bodies from where they were in surplus to where they were in deficit. The deficiency of female bodies was most keenly felt in the colonies of the British Empire, in countries such as Canada and Australia that were absorbed into the Empire by male pioneers and emissaries, but crucially lacked an equal number of women. In framing the movement of female bodies in the terms of surplus and deficit, this answer to The Woman Question reveals another confluence in the discourse around women's bodies and that of nineteenth century capitalism, as historian James Hammerton notes keenly, arguing that "The 'redundancy' of women in Britain could easily be put down to the greater emigration of males, and wholesale shipments of prospective wives to the colonies seems a natural solution" (Hammerton 1979, 28). In addressing this deficiency, from the 1830s until 1914, benevolent societies were set up to address this issue head on, or already existent societies set up emigration arms to facilitate this "wholesale shipment" of women. The chief group of women to emigrate were what referred to as 'those distressed gentlewomen', who were either unemployed governesses and/or needlewomen.[217] The Colonial Office (now The Foreign Office) established one of the first organisations that set up and paid for a female emigration system in 1831, managed by a board of Emigration Commissioners. Financed from the sale of colonial land, the scheme managed the emigration of sixteen ship-loads of odd women, carrying 3,000 of them to Australia between 1832 and 1836. Although it began its work with working-class women, by 1835 these ships had two different class of berths in which the emigrant could travel, steerage and one for 'respectable ladies'. This scheme was followed by the establishment of two more emigration organisations in 1849, an emigration arm to the Governesses Benevolent Institution and the publicly sponsored National Benevolent Emigration Fund for Widows and Orphan Daughters of Gentlemen, Clergymen, Professional Men, Officers, Bankers and Merchants, both of which failed. However the same year also saw the establishment of the more successful British Ladies' Female Emigrant Society, whose work was followed by the emergence of the Family Colonization Loan Society (1850) and the Fund for the Promotion of Female Emigration (1849). Although most women who emigrated through the help of these organisations during the 1850s were working class or lower-middle class, by 1862 this trend had climbed the social ladder, with the establishment of Female Middle-Class Emigration Society, as increasing numbers of middle-class women sought to emigrate following the Crimea War of 1854 and the Australian Gold Rush of 1852.[218]

The work of these emigration bodies consisted of firstly the recruitment and financial sponsorship of emigrants, and then the organisation and management of their emigration to various British colonies. The emigration of women to the colonies of the British Empire assuaged male anxiety, as it went some way towards assuring the security of the state of the Empire through encouraging the growth of British populations in colonised lands. However undoubtedly the emigration of women was a circulation of the capital, the capital being the female body, as shown by the following report in *The Colonist*, the newspaper for British Columbia, on the arrival of a so-called Bride Ship, *The Tynemouth*, on 17 September 1862, in the port of Esquimalt,

> ... we went aboard the steamer yesterday morning and had a good look at the lady passengers. They are mostly cleanly, well-built, pretty looking young women–ages varying from fourteen to an uncertain figure; a few are young widows who have seen

[217] These distressed gentlewomen can be seen from the fact that the largest female occupational class in lunatic asylums were governesses (Hammerton 1979, 25-27).
[218] Hammerton claims that during the Gold Rush emigration rose from 21,532 in 1851 to 87,881. Examples of other emigration societies include The British Women's Emigration Association, The British Temperance Emigration Society, the Potters Joint Emigration Society and Savings Fund, The Family Colonisation Society and The Traveller's Aid Society (Hammerton 1979, 122-124).

> better days. Most appear to have been well raised and generally they seem a superior lot to the women usually met with on emigrant vessels. Taken altogether, we are highly pleased with the appearance of the "invoice"... They will be brought to Victoria and quartered in the Marine Barracks, James Bay, early this morning by the gunboat Forward. (Akrigg and Akrigg 1977, 257)

Another very different answer to the Woman Question was provided by women themselves. In 1859, at the height of the debate around women and work, the Langham Place Group, a collective of female middle and upper-class women activists who were pursuing an agenda of female equality and rights, formed the Society for the Promotion and Employment of Women (SPEW) to focus on the cause of women's right to work in the commercial world.[219] In an attempt to circumvent biologically deterministic accounts of their gendered bodies, SPEW pursued its cause through a strategy of promoting women's human rights and playing down the threat to working men (Leigh Smith 1857). Working primarily as a funding body–although also as an employment agency–SPEW provided interest-free loans for women to train in a variety of technical trades, including printing, law copying, plan tracing, telegraphy and photography. It also established business training schools, so that women could be formally trained as book-keepers; and in keeping with times, SPEW also founded the first female typewriter training office in 1884, in Chancery Lane (The Society for Promoting the Employment of Women 1884, 13-14).[220]

A third answer was for women to arm themselves more fully, to train themselves harder for the marriage market, in order to diminish the probabilities of becoming 'odd'. One of the key ways this was done was through the training and practice of accomplishments. Stemming from an index of uselessness performed by the eighteenth century upper classes, accomplishments became a vital part of a nineteenth century middle-class woman's education, in order to produce a competitive product, a gentile body, for the marriage market. Thus women were trained to perform the practices of accomplishments as a demonstration of the refinement of their 'character', as a practice exemplar of their identities. Amongst such practices were the learning of French, singing, piano playing, needlework, all of which were positioned outside of the capitalist market system of which women themselves were a product–even though vast sums of money were oftentimes spent on securing the services of the most highly renowned teachers. In their accomplishments, women were trained to be useless and in their uselessness, as pure uselessness, became more highly prized objects. The training in accomplishments gained prominence with the burgeoning Victorian middle-class, becoming emblematic of the Victorian ideology of the feminine.

The contradiction of accomplishments as a counter to commerce and labour is shown through the network of Victorian values around female labour, which knitted together industry and piety. In this network, an accomplished woman would have to perform her labours, but never giving the appearance of doing so, lest she degrade her work, and thus her self. Through this trajectory, accomplishments became Victorian middle-class women's occupation, an occupation to be pursued in the domestic environment, placing women at one and the same time at home and at leisure, but industrious nonetheless. The goal, and most oftentimes expectation, of her accomplished practices and performances was undoubtedly to exhibit the economic prowess of the male householder and his ability to maintain a house of (seemingly)

[219] The Langham Place Group, named after the office location of the publication *English Woman's Journal* at 19 Langham Place in London, was formed by the activists Barbara Leigh Smith Bodichon, and Elizabeth (Bessie) Raynes Park. Other members included the journalist and poet Isa Knox, the novelist Matilda Mary Hays, rector's daughter Emily Faithfull, Maria Rye, Jessie Boucherett, the poet Adelaide Proctor, editor Emily Davies, and Lady Theodosia Monson (Rendall 2007).

[220] SPEW's typewriter training office will be explored in greater detail below in this chapter.

leisurely women. The moral imperative of women's work in the domestic sphere was that by learning skills productive of a 'restful' and 'harmonious' domestic space, women were providing a retreat for men from the cut and thrust of the prescribed male world of commerce, the other space to industrialised culture; it was in their responsibility and management of this other space, women became the clichéd 'Angels of the House.' Yet because of women's position as the creators and managers of this other space, the occupations women 'took up', the practices in which they were engaged, were never to be described as work in any economic sense, as this would put the status of the male householder in jeopardy and by association, the household in general; rather these accomplishments were middle-class women's natural occupation. Thus the distinction between male work and female occupation was carefully maintained, by setting middle-class women's labour firmly within a domestic context and outside of the mainstream (male) commercial world.

The seeming paradox of women and accomplishments is however just as superficial as it appears: for in actuality these accomplishments were the route through which a woman, and thus her family, could gain financial security and social respectability (or not). This is not so much a paradox, but more metaphorically glacial; whilst the dominant, most prevalent argument positioned the learning of accomplishments as moving a woman away from the world of commerce and capitalism, in actuality the undercurrent of the discourse moved the useless woman towards gentility and therefore towards being a highly valued 'product' on the marriage market.

Needlework, Its Social and Phenomenological Practice

The practice of needlework was one of the most prominent, if not the most prominent, for middle-class women to perform, due to its utility in producing decorative items for the domestic space; through embroidery especially, the proposition of women as 'Angels of the House' could be further supported.[221] Due to needlework's resonances with the social role of Victorian women as guardians of the domestic space, its practice quickly became a moral one, associated with such concepts as obedience, piety and modesty, as promoted by Sarah Ellis, a Victorian evangelising needlewoman, who wrote in relation to needlework that "the feminine qualification of being able to use the hand willingly and well, has a great deal to do with the moral influence of women" (Ellis 1839, 10). Therefore, as feminist art historian Rozsika Parker noted, embroidery in the Victorian Age was a signifying practice of gentility because of its association with domestic utility, a double expression that folded one set of values onto another, so that it was both "an index of utility" and "an index of gentility" (Parker 1984, 152;and Bercaw 1991, 240). Embroidery enjoyed increasing popularity within the Victorian

[221] Middle-class women's houses often overflowed with embroidered objects, as noted in the following passage on the domestic interior,

> Inside, soft, warm, brightly coloured Berlin woolwork spread over everything: over curtains, portières, pianos, anti-macassars, mantelpieces, tables, chairs, stools, screens, books, etc, providing a padding against the world outside ... (Parker 1984, 158)

Another important element in understanding the position of embroidery within the emerging discourse of craft is its gendered semiotics, for,

> Embroidery, by the time of the art/craft divide, was made in the domestic sphere, usually by women, for 'love'. Painting was produced predominantly, though not only, by men, in the public sphere, for money. (Parker 1984, 5)

Parker argues that the assertion of needlework, specifically embroidery, as an art would contribute to the affirmation of its relegation in its categorical relationship to art, and that its deconstruction is the only valid methodology in any analysis of this pursuit. On the other hand, she objects to craft being applied to it, as it is not utilitarian but decorative, much as painting operated. She concludes by renaming it embroidery art, as a broker of the peace between art and craft, because it is "undoubtedly a cultural practice involving iconography, style and a social function" (Parker 1984, 6). She argues that the 'naturalisation' of embroidery as feminine work was a result of the 'naturalised' division of embroidery from painting, and that its subsequent division into what she terms 'a public craft' and 'a domestic art.' It is this division between the public and domestic that Parker argues is one of the results of the developing discourse around painting that, from the seventeenth century onwards, located it more firmly as an expression of individuality; this is countered by the discursive relocation of embroidery as painting's antithesis, as a collective practice.

middle-classes, most notably because the increase in the size of the middle class population was reflected in the other fashion for so-called 'fancywork' or decorative work (Bercaw 1991).[222] One fashion that seemed to establish embroidery as feminine, and vice versa, was the arrival of gothic revival in the nineteenth century. This trend, a form of neo-medievalism, reincarnated middle-class Victorian woman as the ideal of medieval womanhood expressing the qualities of chastity, docility, obedience and patience through her needlework; or as she is described by Parker, "aristocratic, timeless, willowy, patient, natural, naïve and unobtainable" (Parker 1984, 182). Yet, in this practice of embroidery as an expression of virtuous Victorian womanhood, it was understood as a performance, an activity, an act; the ever-advising Sarah Ellis describes her 'woman' as a performer (Ellis 1839, 10).

The conflation of character with historical periods exhibits itself in the frequent complaint that women's work with the needle resulted in female melancholia, that the needle was a technology of oppression. However, other contemporary commentators saw needlework as a liberating activity, a dichotomy that reveals needlework as a technological practice whose social value was an expression of the central debate around technology as either utopian or dystopian (Parker 1984, 148; and Bercaw 1991, 238-239). One of the critics of women's work with the needle, Mary Lamb, in a letter to the editor of the *British Lady's Magazine* in 1815 (now known as the article *On Needlework*), argued against embroidery by comparing it to the work of men, arguing that men's time, divided as it was between "real business and real leisure," stood in direct opposition to the content of women's time, for whom neither their work nor their leisure was either real or separate (Lamb 1903).[223] Against this position, the Victorian novelist Dinah Craik argued that the practice of needlework was one of liberation, noting that the needle was "a wonderful brightener and consoler; our weapon of defence against slothfulness, weariness and sad thoughts" (Craik 1859, 81). Although a variety of positions were taken about the relation of women, work and the needle in the nineteenth century, what is certain is that the domestic and needlework were intimately intertwined. And as this intertwining became tighter and tighter, embroidery became more and more problematic; for although a sign of gentility, it could, because of its over-practice, also be interpreted as demonstrating immodesty, in that the embroiderer was positioning herself as morally superior by the practice alone; for as Parker notes "In the nineteenth century, unless embroidery was performed as a moral duty, in the spirit of selfless industry, it was regarded as sinful laziness" (Parker 1984, 154).

Women learnt to sew either from their mothers and other female members of their household, or more frequently, it was part of their educational programme, whether that education was private or state sponsored (Oaski 1988, 225). Embroidery was held in such high esteem as a practice of both morality and utility that under the 1833 Factory Act, which required labouring children of the working classes to receive two hours of education a day, girls were taught needlework for an hour and three quarters (Factory Act 1833). The subsequent 1850 Education Act further inscribed needlework techniques, with girls being taught embroidery, whilst boys were taught woodwork, following their joint education in reading, writing and arithmetic. Although embroidery was practised by the working classes for its useful nature, and through its utility was intended to be a promotion of 'moral uprightness', middle-class women still embroidered precisely because it was unpaid, because there was a moral force

[222] Nancy Dunlap Bercaw ties in the 'craze' for fancywork, which included working with rice, feathers and human hair, with the drive to bourgeois middle-class culture, so that women could act "as consumers, acquiring new objects even though they made these objects themselves" (Bercaw 1991, 234). Among the objects that fancywork created were lamp mats, wall pockets, watch stands, figurines and shrines.

[223] For a detailed study of the role of needlework in the life of one Victorian middle- to upper-class woman, see Amy Boyce Osaki's article, 'A "Truly Feminine' Employment": Sewing and the Early Nineteenth-Century Woman', on Eleuthera Du Pont's work with the needle (Oaski 1988).

in its unpaid utility. Indeed, should a middle-class woman earn a living from her needle, it was considered to be a slight on her husband or father, for his (obvious) inability to keep her in the style to which she should be accustomed (Cluckie 2008, 56).[224] Parker argues that the characteristics of the needlework directly map onto the idealised Victorian woman, and that the ideology of Victorian femininity merges back into the practice itself, writing that "...embroidery and a stereotype of femininity have become collapsed into one another, characterised as mindless, decorative and delicate" (Parker 1984, 6). This collapsing of practice into stereotype is supported by the nineteenth century lacemaker Ernest Lefebure, who explicitly tied women's fingers with needlework in his book *The History of Embroidery and Lace* published in 1888, when he wrote,

> She is the sovereign in the domain of art needlework; few men would care to dispute with her the right of using those delicate instruments so intimately associated with the dexterity of her nimble and slender fingers. (Lefebure 1888, vii).

As unpaid labour, as feminine accomplishment, already imbued with the values of repetitive action, quiet concentration and docility–or, as Nancy Dunlap Bercaw describes them, "skilled workmanship, genteel accomplishment and quiet domestic employment"–embroidery trained women's bodies in particular ways (Bercaw 1991, 240). At a primary phenomenological level, the level of the body fragment, the hands interact with the technologies of needlework, the needle, the fabric, the thread, in two different ways. Where the embroidery is small enough to be carried on a portable frame, one hand holds the frame, whilst the other holds the needle, loaded with the thread. The sewing hand moves not just forwards and backwards across the surface of the material but also from behind and in front of the material, an action of depth as well as breadth. Additionally the notion of pressure and force have a crucial role to play in needlework; the needlewoman has to use an appropriate amount of pressure to draw the needle through the canvas and back again, without either stretching the thread or leaving the stitch loose. At a secondary phenomenological level, the level of the entire body, there is an engagement by both hands, and with a concentrated focus of the eye, in order to place the individual stitches in the correct pattern, the body of the needlewoman is poured around the technology. The body is held, in tense and concerted concentration. At a tertiary phenomenological level, the body translates the pattern into inscription, through its abstract conceptualisation. Although oftentimes a variety of stitches are sewn, the work is the production of discrete repeatable unit that is of itself repetitive, stitch after stitch minutely and meticulously placed to adhere to the rules of pattern creation; and in its repetition, the needlewoman creates a visual code, a pattern, which can then be read iconographically and/or stylistically. In its determinate nature, each stitch of the overall image holds intentionality behind it, containing within it a multitude of small individual decisions of type of stroke, colour and size, to contribute to an overall effect, to an overall piece. Therefore, although appearing to perform work that reflects her supposed docile and passive traits, the needlewoman is actively

[224] In *The Rise and Fall of Art Needlework: Its Socio-Economic and Cultural Aspects*, Linda Cluckie attempts to argue, contra Parker, that embroidery was a 'real' commercial concern, and was not associated with femininity and domesticity. However, her argument is very weak, with a number of contradictions–and somehow fails to acknowledge that whilst for working class women, embroidery was a means of earning a living (albeit a somewhat pitiful one) the discourse around embroidery and middle- to upper-class women was quite different. (For more on women who earnt their living from needlework, dressmaking and their working conditions, see Perkin 2002, 36-37.) One example of Cluckie's argument that embroidery was a 'real' commercial concern for the women embroiderers is her exploration of the Embroidery Department at Morris & Co. This department employed many of the women (i.e. wives and sisters) of the men of the Morris circle including Jane Morris, her sister Bessie Burdern, Kate and Lucy Faulkner, and Georgiana Burne-Jones. Although meant to demonstrate that these women's labours were part of a commercial concern, Cluckie then notes that no wages for these women appear in these accounts for 1862 and 1863, explaining this away as their wages were probably "included in those given to their husbands" (Cluckie 2008, 82).

engaged in her labour; most importantly, she is working on a grid structure, the weft and weave of the canvas, fragmenting a pattern down to its individual stitches and their relative position to each other. By building up a piece of embroidery, thread-by-thread, stitch by stitch, to form an overall pattern, she is training her mind to work with the grid, whilst her body makes repetitive movements to create the stitches.

Piano Playing, Its Social and Phenomenological Practice

The other notable and popular accomplishment Victorian middle-class women learnt was to play the piano. Again, the piano and other keyboard instruments were learnt as accomplishments by upper-class women in the eighteenth century to display their bodies and sensibilities to individuals in the marriage market; in the nineteenth century, piano playing had become the epitome of the expression of middle-class women's personalities. With the growth of the Victorian middle-class, and the increasing technological development of the piano machine itself, piano playing was adopted as one of the central practices of domesticated women as the personal qualities required to become a skilled player intertwined with the central virtues of the Victorian work ethic, "toil, sacrifice and perseverance," much as had happened with the practice of needlework (Roell 1989, 3). The leading mid- to late-nineteenth century method for learning how to play the piano, the Klavier Schule, as described by Siegmund Lebert and Ludwig Stark in their 1856 four volume handbook on piano playing, *Grand theoretical and practical piano-school for systematic instruction in all branches of piano-playing from the first elements to the highest perfection*, "demanded practice of several hours a day, regardless of whether the pupil aspired to a concert career or to merely enhanced social graces" as it aimed to "[strengthen] the fingers by rigidly playing studies, scales, and exercises 'with power and energy'" (Roell 1989, 9). This elision of a rigorous work ethic with the virtuous and harmonious nature of music itself, as a foil to stress and provider of a calming and welcoming atmosphere, led to the piano being "the primary musical instrument" and as such, "the piano not only became symbolic of the virtues attributed to music but also of home and family life, respectability, and woman's particular place and duty ... it was a moral institution" (Roell 1989, 5).

Due to the framing of piano playing as a morally respectable practice, piano playing became increasingly feminised during the nineteenth century, and the piano becoming positioned as "almost exclusively among amateurs as a female instrument" (Leppert 1992, 111).[225] Women were very rarely permitted to perform outside of the domestic environment; a male householder permitting a female family member to perform in public, and thus to be stared at by audiences of unknown men, was morally reprehensible.[226] Thus women pianists were always positioned as amateurs, and their highest accolade could only ever be that they

[225] Historian Patricia Branca argues that sewing was a more prevalent practice than piano playing, due to the expense involved. Drawing on not just the increase in sewing machine advertisements and the increase in the number of enquiries from women to magazines about the benefits of various machines over others, but also on the prices of the machines, which varied from £6 to £16, Branca argues against the piano, which she cites as costing from £28 to £120, and for the sewing machine,

> One important addition to the middle-class woman's home, which has been somewhat neglected, was the sewing machine. The demand for this item increased at a phenomenal rate during the second half of the [nineteenth] century. .... All of this is far from the conventional image of the ornamental middle-class woman. Too often, the piano has been cited as the typical new expenditure, and the image of the middle-class woman sitting at the piano is part of the stereotype. ... According to the advertisements, it seems that new pianos were out of the question for most middle-class families ... (Branca 1975, 51-53).

However, what this quote shows is that Branca is comparing the useful sewing middle-class woman to her useless piano playing sister, an argument that seeks to reclaim nineteenth century women as useful and industrious. The analysis presented in this section synthesises the two practices to produce an understanding of both of them as part of the capitalist structure, albeit as undercurrents, and as technological practices that armed women's hands to step further into the foreground of the labour market.

[226] Rozsika Parker quotes a story told by Jean Jacques Rousseau in which a young girl learning to write, in order that she can stitch her name, realises that needlework shows off her hands to a greater advantage than writing with a pen (Parker 1984, 124).

were 'highly skilled' players. And yet the very instrument middle-class women were learning to use and the techniques they were being taught and which they practised were deeply technological. For although the piano was understood as an aesthetic form, both in its objecthood and in its product, the piano itself was a highly technological object, a machine whose operation required significant technical training. Indeed, such was the elision of the aesthetic and moral character of the product, the music, with the object, that the paradox of the piano as musical instrument and technological device was never directly addressed, even though "the pianist performing on the machinery of the piano, itself the direct result of factory production, apparently escapes the instrumental rationality of the Machine Age" (Leppert 2001, 216).

Repeating the phenomenological analysis performed on embroidery for the piano, at a primary phenomenological level, the hands' interaction with the technology reveals the high level of co-ordination required to operate the keys in a fluent and cogent manner.[227] Like embroidery, the two hands playing the piano have to perform different actions, striking different keys at different moments to produce the music. In the hands' co-ordination however, the articulation of the fingers echoes the movement of the hammers striking the strings within the piano mechanism. Although the movement of operation is perpendicular to the keyboard, the arms, hands, and fingers move parallel to the keyboard in order to strike the right notes, hovering just beyond the reach of the keyboard, in the air above. Therefore whilst piano playing movement has both depth, in the striking of the keys, and breadth, in the movement of the hands over the surface of the interaction with the machine, its breadth is significantly greater than its depth, and the hands are not both in constant contact with the technology. At the second phenomenological level, the body's interaction with the piano is also similar to the practice of embroidery, in that the piano player needs to be able to control the amount of force with which she strikes the keys, just as she needs to control the amount of force with which she makes the stitch. Yet in piano playing the pressure relates directly to the aesthetic; the body's knowledge of how firmly to strike the keys is correlative to the dictates of the piece of music being played. At the tertiary phenomenological level, the relationship of the individual with the abstract space of the technology is demonstrated clearly in the piano; the player reading a score translates the written code of operation, the musical notation, into an aural soundscape, an aestheticized patterning of sound. However, although musical notation dictates discrete repeatable units, sound is a continuum and with the possibility of performing two or more notes at the same time, unlike that which is possible in embroidery, piano playing can be totalising in a way that embroidery cannot. Additionally, as a sound producing practice, piano playing does not produce an object, a product, but rather an experiential space in time.

Dexterity, and Typewriting Phenomenology

What these phenomenological analyses of the female accomplishments of embroidery and piano playing reveal is that these practising bodies were being trained to perform a particular type of dexterity, a dexterity that, although sometimes contested, was normally part of the

[227] Richard Sennett argues that manual technical skill, specifically piano playing, requires learning with both hands from the start, placing the ability to coordinate one's hands as the very basis for manual skill, noting that,

> Hand coordination confronts a great delusion about how people became skilled. That is to imagine that one builds up technical control by proceeding from the part to the whole, perfecting the work of each part separately, then putting the parts together–as though technical competence resembles industrial production on an assembly line. Hand coordination works poorly if organized this way. Rather the combined result of discrete, separate, individualized activities, coordination works much better if the two hands work together from the start. (Sennett 2008, 164-5)

Interestingly in arguing against partial training, the metaphor that Sennett draws on is that of the industrial production line, therefore, albeit in a different and unrealised manner, tying the labouring hand, the dexterous hand, to the paradigmatic modernist technological system of production.

stereotypical definition of female labour.[228] Indeed, it was the capability for dexterity that was invoked by contemporary commentators and repeated in subsequent histories of typewriters and office labour to explain why women were the 'natural' operators of the typewriter (Fine 1990). However, in the late twentieth century, feminist historians oftentimes dismissed the concept of dexterity as an explanatory factor of women's move to the typewriter, either because the ascription of dexterity as a 'natural' ability of the female body was seen to be biologically deterministic, reflecting a nineteenth century patriarchy; or because dexterity was simply read as having small fingers (Davies 1982, 90). And yet, whether it be through the dismissal of an 'obviously' mistaken cultural assumption or the dismissal of such an 'obvious' biological fact, the dismissal itself misunderstands the concept through oversimplifying female dexterity as lie or truth, and therefore cannot address fully the history of women entering the labour market. For dexterity is not simply a physical motor skill but rather a somatic possession, encompassing mental ability. Therefore dexterity can be seen as a mapping relation, one that transposes the physical onto the mental and vice-versa. That dexterity goes much deeper into the human body than simply the size of a specific body part has been noted by sociologist Richard Sennett, who, in a similar fashion, argues that dexterity is an ability to perform a certain technique and thus is a form of embodied knowledge (Sennett 2008).

Certainly the use of dexterity around the question of women and labour in the nineteenth century is recognisable as a shorthand for a particular body, possessing a particular set of bodily skills; dexterity therefore is historically specific, standing in this case for a set of assumptions about the nineteenth century labouring female body, which although seemingly place her capabilities in her hands alone, in actuality reveal them to have been spread out over her entire body.[229] Historian Maxine Berg, in outlining the ideological construction of the labouring female body, has perhaps provided the clearest definition of Victorian dexterity, when she wrote,

> ... women are particularly sought out by employers for their 'nimble fingers', and their powers of concentration on tedious, laborious processes, as well as for their docility and their cheapness. (Berg 1994, 151-52)

The use of dexterity as a natural bodily skill of nineteenth century Victorian middle-class women reveals that dexterity is a concept used to relate types of bodies to each other, specifically gendered bodies in relation to labour. Therefore, in order to understand how the concept of dexterity came to be used as an explanatory model for the feminisation of typewriting, a phenomenological analysis of typewriting and a subsequent comparison to those

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[228] Towards the end of the nineteenth century, Havelock Ellis contested women's natural ability as dexterous creatures, specifically noting that any dexterity she possessed was simply the result of being trained in needlework,

> There is a general belief that women are nimble and dexterous with their fingers. If, however, we except needle-work, in which women are as a rule forced to possess the skill that comes with practice, there seems reason for concluding that on the whole manual dexterity of women is somewhat inferior. This deficiency seems to be more marked in the more special and skilled departments of work. (Ellis 1894, 161)

This counter-expression of dexterity as a natural ability could be because by the end of the nineteenth century, dexterity was being recognised as an increasingly important skill in industrialising western economies, one which needed to be reclaimed back from its lowly position for the labouring forces. For example, Ellis, in drawing together his sources on which sex was more dexterous, took testimony from a wide range of practices, including a number of professors of chemistry, cigarette rolling businesses and heraldic companies.

[229] That dexterity is historically specific can be best revealed by an outline Sennett gives as to why women in Ancient Greece were not, and could not, be considered to be craftsmen, a reason which Sennett plants firmly on the doorstep of classical science,

> The [classical] science contrasted the man's hand dexterity to the inner-organ strength of women as childbearers; it contrasted the stronger arm and leg muscles of men to those of women; it supposed that men's brains were more "muscular" than those of women. (Sennett 2008, 23)

Therefore in the classical world, although there was the maintenance of certain stereotypical characteristics of male superiority, dexterity was a male not female capability.

of needlework and piano playing will unpick what kind of trained bodily practice and embodied knowledge was present in these women's bodies.

At a primary phenomenological level, the hands' interaction with the machine reveals the typewriting hand as claw-shaped, with the hand parallel to the machine's interface and each finger forming an individual talon, moving up and down perpendicular to the machine interface, the keyboard. Like the relation of the piano playing hand to the piano playing mechanism of hammer striking string, the finger movement of typewriting is mimetic of the typewriter levers, with each finger becoming the individual 'pens' of the new writing technology – it is the fingers, isolated from each other, that become operational devices. This isolation also manifests itself in the writing surface; for with typewriting, this surface becomes distanced from the hand, becomes other. The body is not in contact with the writing surface; instead the writing surface is held within the body of the machine, on the rubber platen. This isolation appears deeper within the process of typewriting as words themselves fragment into individual letters, as the totality and completeness of words consciously become discrete combinations of symbols.

At a secondary phenomenological level, the body at the machine, it soon becomes clear that physical force is needed to operate the machine, which, unlike embroidery but somewhat like piano playing, requires force over and above a certain level. Thus the relationship between the body and the typewriter can be characterised as one of force; the technology demands a push function from the body. However this force does not flow in one direction; the typewriter resists the body. Furthermore this seemingly expressive force of the machine is not only against the body but also against its environment, in that its resistance produces the loud staccato sounds of keys hitting paper, reverberating in the atmosphere with each punch of a finger. Moving into the machine, the keys are set as an array of individual branding irons, 'burning' an individual symbol onto the plain even surface of the paper. The typewritten text is the result of a process that stamps the symbolic, symbol-by-symbol, on to the blank surface and so onto the world; the typewriter is an inscription machine.

At the tertiary phenomenological level, typewriting derives from the seemingly peripheral mechanisms of the technology. For typewriting does not only perform a 'division of labour' onto words by segmenting them into individual letters, but through additional levers, keys, locks and tabulators, it also mechanises the space between symbols, between lines, between the text and the edge of the writing surface. The typewriter does not just mechanise the symbolic, the present, but also text space itself–it mechanises absence. Features such as margin widths and tab spaces becomes controlled, become exact, discrete and repeatable.

Phenomenological Distinctions and Technological Remediation

Combining historical context and phenomenological analysis, it becomes clear that the training in and practice of the accomplishments of embroidery and piano playing by middle-class women in the late-nineteenth century were not just craft practices but also technologies. The practices of embroidery and piano playing were crafts, laboured at by (amateur) women, outside of the near all-pervading capitalist structures of the late nineteenth century. However, embroidery and piano playing were (and are) also 'technes' (τεκνε), technologies in the same sense as that used in the classical world, in that they are both "a set of rules, system or method of making or doing whether of the useful arts or of the fine arts" (Liddell and Scott, 1973, 1,785; quoted in Bolter 2001, 15).[230] Drawing the genealogy of technology through to contemporary

[230] The Greek word *techne*, from which English get the words technology and technique, was originally applicable not just to art, and what we would now understand as craft practices, but also to poetry, drama and the act of writing itself; it was a term which encompassed all practices that involved the materialisation of ideas through the labour of the body. As David Nye notes,

understandings, the practice of embroidery and piano playing can be seen as both technologies and techniques, a set of tools and a method of using the tools.

Therefore, the shift of women performing craft activities to performing mechanised writing can be described as a 'remediation' of technique. Remediation is a concept defined by media theorists Jay David Bolter and Richard Grusin as "the formal logic by which new media refashion prior media forms" and is commonly understood as applicable to objects of technology (Bolter and Grusin 2000, 273). Aimed at stripping technological determinism of its linear narrative form by making complex the history of media and technologies, and owing an intellectual debt to McLuhan's mantra that the medium is message, remediation is not directly correlative–features and forms that become remediated are not in the first instance obvious, and excavating what the typewriter remediates, which features it draws in from other technologies and what techniques are required, contextualises not just the technological object but also the technological practice. In using a term that is most often applied to technological objects to describe practices takes into account the use function of these machines, exposing how techniques are embedded within technologies.

As demonstrated above, embroidery orders a decorative space through the creation of pattern and piano playing orders the domestic aural space to provide a harmonious totalising space. In the organisation of space, the training of the hands to labour at repetitive tasks, such as stitching or striking piano keys, and the intellectual training in the communication of codes, such as the stitch or the musical note, armed women with skill sets that simplified their training in the operation of the typewriter. For typewriting not only required repetitive and precise manual work in addition to the interpretation of codes, it also required an ordering of the writing space through the use of discrete units, standardised alphabetic, numerical and grammatical marks. Friedrich Kittler argues that women's move into the office, through the operation of typewriters, saw "their useless piano fingers increase in economic value" (Kittler 1990, 196). In tying typewriting to prior techniques of embroidery and piano playing through the concept of remediation demonstrates how women were embodied within the typewriter, albeit unknowingly.

However it was not only in the technique of operation that women were implied; the technology of the typewriter remediated these practices of accomplishments' respective technological objects, incorporating both the technology of the piano and the sewing machine. Early mechanised writing machines, such as Dr Samuel Francis' Literary Piano of 1857 (Figure 3.4) and numerous prototypes of the Sholes, Glidden and Soulé Type Writer produced between 1868-1972 explicitly contained this relationship within the machines themselves through the use of a piano keyboard to operate the writing keys (Figures 0.4-0.10). The technology of the sewing machine also appeared foregrounded in the new writing machines, as the two leading technicians responsible for the development of the Sholes, Glidden and Soulé machine into the first Remington & Sons' Sholes & Glidden Type-Writer during 1872 to 1874, Jefferson Moody Clough and William McKendree Jenne, were the Remington superintendent of mechanics and the chief mechanic in the Remington Sewing Machine Department respectively. This led to technical features of the typewriter, such as the return carriage being operated by a sewing

> The ancient Greeks had the word "techne", which had to do with skill in the arts. Plato and Plotinus laid out a hierarchy of knowledge that stretched in an ascending scale from the crafts to the sciences, moving from the physical to the intellectual. The technical arts could at best occupy a middle position in this scheme. (Nye 2006, 7)

Richard Sennett draws on a different Classical etymology of craftsmanship in his book *The Craftsman*, by reference to the Homeric hymn to Hephaestus, the god of craftsmen. In this hymn, the word used for craftsman is *demioergos*, which compounds the word *demios*, meaning public, and *ergon*, meaning productive. This naming of craftsmanship therefore stressed the social and political function of these classical craftsmen; demioergons included potters, doctors, magistrates, professional singers and heralds, who, Sennett notes, functioned as do contemporary newsreaders (Sennett 2008, 22).

machine foot treadle, its mounting on a sewing machine table and its aesthetic–black with a flower motif–being extensions of the Remington sewing machine. Notably the typewriter's aesthetic was feminine, because it was aimed to 'fit' into the late Victorian interior, an idealized space of femininity, whether that space be of the (male) office or (female) home (Perkin 2002, 37).[231] This was a conscious marketing strategy, as it was explicitly promoted as such from the first instance when the machine was described in its first advertisement as being "an ornament to an office, study, or sitting-room" (Locke, Yost et al. 1875). Yet even in its feminised aesthetic it was nevertheless primarily aimed to be used by professional men, "editors, authors, clergymen – all of whom are obliged to undergo the drudgery of the pen" (Locke, Yost et al. 1875).[232] Even aimed at (male) professional users, first and foremost, this new machine was congruent with the embroidered cushions, the drapes, the sewing machine, the carpets; it was patterned to be an extension of the pattern within the domestic space–it was patterned to fit.

Finally, the argument that typewriting is a remediation of piano playing and embroidery folds back on itself: the act of writing is a techne, a craft and a technology, whether that technology be a stylus, pencil, or typewriter as "Ancient and modern writing are technologies in the sense that they are methods for arranging verbal ideas in visual space" (Bolter 2001, 17). Therefore although writing can take many forms and be created with a variety of different technologies and techniques, it is always an act of a human agent converting thought into material substance, into the world. With the use of the typewriter, the act of writing became partially mechanised, although it still required a human operator. However typewriting carried with it other technologies, technologies and techniques women had traditionally been trained in and performed–the sewing machine and the piano, and needlework and piano playing. Whilst accomplishments were presumed to be refined, non-capitalist occupations engaged with in order to create a valuable commodity for the marriage market, in actuality these accomplishment were labours, were work that armed women, training them to operate their bodies in particular ways so that with their accomplished fingers, they could enter the labour market en masse.

Finally, this remediation reveals another aspect of female labour, craft and technology. Embroidery requires the ability to read embroidery patterns; piano playing requires knowledge of how to read musical notations; and typewriting requires the knowledge of written language and forms of writing. Thus each practice reveals itself to be one of codes, of reading codes and transcribing them into material form, whether that form be ephemeral, as with music, or material, as with a piece of sewn material or a typewritten text. However the translation of these texts (the pattern book, the sheet music and the annotated or spoken word) into different material forms (the sewn piece, the recital, the written letter) requires a 'reading between the lines'; for typewritten text there is the material text and its meaning; likewise with embroidery there are the individual stitches and the meaning of the image; and for the piano, the individual notes create a continuous and total piece of music. Therefore although these activities are often framed, and thereby dismissed, as mere manual labour, in actuality the use of women's hands to embroider, play the piano and typewrite positions women as code makers, readers and

[231] Angela Kwolek-Folland traces the increasing feminisation in the interiors and architecture of the office in late nineteenth century, as offices became styled in a more domestic manner, with the introduction of rugs, fireplaces, rich wood desks and curtains. That the Remington Type Writer should be femininely decorated does not necessarily mean it was intended for the home, but was intended for the increasingly feminised space of the male office (Kwolek-Folland 1994).

[232] The relationship between the piano, sewing machine and typewriter is also made explicit in the first advertisement for the Remington & Sons Type-Writer, which has the following opening passage:

> A machine now superseding the pen. It is manufactured by Messrs. E. Remington & Sons of Ilion. It is the size of a sewing machine, and is an ornament to an office, study or sitting room. It is worked by keys, similar to a piano ..... ("Type Writing Machine" 1867)

translators.[233] Thus as embroidery patterns, piano scores and dictation were transformed into cushions, piano performances and typewritten pieces of communication, women interpreted a code which they then enacted, or performed out, both through objects of technology and through the techniques of the female bodies, to produce an item, a patterned material object, a patterned aural space and a patterned piece of communication.[234]

[233] Parker, in defining the practice of embroidery as a cultural practice involving iconography, style and a social function, is also arguing towards embroidery as being an expression of codes; the iconography is a symbolic code; the style a visual code; whilst the social function is the unique expression of a social code (Parker 1984). In this way, embroiderers are code makers par exemplar.

[234] Certainly music was originally a *techne*, and this word betrays its roots as being tied to bodily acts, with musicians being known as *tectons*, as "step-joiners, people who filled the intervals or spaces between sound with their bodies" (Stubley 2006, 46).

3.3 Mechanised Women: Telegraphists and Typewriters 1832-1905

The final section of this chapter examines women's work with technological communication devices from the mid- to late-nineteenth century, in those industries in which women were employed in significant numbers. Through the history of women's training and practice first in telegraphy and then typewriting, it argues that the construction of women as mechanisms, as conduits, as labouring devices of the late nineteenth century media communication explosion, was a crucial element in the feminisation of typewriting and thus, as media communication exploded, women's bodies were drawn necessarily into the labour market en masse.

Telegraph/y/ists

Although there had been attempts to communicate across a distance before the arrival of the electrical telegraph in the 1840s, it was not until the American painter and inventor Samuel Morse (1791-1872) and the British pairing of William Cooke and Charles Wheatstone simultaneously developed complete electrical telegraphs that it can be said to have been successful.[235] Morse began his development of a new communication system upon hearing of the newly discovered phenomenon of electromagnetism during a return sea voyage from Europe to New York, a report and demonstration of which elicited the response from Morse, that "if the presence of electricity could be made visible in any part of the circuit, I see no reason why intelligence cannot be transmitted instantaneously by electricity" (Ornell 1982, 444).[236] In inventing a complete telegraph system of wires, sending and receiving machines and notational system, there were two elements of his invention that are crucial in understanding the success of Morse's innovation. The first of these was his invention of an electromagnetic relay, part of the transmission and reception machines that was able to answer some of the problems inherent in the previous attempts at inventing an electrical telegraph

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235 Whilst Morse's system was the first successful electromagnetic telegraph system, it was not the first telegraph system, mechanical or electrical. In 1753, an anonymous writer with the initials C.M. outlined the possibility of an electrical telegraph, writing in a letter to the *Scotts Magazine*, published on 17 February,

> It is well known to all who are conversant in electrical experiments, that electric power may be propagated along a small wire, from one place to another, without being sensibly abated by length of progress. Let then a set of wires, equal in number to the letters of the alphabet... (Molloy 1974, 5).

After this however, there is the more famous Chappe telegraph system, which was not electrical but rather optical–a form of long distance semaphore. In naming his system, Tom Standage notes that Chappe wanted to call his invention a 'techygraphe', or fast writer; but he was persuaded by a friend to name it the 'telegraphe' or far writer, showing time and space were understood as being radically restructured by these new technologies–although which of the time and space were the focus of alteration was obviously contentious (Standage 2007, 10). For more on time, space and telegraphy, see Morus 2000.

In his lecture to the Post Office Telephone and Telegraph Society in 1934 on the history of the telegraph, H.G.Sellars lists a number of early inventors of a telegraph system; however the device he describes these individuals as being involved in developing is a electrified polygraph, whose transmission rod between the two writing pens is replaced by an electrical system–a transmitter, wire and then receiver. Of those who attempted this machine's invention are Ralph Wedgwood, E.A.Cooper, Lenoir, Arlincourt, Jordery, a J.H.Robertson and 'others', a number of whom also appear as early typewriter inventors. (See Appendix 1: Pre-1868 Typewriters). Sellars claims that it was not until E.A.Cooper invented his 'telautograph', or 'telewriter' in 1878 that this machine could be considered suitable for public use. Sellars' description of Cooper's machine follows, to flesh out how this machine was a communication device intended to transmit handwriting rather than typewriting or an alphabetic code, noting that,

> The transmitter consists of a pencil carrying at the point two jointed rods. When writing, the movements of these rods and their extensions vary the current sent to the line wires. The received signals pass through two moving coils which take up positions in accordance with the current variations, and their movements are conveyed to the receiving pen, which consequently reproduces the lines drawn by the transmitting pencil. The pen also responds when the pencil is lifted from the paper roll as writing proceeds. To move the paper up when writing, the transmitting pencil is pressed against a small contact to the left of the writing tablet. This action not only shifts the paper at the receiving pen to obtain a fresh supply from the inkwell in a manner which quaintly resembles a personal movement. (Sellars 1934, 9)

Also part of the telegraph thread in the history of mechanised writing is Frederick Creed's Teleprinter, which was a keyboard typewriter telegraph of the late nineteenth century(Ibid.).

In inventing an electric telegraph, both Morse, and Cooke and Wheatstone were building on the work of other attempts at an electric telegraph, including Baron Schuling von Canstatt's invention of 1832, Carl Friedrich Gauss and Wilhelm Weber's personal electric telegraph of 1833. Again, with this invention, a number of telegraph inventors are also listed as early typewriter inventors.

236 Dr. Charles Jackson was the teller of this tale, who subsequently demonstrated electromagnetism's properties to Morse, building on the work of William Sturgeon, who described it in 1924 (Ornell 1982, 444).

system; the second element was his invention of the notational system of Morse code, a code that turned the constraints of his electrical transmission system into an alphabet, which could then be used to write messages. With a working model ready in 1835, and its first public demonstration in 1837–at the City University of New York, where he was the Professor of Painting and Sculpture–it was not until 1844 that Morse managed to secure funds from the American Congress to run a line from Baltimore to Washington, over which he transmitted the first long distance message (Ornell 1982, 445).

Morse's successful transmission of communication over a long distance, his successful transmission of intelligence by electricity, was followed by a period of fervent speculation by investors, who were quick to purchase licenses to establish their own telegraphic communication networks, and in doing so, they established a myriad of new telegraph companies. Following the formation of the Magnetic Telegraph Company in 1846–the company that was the first to establish a telegraphic line between Washington and New York–an exponentially increasing number of newly established telegraphic companies was joined by a competing telegraph system that used the newly invented printed telegraph machines of Royal E. House and David Hughes (Figure 3.7 and 3.8). The purchase of telegraphic licences, both of the Morse telegraph system and then from its subsequent rivals invented in Morse's wake, saw a similar exponential increase in the length of telegraph wires that soon were to criss-cross the globe, as well as in the number of telegraph offices that became the nodes of the system. From the initial small length of 40 miles of telegraph lines that in 1844 were laid between Washington and Baltimore, in America there were over 2,000 miles of lines just three years later; by 1849, these lines covered 12,000 miles; by 1853 there were 27,000 miles; and by 1867, there were 90,000 miles of telegraph lines covering America, creating a "net-work like a spider's web" (Sollors 1983, 470; Stolow 2006, 9; and Standage 2007, 58). In Great Britain, this spider's web began with 2,200 miles of lines in 1850, but soon increased to 40,000 miles by 1854 and 80,000 miles by 1867 (Otis 2001, 190). Likewise, there was an explosion of telegraphic companies so that by 1850, there were over fifty separate American telegraph companies. However this explosion in telegraphy did not occur only in America and Great Britain but was a global phenomenon, with newly formed telegraph companies often spanning national borders, sometimes spanning previously uncharted territory. These newly formed companies included the Electric Telegraph Company (1846), the Submarine Telegraph Company (1850), Western Union Telegraph Company (1851), the Société du Câble Transatlantique Française (1869), the Eastern Telegraph Company (1872), the Africa Direct Telegraph Company (1885). The founding of all of these companies meant that by the early 1870s, there was over 650,000 miles of telegraph lines "web[bing] the world in a net-work of throbbing life", producing a world that was "palpitating with human thoughts and emotions" (Otis 2001, 191).

To man this rapidly increasing new communication network, armies of trained telegraph operators were needed. Christened modern Prometheans by telegraph historian Thomas Jepsen, these new telegraph operators needed to be technically minded and literate (Jepsen 2000, 40). Although many men seemed to be the natural bodies to become telegraph operators–due to the technical nature of the work, and the need for a high level of literacy–it was soon established that this type of work was, in many ways, ideal labour for women. On the surface this switch in the gender of the labour required for this albeit new professional occupation is a surprising turn of events in the mid-nineteenth century. To assuage this surprise, to justify this re-gendering, contemporary accounts cite women's cheapness and docility as the main reasons for their employment at the telegraph key, arguing that they were far better employees than more expensive and demanding men. However, another reason often

cited is their skill at the "manipulation of the apparatus" and that the "steady work at low pressure, with more or less mechanica [sic] in character, necessitating little or no judgement" was ideal work for women (Garland 1901, 254, 258).[237] As media historian Laura Otis has noted, it was "women's superior manual skills and the lack of agency in their movements" that saw their increased employment as telegraph operators; and in the argument that women were the ideal telegraph operators, the familiar biological essentialist argument became re-articulated in relation to the machinery of age, as women's mechanistic natures elide with the new media communications (Otis 2001, 194). By 1855, one of the leading British telegraph businesses, The Electric Telegraph Company, employed noticeable numbers of women as telegraph operators, who, like many of the women who were later to be employed as typewriters, were single and middle-class, often the daughters of men of the professional classes.[238] These women were employed as operators, normally under the direction of a female matron; the female matron was herself directed by her male employers. The careful separation of the sexes in the business' operation and process continued into the space of the business; the offices normally had separate entrances for the women, separate facilities and separate office spaces, the necessity and therefore expense of which was sometimes cited as a reason against women's employment as telegraphers (Garland 1901, 257). Initially the sending and receiving of telegraph messages was not a constant work, and thus there were natural decreases and breaks in the work intensity of telegraphy. Although female operators worked long hours, from 8am to 10pm, during their breaks they were oftentimes noted as doing needlework (Kieve 1973, 87).

In the United States, women telegraph operators first became state employees during the Civil War, when the government's (male) operators were sent into the battlefield. Following the war and return of the (male) operators, these newly trained women moved from being governmental employees to commercial sector employees when they were hired by the Western Union Telegraph Company (WUTC), whose unofficial employment of women during the war caused it to realise that the business' employment costs could be slashed if it employed female rather than male operators. Following this hiring process however, the WUTC soon saw the opportunity to offer industry accreditation to the armies of women eager to become telegraph operators. Therefore in 1869, it sponsored a telegraph training course specifically for women at a New York private business college, the Cooper Institute. The course lasted eighteen weeks, and included bookkeeping, battery maintenance, sending and receiving messages in Morse code, and preparing reports–a mix of intellectual and physical work that demonstrates the technical nature of telegraphy was not merely mechanistic, as had been argued in the regendering of the telegraph operator. When this course ran, its admissions procedure was not only very competitive but also demanding in the amount of work it required of its trainees.[239] Firstly, applicants had to apply by handwriting a letter, in order that both their 'hand' and their

[237] Although Garland goes on to note that where this pattern of work is not found, women are generally inferior to men, he attempts to be generous in his criticism, noting that this might have been, partly, due to "educational disability". However, in the next clause he sweeps this aside, noting that "there seems to be something more fundamental in the ability to work at high pressure" for women (Garland 1901, 258). On the same page, Garland quotes Havelock Ellis' argument about what work was suitable for men and women, in which he wrote,

> The tasks which demand a powerful development of muscle and bone, and the resulting capacity for intermittent spurts of energy, involving periods of rest, fall to the man; the care of children and all the very various industries which radiate from the hearth, and which call for an expenditure of energy more continuous but at a lower tension, fall to the woman. (Ellis 1894, 1)

[238] However, what is noticeably different is that the pay for female telegraph operators was substantially more than other paid work for women; in 1859, women operators earned between 10s and 30s a month, compared to the 3d a day earnt by needlewomen (Kieve 1973, 86-7).

[239] The course ran for eighteen weeks, from 9.30am to 3.30pm. Should a student miss three sessions, she would be dismissed from the course. Courses in other western countries were even more demanding, such as the entrance to the Norwegian national telegraph training course; on this course there were exams in French, German and English, as well as handwriting, literacy and the Scandinavian languages. Hence telegraph operators in Norway were normally from the upper-middle class (Jepsen 2000, 97-8).

level of literacy could be judged. This was then followed by an interview in which the applicant's overall physical strength and health was assessed, for, as noted in the advertisement for the course, "Preference will be given to those who by education and physical ability appear best qualified for the business" (Journal of the Telegraph, 15 February 1869; quoted in Jepsen 2000, 44). These criteria for training–high level of literacy, physical strength, and good handwriting–were clearly aimed towards admitting middle-class women and girls, those women who were well educated and physically healthy.[240] However, even for those trained telegraph operators who secured employment on graduation, the work was never constant, with busy and quiet periods; and it was in those quiet moments, that a contemporary commentator noted that,

> When a message has been dispatched or received, the operator may, and often does, take up her knitting, crocheting, or sewing, passing pleasantly the interval until the arrival of the next message. (Rayne 1893; quoted in Jepsen 2000, 139)

That needlework should sit side-by-side with technical operation appears again, in the case of one of the first digital nomads, Emma Hunter of Westchester, Pennsylvania. In the very early days of the telegraph, in 1851, the superintendent of the telegraph company the Atlantic and Ohio Telegraph Company employed Miss Hunter as one of the first telegraph operators. However, instead of assigning her a desk in the office, he ran telegraph wires to her sitting room, installing a key on one side of the room. As the editor of the *Journal of the Telegraph* noted, on the other side of the sitting room, opposite the telegraph machine, was a sewing basket so that,

> ... [the] new assistant sent and received her messages, and filled up the interim in fixing her Sunday bonnet or embroidering articles of raiment which a gentleman editor is not expected to know or name. (1870, 22; quoted in Jepsen 2000).

Certainly in the United States, female telegraph operators often came from working class backgrounds, and used their employment as telegraphers to enter middle-class; the telegraphy industry was ideal for those who were "literate, technically minded and socially aspirational"; and the relatively high pay enabled these tapping women to move into a different economic class (Jepsen 2000, 40).[241] Mrs M.E. Lewis, a telegraph operator from New York, tied the domestic practices to commercial ones in the following way,

> Woman's sphere, according to him [J.W. Stover, a critic of female telegraph operators] is keeping house. Now, exactly the qualities for a good housekeeper are those for a good telegrapher–patience, faithfulness, careful attention to numerous and tiresome little details. If women are not on an average altogether superior to men in those qualities, I am in error. (Jepsen 1993).

Undoubtedly the economics of the telegrapher was similar to that the typewriter, in that women were paid one half to two thirds of a male salary, for performing in the same position.

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[240] The first course admitted eighteen students, of which two resigned and four were released due to incompetence. By 1871, just two year later, there were 275 applicants for the course, of which ninety-six were admitted.

[241] By 1860, women operators were earning between $6 and $25 a month, which Jepsen makes equivalent to the pay of a teacher or bookkeeper. In comparison, factory work would pay around $10-15, whilst domestic work would pay $5-10. The payscale for types of work in telegraphy offices were as follows: Managers, $100-150; Chief operators, $75-100; First-class operators, $60-100; Second-class operators, $15-60; Clerks, $15-30; and Messengers, $10-15 (Jepsen 2000, 61-63).

In 1877, Mr Fischer, the manager of the Central Telegraph Office (CTO) in London, carried out the Postmaster General's instructions to replace 120 female telegraph operators with 100 male operators. Ostensibly, this replacement was done in order that the CTO could have a more flexible work force; the women employees were not permitted to work nights nor on a Sunday, and by 1877, this was considered to be a hindrance to the efficient working of the office–a case of the very rules around the employment of women as established by men being used for their subsequent dismissal (Central Telegraph Office and Postmaster General 1877-1880). However in a subsequent letter, Mr. Fischer requests to make further substitutions, replacing ninety-six women with ninety-six men, replacing three supervisors (female superintendents), six assistant supervisors (female assistant superintendents), twelve first class telegraphists, twenty-eight second class telegraphists and forty-seven third class telegraphists, with one male superintendent, four male assistant superintendents, fourteen first class male telegraphists, thirty-three second class male telegraphists, and forty-four third class male telegraphists. Even with an increase in the number of lower-order male employees replacing more highly placed female ones, the cost of carrying out this substitution was calculated at £2,563, 13s, 1d, demonstrating how vast the pay differential between the genders in the same employ was in the late-nineteenth century, and how keen the male management was in ridding itself of female employees.

Although the tapping out of codes through women's dexterous fingers was possible because this 'clean' work was able to keep interaction of their bodies with 'the public' at a minimum, this form of writing was often viewed as stripping the body out of the writing, out of the hand. However, as experienced telegraph operators soon discovered, the use of a writing machine, albeit through the standardised code of long and short taps to transmit letters of the alphabet down the wires, did not strip away agency–in fact, an experienced operator could construct an agency from the very rhythm of his/her taps. For, as Laura Otis notes "Technological communications, like those sent directly by the body, have a distinct personal rhythm", a phenomenological distinction that meant "from the duration and spacing of Morse's dots and dashes, an experienced operator could detect not just the sender's sex and identity but his or her personality or mood" (Otis 2001, 196).

Typewriter Training

Just as training was central to the spread of telegraphy, typewriter training was a crucial element in the rapid absorption of the typewriter into the cultural landscape. The first documented typewriter-training course for women was offered through the Ballard School of the Young Women's Christian Association (YWCA) in New York in 1881.[242] From this course, women were assigned to workplaces, with the typewriter (machine) leading the way–the typewriter was sold to the employer, and with it the employer received an operator. However in the setting up of the YWCA typewriter training programme, an anxiety arose in the Education Committee of the organisation about training women as typewriters and was only assuaged by the proposal that admittance onto the six month course was conditional on the female candidates successfully passing a "thorough physical examination"' so that the committee could counter the claim that "the female mind and constitution would be certain to break under the strain" (Sims 1936, 84-85). The first class at the YWCA admitted eight 'strong' women, all of whom quickly found employment after their six-month course (Beeching 1990, 36). However such was the success that the YWCA ended up receiving "hundreds of requests it couldn't fill,"

[242] The earliest reference to a typewriting school comes from 1878, when a commercial school began to include typewriting classes by D. L Scott-Browne at 737 Broadway, New York, USA (Herkimer County Historical Society 1923, 81).

so much so that "the directors had to send back polite word that, until another class had been graduated, the supply of girls was unfortunately exhausted" (Bliven 1954, 72).[243] The demand for typewriter training and for trained typewriter operators exploded in America in the first half of the 1880s and in the second half of the decade in the UK. This explosion was met with a surge in typewriter training schools and courses. In America, this surge in typewriter classes is largely found within the context of already established business colleges, the largest of which was the chain of Bryant and Stratton Business Colleges. By 1864, the Bryant and Stratton Business College had fifty separate business schools, running in a large number of major US cities. In 1880, it began to run a typewriting course, whose establishment can be seen to confer on the typewriter a level of cultural success, specifically from business educators and commercial organisations. However in its establishment, the College was explicit about who were the ideal bodies for this course and how these bodies should function, as the course description outlines,

> Ordinarily one who has the ability to play well upon the piano and especially one who has practical knowledge of phonography may become an expert typist. This department of industry is exactly suited to women. Requires none of the physical exhaustion which causes the sewing machine to be dreaded (1880, 31; quoted in Fine 1990, 21).

The explosion of typewriter training and consequently of trained operators was such that when Irene Hartt came to write her 1895 advice booklet *How to Make Money Although a Woman*, she included a chapter on becoming a typewriter, as "typewriting is in great demand", noting that there were approximately 2,000 stenographers and typewriters in New York City, three-quarters of whom were women (Hartt 1895, 90). In accounting for women's new place at the machine, Hartt cites the frequently-voiced reason that because "typewriting is very much a simple mechanical acquirement, which demands a rapidity of finger movement" that "[t]he best typewriters are women" as "women always excel men" in this capacity and capability of their bodies (Hartt 1895, 89). Supporting Lisa Fine's argument that the late nineteenth century office became domesticated, Hartt notes that the presence of these women machine operators in often male-only offices had the effect of improving and refining them, as "[a] good woman is always a good woman, and she improves those things about her instead of descending to them" (Hartt 1895, 89). Just as there was an implicit call for middle class women to become telegraph operators–by demanding that the women were healthy and highly literate–so too was there an implicit demand for the same in typewriter operators. Hartt notes that to become a successful typewriter, a woman must have a good education, be up-to-date with world events, know who the leading public men of the day are, their politics and how to spell their names, as well as have a good working knowledge of the names of 'foreign' countries and cities; in short a female typewriter "must be bright and right up to the times" (Hartt 1895, 88-9).

In the UK, the first typewriting training class was established by the Society for the Promotion of the Employment of Women (SPEW) in 1884. Although uncertain about whether

[243] The exact details of the physical examination prospective female typewriting students were submitted to is not clear. However the 1880s was the decade in which body analysis methods were formalised through Galton's anthropometry and Bertillon's classification of criminals. What is particularly relevant to this discussion of clerical work and bodily practices is Galton's anthropometry as it was aimed, from the outset, towards adoption by the British Civil Service; Galton intended his system to be used to identify the most able bodies to work in public office. As Galton himself notes, anthropometric analysis were already being practised in the USA, where students at John Hopkins University were required to be regularly physically examined in order to matriculate (Galton, 1884, 35-36). Students at East Coast American colleges still had to submit themselves to anthropometric evaluation and analysis in order to graduate, up until at least 1960s, with George W. Bush at Yale and Hillary Rodham Clinton at Wellesley being two of the students who would have been analysed (Burnyeat 2008).

it would be a financially secure, SPEW set up a typewriter office because "an intelligent woman, who is energetic and punctual ought to be able to make a fair income by it" (The Society for Promoting the Employment of Women 1884, 13-14). Setting up an office at Lonsdale Chambers, 27 Chancery Lane, in the heart of London's legal district, the joint managers Mrs Marshall and Miss Garrett oversaw an office of four to five women, working on three (Remington) machines. Work was immediate and the office soon had to buy more machines to accommodate the work, taking the total to seven by 1885.[244] The first report by the typewriting office to the SPEW Committee highlighted the crucial role that dexterity played in producing a good typewriter, a typewriter which the office trained, noting that "those who are accustomed to play on the pianoforte and whose fingers are lithe and nimble are most successful" (The Society for Promoting the Employment of Women 1885, 13-14). By the following year, 1886, the typewriting office had purchased a further six machines, doubled their office space to accommodate their growing staff and students, employing eight clerks and training sixteen women (referred to as ladies), four of whom moved to Liverpool, Cambridge and Oxford within the year, to open satellite offices. However such was the throughput of work and the need for typewriting training that in the same year, 1886, the SPEW typewriting office began to issue 'certificates of competency' to its successful trainees, to ensure the quality of the typewriting and of the typewriter operators for potential employees, presumably because by this stage there was competition from other, less reputable typewriter operators. In issuing this certification, the typewriting office declared that "No one should attempt to open a type-writing office without having had at least six months' training in an office where steady and general work is going on" (The Society for Promoting the Employment of Women 1886, 13). By 1890, the UK typewriting industry had become firmly established–in 1887, one of the satellite offices purchased a Hammond typewriter, a more portable writing machine than its Remington machines, so that typewriter operators could be sent out to offices where they were needed (The Society for Promoting the Employment of Women 1887, 14); in 1889, Mrs Marshall, the 'mother' of SPEW's typewriting program, noted that "The demand ... noted in 1887 in skilled typists arrived in 1889" when "Supply is not sufficient to meet demand" (The Society for Promoting the Employment of Women 1889, 12); and by 1890, the typewriting program's annual report to the Society notes that twenty-seven offices had joined together to form the Society of Typists for typewriter employers, and a Type-Writer Operators' Union had been formed for clerks, in order to stabilise the price of a typewriter operator, with some fifty separate typewriter offices and training schools operating in London alone (The Society for Promoting the Employment of Women 1890, 13).

In understanding why women's 'natural' dexterity was so important in the first decades of the typewriter's successful absorption into the cultural landscape, it is fundamental to note that there was no uniform technique of typewriting for at least the initial decade following the introduction of the Remington typewriter. Touch-typing was a technique developed after the popularity and success of the machine was, to a greater degree, already established. The formalisation of this technique came from Mrs Elizabeth Longley at the Phonographic and Typewriting School of Cincinnati in 1881. In the first book on touch-typing *Type-Writer Lessons for the Use of Teachers and Learners Adapted to Remington's Perfected Type-Writers*, published in 1882, Mrs. Longley promoted her 'all finger method' – a method of typewriting with one's eight fingers–by recommending that "if each finger is allowed to do its

[244] Records show that in October 1884 the SPEW typewriting office typed 6 plays, 106 folios, 24 pages of stock lists, 2 hours of writing from dictation; in November 1884, 3 plays, 129 folios, 104,192 words charged per 1,000; in December 1884, 2 plays, 571 folios, 85,144 words charged per 1,000; in January 1885, 17 plays, 238 folios and 47,048 words charged per 1,000; and in February 1885, 16 plays, 85 folios, 202,349 words charged per 1,000, including 10 hours of writing from dictation (The Society for Promoting the Employment of Women 1885, 13-14).

share of the work," then "the labor of striking the keys will be pretty equally distributed and easily performed"; for "the use of all the fingers in type-writing" was "just as important as in piano-playing" (Longley 1882, 2). When she came to write the companion typewriter instruction book for the double keyboard Caligraph later in the same year, *Caligraph Lessons for the Use of Teachers and Learners Designed to Develop Accurate and Reliable Operators*, the practice of playing the piano came further to the fore. Mrs. Longley notes,

> Any one can sit down, and, by striking the keys, print words; just as any one can, by striking the keys of a piano, sound the notes of a tune; but to strike the keys of the Caligraph in a way that will make the most perfect work the most rapidly, requires experience, or the advice and instruction of those who have given the subject special attention. (Longley 1882, 1)

This description of learning how to write on a typewriter places accuracy and rapidity at the forefront of the practice of typewriting; but in its relation to piano playing, it suggests that the technique of playing the typewriter is intimately tied to the product of the typewriter–perfect work would only result from a perfect technique, one in which a typewriter operator had to be professionally trained. With the publication of *Practical Typewriting by the All-Finger Method, Which Leads to Operation by Touch* by Bates Torrey in 1889, touch-typing was cemented as the teaching method of the technique of typewriting (Torrey 1889).

Undoubtedly, prior to the advent of touch-typing as a formal system of operation of the typewriter, women's hands trained in playing the piano can be considered to be 'pre-trained', albeit unknowingly, in the operation of the typewriter keyboard, a factor commentators of the time were aware of. Again and again in the literature of the time, references are found to piano playing in conjunction with typewriting, such as calling the typewriter a 'literary piano'. This description of typewriters as pianos ties in with a thread of mechanised writing machines pre-1868, most notably Pierre Foucauld's Clavier Imprimeur (1849), Oliver Eddy's Printing Machine (1850), Dr. Samuel Francis' Printing Machine (1857) and Adolphe Charles Guillemot's Machine for the Blind (1859), all of which were direct adaptations of a pianoforte (Figures 1.53, 3.5 and 3.6). Returning to the contemporary literature, the sales agents for the Remington typewriter, Wyckoff, Seamans & Benedict, capitalised on the piano technology inbuilt into this new writing technology, one which necessarily meant that the technique of the piano was inbuilt into the technique of typewriting from its very start. In capitalising on this facet of the typewriter, the sales and marketing firm placed a newspaper advertisement for a typewriter operator in 1875, referenced as the first, that set out to exploit an already existent labour force suitable for the machine's operation; it ran as follows,

> A bright educated woman wanted to take a remunerative position. Musician required. (Wyckoff, Seamans et al. 1900, 6; also Pioneer Typewriter Gets Jeweled Watch: Mrs. Saunders Introduced Writing Machine in London 1905).

This advertisement was answered by a Mrs. A.M. Saunders, a doctor's daughter who, after she had been widowed with a young child, began working as a music teacher because of her noted skill at the piano. After an initial interview for the advertised role, she took the promotional literature and at first glance, thought she had applied for a job operating a sewing machine, but she "could not see how a sewing machine could write" (Pioneer Typewriter Gets Jeweled Watch: Mrs. Saunders Introduced Writing Machine in London 1905). However, after instruction and practice, this middle-class gentile piano-playing lady became the one of the

leading typewriter operators of the Remington company, introducing and training women typewriter operators in major metropolises across the United States and later in London. Mrs. Saunders was in no doubt her skill at the typewriter was due to her piano training, and Remington & Sons made clear that she had been hired as a "[musician's] touch was needed on the keys to insure speed" (Pioneer Typewriter Gets Jeweled Watch: Mrs. Saunders Introduced Writing Machine in London 1905). And yet with this speed of her fingers at the piano came other factors: middle-class status, a good education, physical strength and the ability to read a notational language and to perform it through her body. This first case of a female typist, Lisa Fine argues, was not a single anomalous case but rather an expression of the widely held belief by those in the typewriter industry–salesman, manufacturers, promoters and typing schools–that "most educated, middle-class women, in particular, possess a skill that would enable them to effectively learn and demonstrate this new skill" (Fine 1990, 21). This argument can be seen in other historical documentation around typewriting, such as when Mrs. M.V. Longley's echoed the necessary relation between piano playing and typewriting at her address to the First Annual Congress of Shorthand Writers in Cincinnati in 1882, albeit that it articulated in greater detail the physicality necessary for the typewriter's operation; for,

> As well might a person expect to be a successful piano or organ player while using but two or three fingers of each hand as expect to be a successful typewriter operator while using only a part of the fingers to strike the keys of the instrument (Wyckoff, Seamans et al. 1900, 6).

Although the publication of manuals on touch-typing helped in the adoption of this method of typewriter operation, the widespread use of this method was the result of 'spectacle'. To promote the machines, rather than the technique, Wyckoff, Seamans & Benedict staged a series of typewriting contests between Frank McGurrin, a law clerk from Michigan who had taught himself the then unknown technique of touch typing some ten years earlier in 1878, and Louis Traub, a typewriting instructor and sales agent. In a widely anticipated competition in Cincinnati on 25 July 1888, McGurrin and Traub publicly competed against each other, the former on a Remington and the latter on a Caligraph, in a competition that drew both a huge crowd and huge media attention. With McGurrin's success, the event proved a success for Remington's writing machines, partially through establishing that the skill of typewriting lay in the machine rather than the operator; such was the success of the entire press relations event, that numerous other typewriting competitions were staged and others who had taught themselves touch-typing joined the fray.

The Business Practices and Economics of the Typewriter

The type of work typewriters were trained to perform fell into two distinct business practices. The first practice was typewriter (person) as copyist/multiplier-of-text.[245] The second was typewriter (person) as stenographer-typist; these were individuals trained in shorthand and typewriting. To understand how the typewriter, machine and operator fitted into the commercial office, it is necessary to examine which business practices the typewriter replaced, accentuated or eliminated.

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[245] Using carbon paper, a typist could produce numerous copies of one piece of (type) writing, and, in this use of the typewriter, can be seen to be a replacement for the traditional (male) office role of copyist/scrivener. This history of the typewriter and the history of carbon paper are intimately tied together, with the invention of carbon paper by Pellegrino Turri to be written through, with his typewriter for the Countess Carolina Fantoni; and also Ralph Wedgwood's Manifold Writer, which was, as discussed in Chapter One, not a typewriter but carbon paper for generating simultaneous copies of handwritten letters. For more on the latter invention see Adler 1990.

Up until mechanisation and the drive towards efficiency, the commercial office/business had followed the same structural template for decades, if not centuries. By the mid-nineteenth century, the standard office structure was vertically hierarchical and narrow, with the business owner at the top, followed by the manager(s), clerks, copyists and, at the bottom, office-boy(s). The model was a ladder model, in that entrance at the bottom rung could lead an individual upwards, provided he had the right skills. Thus the office boy was an apprentice copyist, the copyist was an apprentice clerk, the clerk was an apprentice manager, and the manager was an apprentice (or more often, a *de facto*) business owner. This was reinforced by the structure of the space of the office itself, which was often not spatially differentiated, but had all employees working within close physical proximity to one another, thus facilitating the circulation of business knowledge and practice to all the employees.

Where a typewriter was introduced with the requisite body to operate it, the typist took over, predominantly, the copyist position, although oftentimes also parts of the clerical role. In situations where women were employed to operate a typewriter as copyists/multipliers of text, women did not enter the office directly, either as business practice or space. For example, in the British Civil Service, typewriting women copyists worked in a separate room or rooms to the rest of the organisation, often with a separate entrance and facilities, mimicking the structure used in the employment of women in the telegraphy business (Zimmeck 1995, 78-79; and Zimmeck 1986, 160).[246] The transmission of work from the main office to the typing copyists was by use of a dumb waiter, segregating the new female bodies into a precisely demarcated, limited space. In terms of business practice, the typists' reporting line was an added vertical to the already existent business structure; at the point where the main business and the new business activity touched, a female supervisor, a matriarchic manager, was positioned. These gendering practices around typewriter business practice had shifted over from telegraphy, where women were placed under the supervision of a matron who acted as the bridge between the 'girls' and the management, in order that the male management team did not have to come into direct contact with the women who worked for them and vice versa. However, unlike telegraph operators, these new women, these typewriters, were add-ons to, rather than integral parts of the business. Female typewriter-copyists were organised according to principles drawn through from the domestic space, both being set up as a working collective and as being a parallel extension to capitalist structures. For the men who had been removed from entry level jobs in the corporate office of the late-nineteenth century, becoming a clerk was no guarantee of an apprenticeship in business and trade, as noted by one historian of the office, who wrote that the 'ladder of success' was replaced by the 'pyramid of promotion' (Kwolek-Folland 1994, 51).[247] The separation of women into office practice extensions resulted in a demarcation of employment. Whereas male copyists, skilled in what became called the

[246] At the start of their employ in the British Civil Service, women were locked into their rooms (Silverstone 1976). By 1890, the Treasury had organised its workforce not so much by work type, but rather by gender, by keeping its typing pool 'at the top of the house' in 'Special Rooms separate from Office. Special stair-case. W.C.' (Zimmeck 1995, 78). The Foreign Office soon followed suit, adding a dumb waiter through which the male 'boss' could send all the papers for the typing pool to work on, to ensure 'no personal communication with rest of Office' (Ibid.). Zimmeck notes that this demarcation of gender work types had "the effect of rendering women virtually invisible", as well as making the practice of typewriting distinct from hand (writing) copying, rather than as a natural extension to it (Ibid.). Other organisations also followed this demarcation of space for their typewriters, including the Prudential Life Assurance Company, which employed 160 women as 'lady clerks'. Although it adhered to the demarcation of space and practice as outlined by Zimmeck and Silverstone, the Prudential also provided a library and, notably for the argument of this chapter, a piano, both to be used in the work breaks and during lunchtimes (Hammerton 1979, 42). At the same time, the Electric and International Telegraph Company had a similar organisation of its female telegraphists, with separate (private) staircase, rather than the principal (public) staircase that men used, in addition to a separate dining hall and cloak-room (Zimmeck 1986, 160).

[247] That the metaphor of the ladder is replaced with the pyramid mirrors the use of the ladder metaphor within evolutionary biology, as the ladder of progress notion is competes with Babbage's vertical model of the division of labour, which saw large numbers of women at so-called 'low' skilled work, usually with their hands, working under a smaller number of male supervisors (Raucher, Dime Store Chains: quoted in Kwolek-Folland 1994, 51).

craft of handwriting and whom typewriters began to rapidly replace, were firmly embedded within the structure of the business, women were not. As embedded business craft, male copyists occupied a position within the business that was a rung on the ladder to promotion to the position of clerk and from there, possibly further up into the management of the business itself. However (female) typewriters, as part of a separate vertical line of the business, running almost parallel but hardly touching the main business area, did not have this possibility; their only possible promotion could be as the supervising typewriter and from there, no further. This was further confirmed by the so-called 'marriage bar', where upon marriage women were expected to resign their posts to devote their entire energies to their domestic duties.[248] The patriarchy of this system was compounded when employers began to offer a dowry to those of its female employees who did marry. For those typists who did not marry and therefore continued in employment typewriting, there was no entitlement to a pension.[249]

There is also evidence that even having women within an organisation, both in the practice of the business and the space of the business, was too controversial for some organisations.[250] Even so women as typewriter-copyists often found their way through to business practice through employment in a typewriting bureau, which was most often an extension a typewriter training school such as the example found in George Gissing's 1893 novel *The Odd Women*.[251] By working at a typewriting bureau, female typewriters extended a labour structure so familiar to them in the history of nineteenth-century female paid labour, outworking. However, instead of performing their work from home as outworkers as they had done in the craft industries, these new workers hired office space dedicated solely to working, thereby separating the space of paid labour from that of their domestic duties. A further effect of outworking was that these typewriting-copying offices were often occupied by a community of women, thereby overcoming the isolation often felt within other craft outworking fields. This unofficial unionisation of women workers could spread the burden of work across the group and provided communality, albeit in a paid labour environment.

The other business practice the typewriter came to replace was the stenographer or shorthand writer, a position that had usually been held by a man, which, with the new writing machine, became reconfigured as stenographer-typist. This adoption of the new writing machine into this business practice came about because although stenography became very popular and widely practiced after its introduction through the work of Isaac Pitman, the transcription of the spoken word into longhand was laborious, with records indicating it would take half an hour to transcribe five minutes of stenographic notes.[252] Thus when the typewriter

[248] No married women were employed in the British Civil Service until 1946 (Kieve 1973, 102).
[249] Women telegraphers not only had the possibility of being promoted to a supervisory position, but also because of the location of telegraph stations largely in railway stations, to railway controllers. Often women continued to work as telegraph operators after they were married, especially in rural American locations. The non-entitlement to a pension, the marriage bar and the glass ceiling can all be seen as being cemented in with the advent of the typewriter. Women's separation in comfort can also be seen in Kieve, who notes that the female telegraph operators of The Electric Telegraph Company had their own cook. Whilst ensuring the separation of the genders in the work environment, to have one's own cook was certainly not a facility offered to male employees in the office environment (Kieve 1973, 87).
[250] There are few documented cases of organisations for whom it was controversial to employ female typewriters. Indeed the employment of women as typists across the board in the USA and in the UK commercial sector seems to have occurred relatively fast. However in the most conservative of Victorian institutions, the British Civil Service, employment of women typewriters in the Domestic Division of the Home Office was rejected to the "unsuitable" nature of the cases which the women would have to work on (Zimmeck 1995, 78).
[251] Women as dexterous and as natural typewriter operators are subversive but acceptable ways in which authors could argue for the political emancipation of women. George Gissing's *The Odd Women* is one of a number of late-Victorian/early-Edwardian novels, some fictional, some semi-autobiographical, incorporating female characters who were depictions of the 'new' woman (Gissing, 1980). In the late nineteenth and early twentieth century, Christopher Latham Sholes, one of the inventors of the Sholes, Glidden and Soulé Type Writer that was developed into the commercially successful Remington Typewriter, retold the story of the invention of the typewriter through the lens of female emancipation, a cause he was a champion of, after typewriting had been firmly embedded as a feminine activity.
[252] When the Chicago Stenographers was formed in 1878, its membership of 24 was entirely male, and set up in order to counter against the slew of young women into the profession. The Chicago National Union of Stenographers, formed in 1886, set out in its founding documents the practice of stenography as a craft, and as such positioned their Union as a guild (Fine 1990, 13).

was launched on the open market, a large part of its market was stenographers, who were complementing the speed of stenography in transcribing speech with its subsequent speedy translation back into a legible script through the use of the typewriter. Office historian Lisa Fine lists the activities carried out by these new technological hybrid clerks, skilled in the technique of capturing the written word, and adept at transcribing it through a machine into standardised forms, as taking dictation of correspondence, meetings, reports, telegrams and memos, transcribing dictation on the typewriter, submitting transcription for approval to employer, making appropriate records of paperwork, subsequent filing or mailing, keeping desk space clean, keeping typewriter in good repair and ensuring there were office supplies (Fine 1990, 20). Certainly Fine shows how the typewriter embodies a dexterity that "encompasses not only a skilful fidelity involving fingers and eyes, but also a comprehensive mastery of professional knowledge about the work (Yeh 2010, 96). Where women were employed as stenographer-typists within an organisation, they were located just outside the door of the private office space of the man they worked for or within his personal office, but in the corner with her back to her employer (Bliven 1954, 74). In 'The Shocking Miss Pilgrim' (1947), the female protagonist Cynthia Pilgrim, a New Woman of the nineteenth century working as a typewriter-stenographer, is located outside her boss' office, but against the visual gaze of the male clerks who occupy the physical space alongside her (Seaton 1947). Therefore, unlike piano playing, performed in front of the male gaze so that it became as much about displaying the female body for visual consumption as it was about the skill of the piano player, typewriting was often performed against it.

For historian Margery Davies, the central turning point in the history of the typewriter in American history is the American Civil War (1861-1865). Before this time, she sees offices as small operations, with no office machinery and clerks 'multi-tasking' a variety of roles, including copyists/scriveners, bookkeepers, clerks and office boys. In establishing the discourse around the pre-Civil War office, Davies locates the office as craft workshop and its clerks as craftsmen. She argues that because of the huge variety of roles undertaken by these employees, the office workers became proficient in all aspects of office work that went into the 'product', that went into the running of the business, noting that "The work was organized as an integrated whole, rather than being broken down into a series of component parts separate from one another" (Davies 1982, 19). With the introduction of the typewriter post-Civil War, the new office split the job of the copyist/scrivener into two separate roles–the stenographer, who would take dictation from the letter writer, and the typist, who would operate the machine–and thus the modern, rationalised, capitalist, and fractured office was formed.

This move from craft office to modern rationalised office has found its expression through the work of a number of historians who have traced the move of women into clerical workforce of the nineteenth century, arguing that there was a concurrent deskilling in clerical work.[253] There are three features of women's employment in the nineteenth century office that feed off of, and into, the claim of a deskilling of the clerical labour force–all of which are problematic. Firstly women were paid less for the same roles previously carried out by men. Yet this is not because the women demanded lower pay, but because employers could pay them less. Certainly women could be paid less than a man in their equivalent position, the reasons being that women did not need the same a wage as men, who were assumed to have to support a family, and that each woman had a male family member to support her. Therefore her pay

[253] The deskilling of nineteenth century office work is typically argued by Neo-Marxist historians of the office, who typically see the proletarianisation of office work as intimately tied to the move from the 'craft' office to the rationalised and scientifically managed one, in which the typewriter plays a central role. For more on this reading of nineteenth century office history see Braverman 1974; and for arguments against Braverman and the deskilling of the office see Wood 1982, especially Beechey 1982, and Crompton and Reid 1982.

was only so-called 'pin money', a term derived from the small change required to buy sewing tools. Secondly, as previously noted, in the nineteenth century women could not be promoted through the business in the same way a man could, as it was unthinkable that a woman could be in charge of men; therefore a separate career path for women in the nineteenth century office was created, a career path with fewer number of rungs, which terminated abruptly, and was further supported by the marriage bar. Thirdly, as this chapter has argued, clerical labour was tied into the concept of women's innate nature, their ability to withstand repetition and to act as angels in the office, transposing their ideological roles as angels in the home (Thurschwell 2001, 94). And yet, as Fine argues, the position of stenographer-typist, even that of just typist, required a significant amount of skill, certainly no less than the skill possessed by the male clerk to carry out his role in the pre-industrialised office.

The argument most frequently relied on to explain women's employment at the typewriter was an economic one, a result of the spread of capitalism in the late nineteenth century; due to their socially inferior position, women were cheaper to hire than men.[254] However, as historian Samuel Ross Cohn notes in his analysis of the gender balance of clerical workers in two nineteenth century businesses, the General Post Office and the Great Western Railway, "this argument is not in itself invalid but it is incomplete" (Cohn 1985, 1,061). If women were cheaper, why were they not employed by all businesses wishing to cut costs? Why were men not trained to operate these new writing machines, for it would seem more 'natural' for typewriter to be assigned with male rationality?

There are a number of answers to these questions, most of which play out through Victorian patriarchy. One example can be found in the observation that not all women were consider 'suitable' for office work; one of the first, and most dominant groups of women to enter the office as typewriters were the middle-class, well-educated women, "for whom factory and servant positions were not 'morally acceptable' jobs", whose employ was often the result of patronage (Hoke 1979, 81). The reason for their dominance was not just because of the necessity of employing highly literate individuals but also to counter moral anxiety about having women located in predominantly male offices. In the employment of daughters of the professional classes, businesses and organisations were assured of 'character,' ensuring their workspaces against possible moral corruption.[255] Thus, there were greater concerns than simple pecuniary ones in the employment of women in the office, ones which were based

[254] The most well-known historical account of women entering the office and taking up the typewriter is *Woman's Place is at the Typewriter: Office Work and Office Workers, 1870-1930* by Margery Davies. Although Davies sets out to analyse 'woman's place' at the typewriter through a dual approach of gender relations and politico-economic environment, she places the stress on the typewriter's adoption into the office on the historical economics, on the nature of capitalism at the time. Although she notes that patriarchy and capitalism are not independent of one another, and that her methodology merely exists to determine how woman's place is assigned by the interaction between them, her history from either one position or the other, and therefore the book's goal is not successfully achieved. Davies argues that in the United States the typewriter's success was due to the move from small to medium and large sized business, which came as a result of increased transportation facilities and a plethora of mergers in the 1880s. Davies, who wrote her work in the mid-1980s, was reflecting on the ubiquity of the idea that a secretary was, naturally, a woman, and as such her book can be seen as a feminist attempt to historicise the cultural norm. Key to Davies' arguments about the creation of a viable politico-economic culture in which the new technology of the typewriter could flourish is the fact that this machine had been attempted to be invented during the last 150 years, but had proved to be commercially unsuccessful. It is the very failure of the invention of a commercially successful machine in the 150 years until the 1870s that is Davies' proof of her argument of the socially determined success of the typewriter, one founded in the economic conditions of the period; she concludes that "Rather than causing change, the typewriter followed in the wake of basic alterations in capitalism", following with the stronger assertion that "It is clear that in the development of the typewriter, changes in the organisation of capitalism gave rise to technological innovation, rather than the reverse" (Davies 1982, 37-38). However, even though she sees the economic culture as providing the basis for the typewriter's success, she also sees the technology feeding into developments of capitalism, noting that "Finally the typewriter aided in the development of more rigid hierarchical structures within the office and in the diminution of what upward mobility existed in clerical work" (Davies 1982, 38).

[255] In the USA, women were graduating in larger numbers than men in the late nineteenth century, and therefore in a 'supply and demand' model, educated women from the middle-class were available in ever greater numbers as operators of the new machines (Hoke, 1979, 81). In the UK, the first women typists in the British Civil Services were drawn from the Services' 'extended family,' being daughters of clerks or, as in the case of the Board of Education's superintendent of typists, being 'the daughter of a late Inspector of Schools.' (Zimmeck, 1995, 79).

around class. The general antipathy, if not outright hostility and anxiety found around the employment of women can be seen in the Central Telegraph Office's treatment of female telegraph operators in the 1870s and 1880s. The CTO is a case that demonstrates how employers often found reasons to exclude female machine operators on grounds other than pure economic ones, with the argument that just because women were cheaper employees did not necessarily make them better employees. As has been argued above, the correspondence between the manager of the Central Telegraph Office Mr Fischer and the Postmaster General shows how greater workforce flexibility through the employment of men over women was more important than any increased cost associated with it. Therefore women's place at the typewriter at the end of the nineteenth century can not be ascribed to financial economy alone.

In tracing the history of women's work on the typewriter, the telegraph was instrumental in women's work on, and as, communications devices in nineteenth century Western industrialising economies. The technology of the telegraph machine is commensurable to the typewriter in terms of its operation; both are writing machines, with the former operated by one key and the latter by a board of keys. Therefore they are also commensurable in terms of the techniques required to operate them. For just as the telegraph was seen as the transmission of intelligence through electricity, through the typewriter, an individual was transmitting his intelligence through the body of the typewriter operator; and in this transmission, women, like the telegraph wires, were the conduit through which the writing was done, through which writing was transmitted across a distance.

Conclusion: Technique Acquisitions for the Commercial World

In the emerging life sciences of the nineteenth century, women's stereotype was formalised through their biology. Defined as mechanisms, a term derived from the political economy of industrialising Western nations, women were the organs of hereditary, transmitting the evolutionary process, which under Haeckel's theory of recapitulation was more literal than metaphorical. From this ideological construction, a number of other stereotypical female characteristics were derived, including docility, higher threshold for pain, selflessness, and domesticity. In short women were constructed as passive materiality, subjects who lacked in some important sense dynamic agency and therefore were better understood as mechanisms.

In their material mechanistic state of being, this body of women was ascribed with dexterity, a central ability that was the result of their passivity, in that it was the ability to perform repetitive manual acts that required (so it was believed) little or no mental labour. While on one hand, that of the body politic, dexterity was an essentialist claim, on the other hand, that of the body actual, it was a skill derived from hours of labour being trained to perform feminine accomplishments, particularly embroidery and piano playing. As historian Maxine Berg notes,

> These nimble fingers by repute derive from a long but totally unacknowledged training in household arts and needlework. It was these that formed the background to the acquisition of the knacks, the deftness and the special application with which women worked (Berg 1994, 152).

That these accomplishments, when practised by women, were defined in opposition to a particular capitalist and techno-industrial strand of modernity meant that the bodily skill necessary to perform or execute them was likewise denigrated as not proper work, as unproductive work.[256]

Undoubtedly, the sales and marketing team of Wyckoff, Seamans & Benedict's targeting of women as typewriter operators in their work for the Remington Standard 2 typewriter leveraged a constructed 'natural' fit between the writing machine and female body, built on the recognition that the operation of these writing machines required 'nimble fingers' to perform the repetitive task of typing. This recognition and subsequent leveraging was so successful so quickly that by the early 1880s, typewriting was recognised as a practice particularly suited to women, precisely because of their training in unproductive labour acts, precisely because "are more generally accustomed to a similar use of the fingers in playing the piano, which, of course, gives them an advantage over men" (Longley 1882, 15). The concept of repetition that was built into dexterity in the nineteenth century drew women into the labour market, alongside economic factors revolving around their passivity, such as the belief that the they could be paid lower wages than men, and yet could be relied upon not to complain. Although they did not have the vote, or the right to own property separately from their husbands, or to a bank account, women's place was slowly established as necessary vital part of capitalism's techno-industrial movement and progress. And under this construction, itself founded in the very terms of industrialisation, these mechanisms, these women, complemented the newly arrived communication mechanisms of capitalism, the telegraph and the typewriter.

[256] This concept of women as not being able to carry out 'proper' work has been identified by Meta Zimmeck as a characteristic often applied to the historiography of labour itself, arguing that it is built on a flawed notion of skill, with women characterised as unskilled and men's skilled and semi-skilled. Citing political theorists Anne Phillips and Barbara Taylor's article 'Sex and Skill: A Note towards a Feminist Economics,' Zimmeck also notes that the value of the skills which each gender performs often "bears little relation to the actual amount of training or ability required for them' (Zimmeck 1995, 69).

However, even though understood as machinic, the women themselves saw their labours in a different vein, with one female typist in the British Treasury arguing in a series of simultaneous petitions submitted by female typewriters across a number of British Governmental Departments in 1902,

> As to the alleged mechanical nature of the work we perform, we would respectfully point out that so far as our actual experience has gone, the work is not more mechanical than other work of the public service which is much more highly paid. But though the operation of typing may appear mechanical to an observer, every person of experience knows that the efficient performance of the duty is impossible without the possession of average judgment and skill. (Quoted in Zimmeck 1995, 85)

Thus the overlaying binaries of men and women, the public and private sphere, and productive and unproductive labour weave their way through the history of women and work in the nineteenth century and in so doing reveals them to be a set of dialectic tensions. Through the entry of women into the clerical labour force as typewriters, these sites of tension begin to synthesise and thus collapse the binary, as women are located and locate themselves as office workers. Thus the construction of women as the mechanisms of Victorian progress enabled them to become the machines that powered the industrialised office.

Ghostly Typewriters of the Fin-de-Siécle and the Ventriloquism of Agency

"I hardly know which is me and which is the inkstand."

Lewis Carroll/Charles Dodgson, *Letter*, 26 October 1881[257]

""My dear fellow," said Sherlock Holmes as we sat on either side of the fire in his lodgings at Baker Street, "life is infinitely stranger than anything which the mind of man could invent...""

Arthur Conan Doyle, *A Case of Identity* (1891)[258]

"I reduce the systems of philosophy concerning man's soul to two. The first and most ancient is materialism. The second is spiritualism."

Julien Offray de La Mettrie, *L'Homme machine* (1747)

"An intelligent belief in Spiritualism favours those conditions of mind and body upon which sanity depends."

Eugene Crowell, *Spiritualism and Insanity* (1877)[259]

"What the scientist's and the lunatic's theories have in common is that both belong to conjectural knowledge."

Karl Popper, *The Problem of Induction* (1953, 1974)[260]

"...this phenomenon [of spiritualism] carries the implication of the whole of metaphysics."

Charles Richet, *Thirty Years of Psychical Research* (1923)[261]

"Third Law: Any sufficiently advanced technology is indistinguishable from magic."

Arthur C. Clarke, 'Hazards of Prophecy: The Failure of Imagination' (1962, rev. 1973)[262]

Introduction

Following the arrival of the Sholes & Glidden Type-Writer on the open market in 1874 and the increasing commercial and cultural success of the Remington & Son writing machines in the 1880s, a number of competing businesses quickly established in Remington & Sons' wake, each with their own form of writing machine. Whilst some of these machines followed the design as set out by Remington & Sons' machine, with keyboards and individual type bars, others challenged the machines of the Ilion Armoury by presenting alternatives to what a typewriter

[257] Bakewell 1996, 250.
[258] Conan Doyle 2009 [1891], 32.
[259] Crowell 1877.
[260] Popper 1953, 1974.
[261] Richet 1923, 445.
[262] Clarke 1973 [1962], 221: fn.1.

could be and how it could be operated. This chapter explores these 'other' machines and their operationality in the context of their period, contextualising them within an 'other' set of propositions about how bodies operated to those made by rational materialism, the set of propositions that circulated around the practice of Spiritualism.

The growth of rational materialism around bodies and language in the mid- to late-nineteenth century, exposed as a drive towards transparency, when it encounters the non-physical, the non-material moves in and around the problems of sociologist Max Weber's "iron cage" of rationality and his proposition of the "disenchantment of the world" (Weber 1930 [1905], 181; and Weber 1958, 8). While it can be argued that the rise of rational materialism began to empty out orthodox religion's power to govern all facets of human life, it did not sweep aside religion as a whole to produce an entirely secular culture, empty of wonder. Rather, as philosopher Joshua Landy and historian Michael Saler argue,

> ... each time religion reluctantly withdrew from a particular area of experience, a new, thoroughly secular strategy for re-enchantment cheerfully emerged to fill the void ... the progressive disenchantment of the world was thus accompanied, from the start and continually, by its progressive re-enchantment. (Landy and Saler 2009, 1)[263]

It is into this process of continual withdrawal and advancement that this chapter aims to insert itself, focussing on how the desire for transparency and the thirst for epistemological grounding addressed itself to the unknown and, to some extent, the unknowable–to the (somewhat) opaque world of the afterlife, as formulated in and through nineteenth century Spiritualism. In examining the nineteenth century practice of communing with the dead, from its initial manifestations through to the technological practices of communication themselves, this chapter will argue that it was the specific discourse around the practice of Spiritualism to distinguish between automation and agency that found its mirror in a particular form of typewriting and thereby articulated a set of assumptions around typewriting. It will argue that, although this form of typewriter was as culturally successful as the more popular keyboard-typebar machines, it embodied a different form of typewriting that heralded a different shape of possible knowledge; for rather than the simple binary of type/space (or presence/absence) as manifested with their more popular competitors, these 'other' machines represented knowledge on a plane, on which various positions could be taken.

In the articulation of writing, bodies and technologies within the framework of philosophical discourses around truth and belief, this chapter will examine the two dominant routes to knowledge, scientific methodology and religious practice, to demonstrate how these routes were not binary oppositions but entwined, like a Mobiüs strip, so serving as the foundation to the metaphysics of magical thinking of the late nineteenth and early twentieth century. This chapter will argue that Weber's "iron cage" of rationality,' a proposition of modernism he formed in 1905–in the same year as the Union Writing Machine Company, a

[263] Landy and Saler outline in their introduction three frameworks for understanding the relationship between rational materialism (or positivism) and enchantment in relation to modernity: (1) the binary approach, where enchantment is the domain of the inferior, the uneducated, the primitive; (2) the dialectical approach, where modernity is itself an enchantment, as found in the work of Horkheimer and Adorno; and (3) the antinomial approach, where both sides of the either/or equation are embraced at one and the same time; in this latter definition, the antinomial best understood through the authors' description that "modernity is messy" (Landy and Saler 2009, 1-7). Literary scholar Helen Sword argues that both modernist literature and Spiritualism shared an identical profile, in that both "sought to embrace both authority and iconoclasm, both tradition and innovation, both continuity and fragmentation, both the elitist mystique of high culture and the messy vitality of popular culture" (Sword 2002, x).

trust of leading typewriter manufacturers, convened their meeting in Canada to cement the design of typewriter–had gaps through which magic and enchantment occurred.[264]

The first section of this chapter, 'An Explosion of Machines, 1874-1905', documents the variety of mechanised writing machines brought to the market post-1874, specifically focussing on the 'other' forms of typewriters known as index typewriters, whose operationality and functionality was markedly different to the keyboard-typebar machines. It will then make links to the operationality and functionality of an 'other' type of writing machines, dial-plate machines, planchettes, talking boards, the latter of which was patented in 1890 as the Ouija Board. It will argue that both these technologies of writing, index typewriters and planchettes/talking boards, expressed certain ideas around writing and the body that shifted towards the automation of writing and the displacement of agency–albeit circulating in differing social practices. The second section, 'The Rise of Spiritualism and the Evident Ghost', will argue that this move towards automation with a displaced agent, of both writing and the bodies that wrote, carried with it the very question of epistemological certainty through the paradigm of presence and absence. It will chart the birth and growth of Spiritualism in America and Europe, focussing on the bodies involved and the forms of Spiritualist practice, arguing that the communication practices of Spiritualism and of the spirit media were not just crafty but were also (in the most part) techniques and technologies of writing.

The third section 'Investigative Practices and Legitimate Knowledges' will focus further on the epistemological discourse around Spiritualism, by outlining how potential knowledge was made legitimate by investigating organisations, firstly those formed around the Fox sisters, then the Society for Psychical Research (SPR) and finally the John Nevil Maskelyne and George Cooke stage show at The Egyptian Hall. It will show how the criteria for establishing truth created by the early examining committees of Spiritualism, by the SPR and by Maskelyne and Cooke in practice collapsed in on themselves, producing the possibility of a variety of positions in relation to Spiritualism, a plane onto which an individual could locate themselves. It will end with an exploration of Maskelyne's automata, to show how automation with displaced agency became magical examples of both rational materialism and of spiritualism. The last section, 'The Magical, the Spiritual, the Fantastical and the Typewriter', explores how this collapse of criteria around epistemological certainty was itself productive of a new type of cultural mode, one that literary historian Pamela Thurschwell has called magical thinking (Thurschwell 2001). Beginning with Maskelyne's invention of a typewriter as an example of a magician who invented a paradigmatic cultural object of rationality, it will then focus on the figures of Charles Lutwidge Dodgson and Arthur Conan Doyle, fleshing them out as two embodiments, both individually and in their work, of this magical thinking. Therefore this section will argue that the period at which the form of typewriter was 'up for grabs' was a period of deep ontological and epistemological instability, in that evidence was not self-evident, and that what could be held as true could also, at the same moment in time, be held as false.

[264] Of interest to note is that Weber introduced the iron cage of rationality as a metaphor to replace a 'light cloak'. At work in both of these metaphors is the concept of a covering or enclosing fabric that has in both cases weft and warp; with the latter, the implication of the material is of light thread, with imperceptible (to the naked eye) gaps between the woven threads; with the former, there are visible gaps between the woven iron lengths. The move from handwriting on paper to the metallic grid of the typewriter can be seen to mirror Weber's move from the cloak to the iron cage, with the gaps moving from the imperceptible to the necessarily visible. As Weber notes, "This [modern economic] order is now bound to the technical and economic conditions of machine production which today determine the lives of all individuals who are born into this mechanism, not only those directly concerned with economic acquisition, with irresistible force. Perhaps it will so determine them until the last ton of fossilized coal is burnt. In Baxter's view the care for external goods should only lie on the shoulders of the "saint like a light cloak, which can be thrown aside at any moment." But fate decreed that the cloak should become an iron cage." (Weber 1930 [1905], 181).

4.1 An Explosion of Writing Machines

This section documents and analyses an other form of typewriter, the index writer, that was invented and introduced to the market in the late nineteenth century, after the Sholes & Glidden Type-Writer and its keyboard-typebar competitors began to see increasing cultural and commercial success. Following a study of these typewriters' operationality, this section then outlines the history of spiritualist writing machines, drawing together the form and function of these machines with the form and function of the index typewriters, to argue that machine writing was constructed as displacement of agency.

Index (Type) Writers

The first competitor to the writing machines produced by Remington & Co. was The Caligraph ('beautiful writer) of 1880, invented by George W.N. Yost and manufactured and marketed by his American Writing Machine Company (Yost 1889) (Figure 4.1). Like many other early typewriter entrepreneurs, Yost had been connected with the development of the Remington machine, visiting the Type-Writer's inventors in Milwaukee in 1872, suggesting improvements to the prototypes made by Sholes, recommending the Remington Armoury as the machines' manufacturer and partnering James Densmore as the machine's retail agents (Adler 1997, 57-58; and Linoff 2000, 23). Unsurprisingly, given his involvement with Sholes, Glidden and Soule, The Caligraph largely followed the design of the Remington Model 2.[265] Yet there were key differences between the machines–for although The Caligraph was a keyboard typebar writer, it had a double keyboard of upper and lower case letters, arranged differently to the Remington's QWERTY machine. Even with these differences, such was the success of The Caligraph as a viable alternative to the Remington machine that the first touch-typing guide produced by Mrs Longley in 1883 had two versions, one for The Type-Writer, the other for The Caligraph (Longley 1882 and Longley 1883) (Figure 4.2).

Although the Remington & Son's Type-Writer and Yost's Caligraph battled it out as the keyboard-typebar typewriter of choice during the 1880s, these machines had not fixed the typewriter's design, and soon other mechanisms of typewriting were imagined, mechanisms that resulted in other designs of typewriting machines. These other designs fell into two main groups, the index writers and the typewheel writer. Yet what is crucial to understand is that although there were a variety of different writing mechanisms in late-nineteenth century typewriter, and the typewriter's design was unstable, the machine's output (the typewritten text) and the input (a human operator working with her hands) as a conflation of printed product and individual writer was becoming largely established.

The first alternative design model to the keyboard-typebar typewriter was the index writer, the first example of which was the Hall Type Writer in 1881 (Figure 4.3). The invention of Thomas Hall of New York, its successful appearance on the writing machine market in the 1880s was the result of Hall's fifteen years of work on a writing machine; Hall appears in the history of the typewriter in 1866 and 1867 with two patents for a keyboard-typebar machine, even receiving orders from the US Government for his machines before the manufacturing plans for the new business collapsed (Hall 1867; and Adler 1973, 119).[266] Hall's later Type Writer of the early 1880s, the machine which made his fortune, operates on a grid-like system, requiring one action of the hand to move a pointer over an array of letters and another to press

[265] Yost christened his machine The Caligraph because Type-Writer was a brand name of Remington & Sons' machine–which may explain why there was a ten year period between Yost's first application for a US patent (1879) and it being granted (1889) (Yost 1889.

[266] Hall's machine of 1867 is reported to have been able to produce 400 characters a minute; Adler notes that although Hall received orders for his machine in 1860s, and Hall had a plan for a manufacturing company, these were abandoned because of internal arguments between individuals involved in the enterprise (Adler 1973, 119-120).

a lever that would impress the chosen letterform as type to the paper. Named an index writer because of the system of choosing from an array, Hall's machine was soon followed by other similar machines such as the Universal and the Hammonia (1882), the Columbia Index, the Sun Linear Indexer, the Morris and the People's Typewriter (1885), the Herrington, the World and the Ingersoll (1886), the Odell and the Velograph (1887), the Crown (1888), the Morris, the Victor, the Merritt, the Eureka and the American (1889), the Simplex and the Dollar (1891), the Edland (1892), the Kniest (1893), the Graphic and the Champion (1895), the Index Visible (1900) and the Practical No. 3, Coffman's Pocket, the Niagara and the Best (1902) (Curator 2011) (Figures 4.4-4.26).[267] Certainly, in the first instance, the very number of index typewriters during the 1880s and 1890s point towards their popularity.[268]

The second alternative to the keyboard/typebar machine was a hybrid form of machine called typewheel machines, machines that cannibalised elements of the keyboard-typebar writer and index writer. The first typewheel machine was invented by James B. Hammond (1839-1913), who set up the Hammond Typewriter Company in New York to develop, market and sell his Hammond typewriter of 1884 (Figure 4.27). The Hammond typewriter was developed from James Pratt's Pterotype (Figure 4.28), the patent for which James Hammond purchased from Pratt, who was unable to develop his invention machine commercially. Hammond developed the machine into the form of the Hammond Typewriter, which he patented in 1880 and launched at the New Orleans Centennial Exposition of 1884-5 where it was awarded a gold medal; and it was soon followed by other typewheel competitors, such as the Crandall (1881) and the Blickensderfer (1902) (Robert 2007, 74-90).[269] The typewheel writing machine contained a wheel or cylinder around the edge of which were individual letterforms and to which all the keys of the machine were attached. The depression of a key turns the position of the wheel or cylinder, aligns its corresponding letterform with space open to printing on the paper, when a spring-loaded hammer strikes the paper from behind, pushing it onto the letterform.[270] As all the types were on one part of the device, the wheel was designed to be removable so that other typewheels with different typefaces could be used in the machine.

There are four key differences of these 'other' forms of typewriting machines, the index writer and the typewheel or type-cylinder writer, to the more well-known keyboard-typebar machines. Firstly these other writers were cheaper to produce than keyboard writers, as there were fewer parts. Secondly these other writers were both lighter and smaller than keyboard

[267] In 1885, a sub-category of index machines appeared on the market, named linear index writers, which had "a separate type-slider running perpendicular above a small platen", such as the Sun Linear Indexer by the Sun Typewriter Company (1885-1890), and the more successful Odell Typewriter (1889-1907). Lee S. Burridge and Newman Marshman of New York were granted US Patents 314,996 and 315,386 for their Sun Linear Indexer, which also sold as the Invincible in the UK (. (However, a subsequent patent for An Adding and Recording Machine, of 21 January 1896, granted to Burridge and Marshman, notes that these two patents were for "a machine that will print and add figures by the operation of a stylus" (Burridge and Marshman 1896)). Levi J. Odell, John E. Burton and Charles H. Odell were granted US Patent 399,205 for their Odell Linear Typewriter on 5 March 1889 (Odell, Burton et al. 1889; Robert 2007).

Mirroring the activities of Remington and Co. across the Atlantic, the British sword arms manufacturer Wilkinson Sword (strangely now also, like Remington, better known for shaving products) bought a franchise from the American Typewriter Company to produce and sell its recently launched American index typewriter in the early 1890s. Wilkinson Sword subsequently changed the name of the machine to the Globe and established a separate company to manage its production and sales, the Globe Typewriter Limited, in 1896.

[268] Although this list of index typewriters ends at the beginning to the twentieth century, index writers were manufactured well into the first half of the twentieth century.

[269] It was an article about James Pratt's Pterotype in an issue of Scientific American that drew the attention of Sholes, Glidden and Soule in their Milwaukee workshop and from which the concept of the Sholes & Glidden Type-Writer was first formulated in 1868. Hammond was granted US Patents 224,088 and 224,183 in February 1880, and received further patents in 1883 which finalised his work on the development of the machine (Robert 2007, 77-79). A typewheel writer for printing music was invented by Charles Spiro in 1885, called The Columbia Music Typewriter. The Columbia Company is better known also for its alpha-numeric typewriters than for its musical ones. For an advertisement of this music writing device, see figure 10.8 and Reyna 2011.

[270] Typewriter collector and historian Paul Robert argues that Hammond's inspiration for his typewriter came from an ancient technology quoting Hammond as saying "There was an arrangement for a carved initial letter, probably made of wood, that was moved upon a sliding rod and pressed upon the paper with light ink. The same idea may have influenced [the] invention of the typewriter" (Robert 2007, 76).

writers, making them more portable; in an age when the typewriter operator was often asked to bring her own machine, the lightness of the machine was a key factor in its success. The third difference, one which points towards these machines' subservience to the keyboard-typebar writers, and their eventual disappearance, is that in their operation, these other typewriters, specifically the index writers, were inefficient in comparison to keyboard writers. However, this inefficiency is rather particular, for each of the two hands has to function in a different way to print the required letterform: the movement of one hand to choose the desired letter and a different movement by the other to push the type onto the page. This is quite a different bodily engagement from the keyboard/typebar writer, where each finger could operate individually but in the same fashion, with just one action which would both select and strike to print the letter. This 'align and push' method meant that whilst one hand could operate as five separate fingers in selecting the letter from the index, the other hand operates as a hand, as a single operating unit, to push the paper onto type. Therefore, typewriting speeds are slower on index typewriters in comparison to keyboard typewriters.[271] The final difference, one that may seem slight but in actuality acts as the starting point from which to expand this exploration of 'other' writers, is that with index writers, the index, the space where the operator chooses their desired letterform, is a surface, a two-dimensional plane of forms, rather than a three dimensional arrangement of individual keys; additionally the spatialisation of the alphabet on the index is spaced by the plane, by the same matter as the alphabetic forms rest on, rather than by gaps, by the air, which separates individual keys on a keyboard writer.

This new feature of writing technologies, the selection of a letter from a grid or the location of all printable letterforms on an array (as in the typewheel), placed the alphabet on a two dimensional plane, whilst at the same time writing was made through practice automatic and automated. In the automated writing on a plane, these machines exhibit their uncanny relation with an 'other' type of writing machine, those machines used to communicate with the spirit world; the dial-plate machines, the talking boards and the Ouija board.

Talking/Writing the Spirit

Filed on 28 May 1890 and granted on 10 February 1891, US Patent No. 446,054 was issued to Elijah J. Bond of Baltimore, Maryland, as the assignor to Charles W. Kennard and William H. A. Maupin for the first documented Ouija board, under the category of Toy or Game (Bond 1891) (Figure 4.31 and 4.29). In naming this writing device, Bond declares that it is a 'Ouija or Egyptian luck-board', but in its description, no reference is made to the mechanism (in an abstract sense) of this device, whose purpose was to communicate with the spirit world; although there is substantive description as to the design of the table and how it operates, no explanation is made as to how questions posed by the players are answered. The description of its purpose is noted by Bond as,

> ... the objects of the invention are to produce a toy or game by which two or more persons can amuse themselves by asking questions of any kind and having them answered by the device used and operated by the touch of the hand so that the answers are designated by letters on a board. (Bond 1891)

Rather than the origin of the answers, of the writing, being assigned to any location or individual, it would seem from this description that it is the device itself that is able to write out

[271] However, those index writer operators who learnt the skill of selecting a letter from the index or the wheel, much as keyboard writers who followed the touch typing method, were able to select a letter from the grid quickly and accurately, even if the printing speed was never as quick as the more efficient typebar writers.

the answers for the examiners; the Ouija board therefore seems to be technological determinism taken to its extreme, an object which could write by itself.

However, the Ouija board of 1890 was not the first time a patent had been filed and granted for a writing device that could 'talk' for the spirit world–although it was the first time it had been called a Ouija board.[272] By the 1890s, these apparata known as talking boards were well-known devices for communicating with the spirit world, popularised through the infectious growth of Spiritualism in the mid- to late-nineteenth century. One form of these devices is the planchette, a small heart shaped wooden board with two wheel-based wooden legs and a hole in which a pencil could be placed (Figure 4.30). Séance participants would place their fingers onto this heart shaped device and the device would–or in a number of cases would not–move, writing out the message on a blank piece of paper on which the planchette would rest. According to the American journalist Epes Sargent (1813-1880), author of *Planchette; Or, The Despair of Science* (1869), planchettes (meaning 'little planks) developed from devices first used in the early days of Spiritualism in 1848, when table-tipping had developed into a written form; the latter day planchette was a condensed and compacted version of a full-size Victorian dining table which could write, as,

> ... when the movements of tables took place, it was suggested that by arranging a pencil at the foot of a light table, and placing a sheet of paper under it, the intelligent force that was operating it might produce written sentences. The device was tried and found successful. The table, once set in motion by the passive influence of the medium, began to trace characters, then words and sentences. This method was finally simplified by substituting little tables, the size of a hand; then small baskets, pasteboard boxes, and finally the flat piece of wood, running on wheels, and called Planchette. (Sargent 1869, 2)

By the mid-nineteenth century, there was a large variety of talking boards available, with Sargent noting that in 1868, the same year as the first patent was filed for the Sholes & Glidden Type Writer and the same year that the first publication on the analytical graphology by Michon appeared, the planchette arrived in American booksellers' shops 'in great numbers' (Sargent 1869, 1). One of these, 'The Boston Planchette' was available in a variety of form and prices, dependent on the taste and therefore the wealth of the operator, and were advertised for sale in either black walnut board ('neatly finished'), rosewood (with 'handsome fretted work') or hollywood ('beautifully painted') for $1, $2, and $3 respectively (Figure 4.32). However beyond the design sensibility, the naming of the device, much like the end of the description offered by Sargent in the quote above, indicates a locatable subjectivity at work. For although The Boston Planchette is formally described in its advert like many other talking boards, its naming highlights an important feature of these writing technologies, for it is,

> ... only a little board in shape like a heart, placed on wheels or castors, with a pencil in front. When the fingers are gently placed on Planchette, in a few moments it becomes animated, moves along of its own accord, answers mental or written questions, talks with you and does many wonderful things. (Advertisement for The Boston Planchette, Plate 5 in Braude 1989)

[272] Along with Harry Welles Rusk, Colonel Washington Bowie, John T. Green and William Fuld, these men formed the Kennard Novelty Company of Baltimore, Maryland, to promote and sell 'talking boards' to every home in America. For further information see Murch 2007.

The description of this device as 'Planchette' rather than 'a Planchette' or 'the Planchette' is to describe it with a proper name, conferring the device itself with its own agency; it is the device, rather than the individual, or a spirit, writing. Furthermore, the advertiser's claim of the device's sentience is predicated on its ability to perform both mental and physical activities, including its ability to communicate with its owner, making it 'a pleasant companion in the house.'[273] The cultural positioning of this device as an embodiment of agency expressed through writing clearly echoes Turing's test but also more faintly the discourse around eighteenth century writing automata. However, unlike the writing automata, these planchettes are not writing machines that took the form of embodied representation, but rather are planes of wood under the control of a hand, or of many hands; this is automatic writing under hand.[274]

The planchette was not the only form of talking board available; there were also dial-plate machines, the design of which also fed into the later patented Ouija Board, as they presented the alphabet on a continuous plane. Crucially this design for writing also fed into the design of typewheel writing machines, which also saw all the letters of the alphabet positioned on the outside of a central circular plane. Dial-plate devices were first created in Connecticut in 1853 with spiritualist Isaac T. Pease's Spirit Telegraph Dial, a curious machine echo of one of the earliest spiritualist periodicals, *The Spiritualist Telegraph*.[275] With a rounded base and a horizontally flat board on the top, the Spirit Telegraph Dial has a card wheel attached perpendicularly to the top of the board by a moveable clock pointer (Figure 4.33). During a séance, the medium would place her fingers on the flat top surface, and as the board would begin to rock, so the attached clock hand would move, choosing by pointing different letters from the wheel, and thus spelling out the message. In 1854-55, Professor Robert Hare, an eminent chemist at the University of Pennsylvania brought his scientific training to Spiritualism to debunk the 'popular madness' of Spiritualism as a fraudulent practice. In order to expose these spirit media's practice, Hare developed Pease's device into a testing machine, which he called a Spiritoscope, to detect and communicate with the spirit world in such a way as to minimise the possibility of interference from the medium.[276] In the description of the device in Hare's 1855 book *Experimental Investigation of the Spirit Manifestation*, the Spiritoscope was, like the Spirit Telegraph Dial, a horizontal tilting board attached perpendicularly to a circular pasteboard on which the letters of the alphabet were arranged "as much as possible deranged from the usual alphabetic order", that was then concealed from the medium (Figures 4.34 and 4.35). The letters were chosen by a 'stationary vertical wire', a single clock hand pointer which Hare calls the index (Hare 1858). The medium would lay her hand on the tilting board and by its movement 'to and fro', the hand of the dial moved until it pointed to the relevant letter. The crucial element of Hare's Spiritoscope was that the dial faced away from the medium and still produced coherent and legible messages from the spirits. However, by placing the control of the production of the method in the medium's hands, Hare's testing device quickly produced spirit messages through the media under examination, turning Hare into a spiritualist, whilst at the same time turning the media into typewriters. For although this

[273] The full advertisement reads "IS PLANCHETTE A HUMBUG? – On this point there is a great difference of opinion. That Planchette is full of vagaries there is no question of doubt; with some it is as stubborn as Mr. Mallowney's pig, with others it is docile and quick to answer questions, interpret thoughts of lookers on, and not only tell past occurrences unknown to the operator, but will also give warning for the future. All in all, Planchette is a wonderful institution, full of fun, puzzle and mystery, and a pleasant companion in the house" (Advertisement for 'The Boston Planchette', Plate 5 in Braude 1989).

[274] However, the development of this form of talking-board, or planchette, did not end with the Ouija Board; in 1895 Colin Edmund Campbell was granted a patent for an 'Apparatus for Indicating Telepathic Messages' and later still, in 1919, George F. Pearson was granted a patent for a 'Spirit-Message-Conveying Device' (Campbell 1895; and Pearson 1919).

[275] The new technology of the telegraph was the dominant metaphor for spiritualist communication; this will be explored below, in this chapter.

[276] Isaac T. Pease of Thompson, Connecticut was a professional clock maker, a profession of many other typewriter inventors and automata creators; Pease later worked on improvements to fire-alarms.

device was designed to test the validity of the spiritual media claims and acts, its success as a communication machine meant that it became a valid mode of spiritualist communication, absorbed into the canon of spirit writing as a spirit index writer, as a spirit typewheel. Later, and this is a crucial development for talking boards in general, Hare developed this device to have three concentric circles of notation; the outer one is the letters of the alphabet; the middle one, the numerals from 1 to 10; and the inner one contains message control phrases, including 'Yes', 'No', 'Spell Over', 'Mistake' 'Must Do', 'Think So' and 'Don't Know', textual precursors to those phrases which appeared on the talking boards and Ouija Boards.

Other spirit writing machines include the American publisher and farmer Hudson Tuttle's Dial Planchette or The Psychograph of the 1880s (Figure 4.36). In drawing out the mind, Tuttle's device was a pasteboard with a circle drawn on it, which on the outside edge were arranged the alphabet, the numbers 0 to 9 and the words 'Good Bye' and 'Don't Know'. Inside the circle was a large wooden disc, attached to the pasteboard through its middle, on which an indicator was drawn on. Under the wooden disc were placed ball bearings so that the wheel could freely spin around its axis.[277] Like Hare, Tuttle called the selection indicator the index, tying this spiritualistic communication device to the latter day index writers (Orlando 1996). In addition to Tuttle's Psychograph, there was also a Psychograph patented in the UK in 1854 by a German Professor of Music, Adolphus Theodore Wagner, a device "for indicating person's thoughts by the agent of nervous electricity", that was not so much aimed at spiritual communication but rather to enable an operator to write without moving his hands to any considerable degree (Murch 2007). Lastly, in France there was the Table Girardin invented by Madame de Girardin sometime before 1861, described as being very like Pease's Spirit Telegraph Dial; for,

> The instrument alluded to, consists of a little table with a movable top, eighteen inches in diameter, turning freely on an axle, like a wheel. On its edge are traced, as upon a dial-plate, the letters of the alphabet, the numerals, and the words "yes" and "no." In the centre is a fixed needle. The medium places his fingers on this table, which turns and stops when the desired letter is brought under the needle. The letters thus indicated being written down one after the other words and phrases are obtained, often with great rapidity. It is to be remarked that the top of the little table does not turn round under the fingers, but that the fingers remain in their place and follow the movement of the table. (Kardec 1874, 188)

The planchette, and the dial-plate devices such as The Spirit Telegraph Dial, the Spiritoscope, the Psychograph and the Table Girardin, were all devices that fall under the broad category of talking boards, a peculiar naming as these devices were one and all writing machines, even though sometimes the indicated letters are not inscribed but rather called out by the séance participants, acting as a prompt for the speaking out of the message. Hence even though this was a spelling out of a message through a written alphabet, because the inscription process was through the body of the participant/s who would voice the message, these devices became known as talking boards, as the writing was understood as speaking – an echo of the Bertillon's portraits parlés, which claimed to speak out the description of the body.

As the writing was happening within the participants' bodies, there was a point of confusion created around the not just the identity of the authorial agent but also his/her

[277] This machine can also be thought of in terms of a 'Lazy Susan', or as Eugene Orlando notes "These dial plates were simple rotating discs, like a record turntable, that moved under the touch of the medium's fingers", a comment which leads to thinking about these devices in relation to gramophones and to the current day practice of scratching records (Orlando 1996).

location–was agency in the subconscious, the unconscious or the consciousness? Or was it in another world or did it exist between consciousness? This variety of proposals for where the writing agent was and who he/she was opened up a space to allow for the possibility of the Other. Thus, these spirit writing machines made possible automatic writing whilst displacing agency. In the following section, this chapter will argue that this concept of displaced agency lay at the heart of nineteenth century Spiritualism from its very beginnings, an agency that was evidenced by and through writing.

4.2 An Explosion of Spirit(ualism) and the Evident Ghost

This section of the chapter charts a history of nineteenth century Spiritualism, from its initial birth and through its cultural rise by charting its publications, organisations and mediums that sprang up in its service. This section will then produce an account of the technological practices through which spirit mediums made the spirit world manifest, paying particular attention to writing, to demonstrate Spiritualism as, for the most part, a writing practice located within a framework of displaced agency. It will seek to understand how spiritualist writing practices were legitimised as evidentiary of a spirit world, and how the act of writing itself was understood within the context of agency and materiality.

The Birth of the Spirit Alphabet

Nineteenth-century Spiritualism, a predominantly Euro-American practice with its heyday between the 1840s and 1870s, is most often pinpointed by its contemporary commentators and historians as beginning with near mythological status on the night of the 31 March 1848 in upstate New York. On this night, two sisters, Margaret (Maggie) and Catherine (Kate) Fox, aged fourteen and twelve respectively, began to communicate with spirits in their family home in Hydesville, Arcadia. Beginning when Kate instructed the knocking sounds in her house to 'Do as I do', these rapping noises were soon translated into messages, messages that were 'received' from the spirit world and translated by the girls translated into responses to questions posed by the girls' mother.[278] What were later to be called the Rochester Rappings were said by the sisters to be a communication from a Native American spirit-guide 'Splitfoot'.[279] However, the Fox sisters soon ascribed the messages as being from another spirit, a murdered peddler who claimed to have been buried in the cellar of their house by his murderer, the former tenant of the Fox house, a blacksmith by the name of John C. Bell. The lack of evidence as to how these rappings were produced soon drew many people to Hydesville, "from all parts to inquire into the phenomena, to the no small profit of the Fox family" (Maskelyne 1875, 22).[280]

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[278] There is some discrepancy about the age of the girls in 1848. Whilst their own biography by Davenport takes their testimony as being aged eight and six, some subsequent accounts have them aged fourteen and twelve (For example see Gauld 1968, 15; and Braude 1989, 10). Another has them aged twelve and nine (Sargent 1869, 29). Whilst the age discrepancy between different accounts may seem trivial, the question of whether these girls were small children or pubescent teenagers becomes relevant in considering Spiritualism as part of a history of hysteria. Also the different elements of the story as told by different authors, all slightly editing, or embellishing certain elements, gives an understanding of just how widely Spiritualism, both as a practice and through its history, could be interpreted. The discrepancies between the different stories are too large to explore here but for further reading see Powell 1864; Sargent 1869; The Committee of the London Dialectical Society 1873; Kardec 1874; Maskelyne 1875; Wolfe 1875; Harrison 1880; Weldon 1882; Davenport, Fox et al. 1888; Weatherly 1891; Podmore 1902; Podmore 1963; Gauld 1968; Oppenheim 1985; Braude 1989; Longwill 1995; Howard 1999; Gilbert 2000; Sconce 2000; Luckhurst 2002; Lamont 2004; Rubin Stuart 2006; and McGarry 2008. Further to the question of age, the younger girl Kate was taken under the wing of, and later married, one of Spiritualism's first researchers, Charles Kane. Therefore it has to be a consideration that these girls' ages were inflated to possibly negate any accusations of sexual impropriety for the sake of the younger sister, Kate. The messages were identified by the Fox sisters as coming from "the spirit of a peddler who had been buried in the now waterlogged cellar [of their house in Hydesville, New York]." For an account of the Fox sisters, see Haynes , 2.

[279] That these communiqués came from such an individual in an area of upstate New York which had seen the colonisation of many Native American tribes and much of their land is no coincidence; there is a strong form of Orientalism that runs through nineteenth century Spiritualism, most notably with the practice of Theosophy, established by Helena Petrovna Blavatsky in 1875 with the Theosophical Society. However, a detailed exposition of this strand is beyond the remit of this thesis. For further reading on this see Weatherly 1891.

[280] Although Mr Bell returned to the area on hearing of this accusation to defend his reputation, and, some sources say, the peddler himself turned up in the area in material rather than spiritual form, selling a new stock of wares. In addition to the alleged murder, the story claims that bones were found in the cellar at the spot indicated by the children, although it is noted that these were probably sheep bones rather than human. When asked about the Hydesville story of manifestations and of finding bones in the cellar by a journalist in 1888, Katie Fox, then Catherine Jencken replied "All humbuggery, every bit of it" (*New York Herald*, from 10 October 188, quoted in Davenport, Fox et al. 1888, 58).

The two girls soon moved to their elder sister Ann Leah Fish Fox's house in Rochester, where they continued their spiritualist communications although in a more developed form.[281] The initial communication system used to communicate with the spirit world was an abbreviated Morse code, with one rap for no, two for doubtful and three for yes; under the tuition of Leah, a music teacher, the spirits now rapped at the desired for place when the medium spoke out the alphabet, a practice for which their audiences were now charged a fee, this too instigated by their musical elder sister.[282] In speaking out the alphabet, and the spirit responding at the chosen position in the sequence, this so-called 'spirit alphabet' was an oral form of typewriting, a spoken mimesis of the material form of typewriter keyboard; the alphabet was laid out by the medium, as distinct and separate forms, and letters individually chosen and 'printed' by the spirit.[283] In the dual act of selection and printing, the spirit alphabet is a form of keyboard typewriting, with the medium as the typewriter machine, and the spirit as the typewriter operator; even the tapping sound of the spirits is an aural ghosting of the typewriter-to-come, albeit a different pattern of sound.[284] However, the spirit alphabet can also be seen as a form of index typewriting, in that with a medium speaking through the alphabet, the medium is presenting a plane of forms, which the spirit moves to print out its message, and the entire plane begins again. That this writing method which lies at the heart of the spirit alphabet, a method that came dominate spiritual media practice throughout the nineteenth century, was developed by a woman educated in the notational systems of music and the alphabet further demonstrates the mutual entwining between music and writing, drawing and writing, codes, signals and noise, a thread that has appeared throughout this thesis.

The fame of the Fox sisters did not just spread, but seems to have exploded, in the late 1840s and early 1850s. This seems to be in no small part due to their physical location in upstate New York, a geography infused with fervent religiosity as the area which saw the Salem Witch Trials and the birth of Mormonism; cultural historian Clive Bloom has noted, in accounting for how Spiritualism did not fade but culturally exploded,

> ... for their [the Fox sisters] own brand of mysticism and inspiration were steeped in the peculiarly hysterical and histrionic atmosphere of American religious practice and participated in the millennialism and apocalyptic imagination of New York State particularism. (Bloom 1999, 234)[285]

On 14 November 1849, under the protective arm of the local Quaker group, the Waterloo Congregational Friends, the sisters performed twice in front of an audience of four hundred at Rochester's largest city hall, The Corinthian Hall. In 1850, under the protection of Eliab

[281] There were five Fox children, with Ann Leah, David and Maria, and then the two younger girls Margaret and Kate. Mrs Fox had had another child as well, but who had died aged three. In Davenport's biography, it tells in the first conversation between Mrs Fox and the spirits on the night of 31 March 1848, she asked questions about her dead child and the raps responded with answers (Davenport, Fox et al. 1888). In addition, Margaret and Kate Fox were also brought up with Elizabeth Fish, the daughter of Leah Fish, who was seven years older than the two girls. A spirit would indicate that it wanted to begin to communicate by beginning a communiqué with five consecutive raps.

[282] As with nearly every element of this story, the invention of the spirit alphabet is also variously told, with Ann Braude describing it as an invention of Isaac Post, a friend of the Fox family who played a crucial role in the support and promotion of the Fox sisters' spiritualist practice (Braude 1989, 11).

[283] Epes Sargent describes the birth of the spirit alphabet and the girls' move to Rochester as follows: "... the family removed to Rochester, at which place the manifestations still accompanied them; and here it was discovered, by rapping of the letters of the alphabet in the manner before described, that different spirits were apparently using this channel of communication" (Sargent 1869, 33).

[284] For a study of tap dancing and Taylor-Fordist production line, see Brooks 2003.

[285] For a fuller examination of the Salem Witch Trails, see footnote 293 below. Mormonism–now also known as the Church of the Latter Day Saints, but then part of Latter Day Saint Movement–began in the 1820s when John Smith Jr. composed *The Book of Mormon* in Manchester, New York. Additionally Madame Blavatsky, founder of the Theosophy movement, visited Mary Baker Eddy, a spiritualist from New York State who founded in the Church of Christian Scientist. For more on Theosophy see Blavatsky 1889; Lillie 1895; Maskelyne and Blavatsky 1912; and Weatherly 1891.

Capron, another Quaker from New York State, all three Fox sisters and their mother moved to New York to perform three times a day in rooms in the Barnum Hotel, charging a dollar for admission. After a year in New York, the sisters began to travel more widely, demonstrating their medium capabilities in cities up and down the East Coast of America.[286] However, the lack of any evidence as to how these rappings were produced, coupled with a concomitant excess of belief in the veracity of the spirit communication, in conjunction with the fame of the Fox sisters, led to other individuals across the USA, Great Britain and mainland Europe discovering their own mediumistic abilities, and their own audiences.

The explosion of Spiritualism continued throughout the nineteenth century. However, accounts of its growth are difficult to accurately determine, as the practice did not require formal organisation, there was a large spectrum of other practices and beliefs over which it diversified and the levels of involvement were various. As to actual numbers, accounts vary, with some sources quoting as many as eleven million individuals by 1880.[287] By 1890, there were 45,000 people officially registered as members of a Spiritualist church in Britain (Lawton 1932, 146). Whilst ascertaining accurate figures of those involved with Spiritualism in the nineteenth century (whatever that level of involvement might be) is beset with problems, because it was "not only an elusive population, but also a shifting one", the explosion of publications, associations and societies and the number of media and séances being reported are certainly significantly indicative of its rapid up-take (Oppenheim 1985, 49).

Charting the explosion of Spiritualism in America and Europe through its publications is one method of tracing Spiritualism's growth. Specialist publications arose rapidly, because a large portion of the general press was, for the most part, hostile to the Spiritualism; these new specialist publications were to provide a space for more positive/neutral approaches to the practice. Additionally, in following the explosion through publication histories, a trajectory of Spiritualist practice can be traced, as the media infection was certainly spread through texts in the early decades of Spiritualism in the 1850s and 1860s.[288] The first American Spiritualist publication was the *Spiritual Telegraph* published in New York in 1853, and the first British publications the *Yorkshire Spiritual Telegraph* (later renamed *British Spiritual Telegraph*) in 1855 and the *Spiritual Herald* in 1856. In America, the *Telegraph* was followed by Boston based *Banner of Light* (1856-85), the *Herald of Progress* (1860-64), *The Liberator* (1831-65), the *Agitator* (1850), the *Social Revolutionist* (1856-57), *The Vanguard* (1853), the *Radical Spiritualist* (1851), the New Orleans periodicals *Spiritualiste de la Nouvelle-Orleans, Echo Mensuel/La Salvation* (1857-58), and the Georgia-based *Christian Spiritualist* (1860-1). In the UK the *Telegraph* and the *Herald* were followed by the *Spiritual Magazine* (1860-77), *Human Nature* (1867-77), The *Spiritualist Newspaper* (1869-82), *Medium and Daybreak* (1870-95), and *Light* (1880-present), all of which were London-based weekly newspapers, selling for one or two pence apiece (Gauld 1968, 69-73).[289] However, the publications soon moved outside of

[286] Estimates as to the amount of money the Fox sisters made from their spirit rappings are circa. $500,000. (Maskelyne 1875, 27). Other individuals who discovered their mediumistic capabilities include in the USA, Emma Britten and the Bang Sisters of Lily Dale, New York, and in the UK, Florence Cook of Hackney. It also led to the founding of the Church of Christian Scientist, by spiritualist Mary Baker Eddy in 1879 (Bloom 1999, 234).

[287] Eugene Crowell writes in 1877 that his estimate of 'so low' a number as two million Spiritualists in the United Sates as being less than their actual number (Crowell 1877, 117).

[288] Alan Gauld notes the spread of Spiritualism through texts when he writes that "It was from books, and even more from the Press, that many obtained their first knowledge of Spiritualism" (Gauld 1968, 72).

[289] This list is not to be considered exhaustive of the number of spiritualist publications in the nineteenth century. For example, other publications include the Italian *Annali dello Spiritismo in Italia* (1864-1898); the Dutch *Op de Grenzen van Twee Werelden* (1877), *Geest en Leven* (1900) and *Het Toekomstig Leven* (1896-1920); and the French *Revue Spiritualiste* (1858-69) and *Revue Spirite: Journal d'Etudes Psychologiques* (1858-1864) (Alvarado, Biondi et al. 2006). In her 'References' section, Ann Braude includes a list of 53 American spiritualist newspapers and periodicals, most of which appear to have been established on the East Coast, with the cities of New York and Boston being particularly dense spiritualist publication centres (Braude 1989, 240). Also see section 'The Spiritualist Press' in Oppenheim 1985, 44-48.

the metropolitan, with the establishment of the Manchester-based weekly newspaper *Two-Worlds* (1887-present day), Newcastle-on-Tyne-based *Herald of Progress*, Glasgow's *The Spiritual Record*, Lancashire's *Spiritual Reporter* and Burnley's *Medium* (Oppenheim 1985, 48). Often these publications were linked to spiritualist associations and societies, such as the British National Association of Spiritualist's adoption of *The Spiritualist Newspaper* from 1874 to 1879, and its adoption of the weekly newspaper *Light* from 1880. Spiritualist publishing was part of the field of psychical research; consequently, such publications *Psychische Studien* (Germany, 1874-1926), *Annales des sciences psychiques* (France,1891-1919), *Psychical Review* (1892-1894), *Rivista di Studi Psichici* (Italy, 1895-1901) include spiritualist writings. Of these types of publication, the most famous are the *Proceedings of the Society of Psychical Research* (1882-present), published by the British Society of Psychical Research (SPR); and the American Society for Psychical Research's two publications *Proceedings of the American Society for Psychical Research* (1885-89, 1907-74), and the *Journal of the American Society for Psychical Research* (1907-present).[290] Certainly these publications demonstrate not just the wide variety in formats of spiritualist publications, from weekly newspapers to academic journals, making spiritualist texts available across social and economic groups.

Another feature of spiritualist publications that can be drawn out is that of establishing a more formally declared network through a range of societies and associations as spaces for individuals to meet, discuss and practise their form of Spiritualism. In 1865, the Association of Progressive Spiritualists of Great Britain (APSGB) was founded, an organisation that promoted Spiritualism through the establishment of 'Spiritualist Sunday Schools' called Spiritual Lyceums, and through two leading Spiritualist publications, the journal *Human Nature* and the weekly newspaper *Medium and Daybreak*. The establishment of the APSGB was followed in 1874 by the birth of the British National Association of Spiritualists (BNAS), founded for "the undogmatic and non-sectarian study of Spiritualism" (Gauld 1968, 73). When the BNAS' internal politics resulted in its dissolution in 1881, another entity, the London Spiritualist Alliance, rose in its place, with a new agreement with the weekly spiritualist newspaper *Light* (still published today, but as a quarterly review journal). In 1891, the Spiritualist National Federation (SNF) was formed, a federation of forty-two local spiritualist organisations.[291] However, this was just the tip of the iceberg, as according to historian of spiritualism Janet Oppenheim,

> ... [m]ore than two hundred such groups developed in this period [of Victorian and Edwardian Britain], both provincial societies and London-based associations, that provided a meeting place, social club, debating ground, and séance rooms for spiritualists and psychical researchers. (Oppenheim 1985, 49)[292]

As noted above, the explosion of Spiritualist practice was almost as if it were some kind of infection, as those who came into contact with it, whether through séances or through

[290] For more detailed accounts of the publications in and around Spiritualism in the nineteenth century and early twentieth century, see Alvarado, Biondi et al. 2006; and Braude 1989.
[291] "By 1913 that number had expanded to 141, and the SNF, after much debate, had been transformed into the legally incorporated Spiritualists' National Union." (Oppenheim 1985, 52).
[292] Other organisations include the Christian Spiritual Enquirers, East London Association of Spiritualists, St. John's Association, Serjeant Cox's Psychological Society of Great Britain, the Dalston Association of Inquirers into Spiritualism, and the Marylebone Spiritualist Association. These are taken from a survey of Spiritualist associations and societies conducted in 1888 by the spiritualist newspaper *Two-Worlds* (Oppenheim 1985, 52). Francis Galton was an acquaintance of Serjeant Cox and attended at least two séances at Cox's home, one with a Miss F. and another with D.D.Home, described in letters written to his cousin Charles Darwin dated 28 March 1872, 31 March 1872 and 19 April 1872 (Pearson 1924, 63-65).

publications, soon discovered their own mediumistic capabilities.[293] Tracing this spiritual infection through the numbers of individuals discovering their spiritual capabilities and the number of performances and séances held–what one spiritualist commentator called the 'Multiplication of Mediums'–is another way of following the explosion of Spiritualism (Sargent 1869, 25). One example in the explosion of spiritualist séances can be found in the early career of the Fox sisters: when the sisters moved to New York in the early 1850s, they were conducting séances three times a day, five days a week, a phenomenal number of events within such a short time from the birth of Spiritualism. Another example of this infection, this time in the number of mediums who discovered their spiritualist powers, is the claim of the former Fox sisters' sponsor Eliab Capron that by the summer of 1850, his town of Auburn was home to one hundred mediums; another from spiritualist Cora Wilburn, who stated that her town of Woodstock, Vermont, had around nine 'good' mediums and another fifty that were 'partially developed' by 1852, only three years after the Rochester Rappings (Braude 1989, 19-25).[294]

This spiritual infection soon broke national borders, with the wholesale import of Spiritualism by Great Britain. Beginning in 1852, the arrival of the American medium Mrs. W. Hayden in London led to an explosion of spiritualist practice equal to that of America. Subsequently, American spiritualist mediums frequently made the journey to the UK, the most famous of these being the male medium David Dunglas Home (more widely known as D.D. Home) in 1855.[295] The arrival of American mediums in Great Britain led to what was later called 'The Invasion of the Media', referring to the collective arrival of American spirit mediums travelling across the Atlantic to 'spread the word' of spiritualism (Maskelyne 1875, 97-114).[296] With its invasion and subsequent infectious growth, Spiritualism, by maintaining only to the central tenet that there is a spirit world beyond this material one, had a somewhat flexible epistemology, sufficient enough to be adapted, and therefore adopted, by a range of different religious and non-religious schools of thought, as well as across a range of political positions.[297] Certainly by the 1880s, spiritualist epistemologies covered a range of political and social positions amenable to a range of different audiences, a feature exemplified by the range in Spiritualist publications available and Spiritualist societies and associations one could join.

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[293] The contagious encounter with Spiritualism has been noted by various cultural historians–Alan Gauld uses the word 'infection' to describe the spread of Spiritualism, whilst Clive Blooms calls it an 'epidemic' and Alex Owen a 'fever' (Gauld 1968, 73; Bloom 1999, 234; and Owen 2004, 18). There are a number of historical cases of spiritualist phenomena performed specifically by adolescent girls, which are interesting to note in relation to footnote below on female adolescence and the validity of spiritual practice. Two of the most well-known cases are the Salem Witch Trials of 1692-3 and the Cottingley Fairies of 1917. The Salem Witch Trials began with the accusations of two cousins, Betty Parris and Abigail Williams, aged nine and eleven respectively, who had fits that were then replicated in other adolescent girls in the area. These incidents resulted in the trial of over 150 people for witchcraft, and the conviction of twenty-nine individuals. Twenty of those convicted were executed. Such is the power of the event as an example of mass hysteria that it became the basis for Arthur Miller's play *The Crucible*, written as an indictment of McCarthyism in America. In an attempt to solve the mystery of this hysteria, historians have argued for it as a direct result of Puritanism, or as a translated expression of child abuse. Most recently, in 2002, the child toxicologist Alan Woolf has disproved another long held theory, that the Salem Witch Trials were the result of argot (or ergot) poisoning, a poisoning developed from contaminated grain such as rye or barley (Woolf 2000). Epes Sargent takes the Salem Witch Trials, which he calls The Salem Phenomena of 1692 not only as evidence for the truth of Spiritualism, but compares it with an encounter with the medium Charles Foster in 1868 (Sargent 1869, 103-122). The Cottingley Fairies case centred around photographs of fairies staged and photographed by adolescent cousins Elsie Wright and Frances Griffiths. Arthur Conan Doyle, a figure who appears below in this chapter, believed in the Cottingley Fairies, and authored a book on the subject called *The Coming of the Fairies* (1921). In the 1980s, the cousins admitted to faking the images, all of them except one. There is a huge amount of written work on the Salem Witch trials, both historical and fictional. Recent histories include LeBeau 2009; and Hill 2002. For the history of the Cottingley Fairies, see Cooper 1990.

[294] The extraordinarily-named trance speaker Cora Lavinia Victoria Scott Hatch Daniels Tappan Richmond, more commonly referred to as Mrs Cora L. V. Tappan, who worked in the 1870-80s, was estimated to have given over three thousand lectures in fifteen years (Oppenheim 1985, 22).

[295] Accounts of the séances of D.D.Home are perhaps the most magical of all nineteenth century spiritualist performances. For further reading see Quin, Quin et al. 1871; Home, Doyle et al. 1921; Burton 1948; Lamont 2005.

[296] 'The Invasion of the Media' is the title of chapter nine of the stage magician and anti-spiritualist John Maskelyne's history of spiritualism from 1875, in which he outlines the growth of Spiritualism in America and its rise in Great Britain as an American export (Maskelyne 1875, 97-114). Maskelyne is another figure, like Conan Doyle, who appears below, in this chapter.

[297] Spiritualism could be Catholic, Christian Revivalist, or secular (Owen 2004, 18).

This range of Spiritualism presented individuals with a wide range of positions, from politically left to right, from high to low culture and everything in between such that individuals could place themselves into the Spiritualist movement at a number of points in the array; this range also explains the wide angle of the historical lens through which spiritualism has been read and its history written, whether that be Spiritualism as the result of a 'crisis of faith', or as productive of female emancipation.[298] Thus the explosion of Spiritualism did not follow a single trajectory, but rather shattered into a myriad different spheres, spheres that can be traced around certain social groups.

Tracing the different aims and missions of Spiritualist publications through this explosion and its effects provides a useful way to follow the different strands. So whilst the British *Spiritual Magazine* (1860-75) was "historical and even quite scholarly" (Gauld 1968, 69-73), *The Spiritualist Newspaper* (1869-82, initially called *The Spiritualist*) concentrated on scientific investigation of phenomena, whose aim was

> ... to represent the scientific element. It essayed primarily to record the phenomena, to analyse the evidence, and discuss the explanations, and proposed to defer theological and Socialist speculations until a more convenient season. (Podmore, 1902, quoted in Alvarado, Biondi et al. 2006, 63)

Often Spiritualism became entwined with key contemporary social and moral debates of the culture in which the publications were circulating; for example, in America, whilst the majority of Spiritualist publications aligned themselves with the Abolitionist cause, a number of publications explicitly located themselves as Anti-abolitionist and at least one attempted, with some difficulty, to remain neutral; however whichever position the spiritualist publication took, each contributed to the discourse around slavery. A number of spiritualist publications took the up the flag of women's suffrage, such as Hannah Brown's *Agitator* of 1850 and Elise van Calcar's *Op de Grenzen van Twee Werelden* of 1877. Indeed, as a predominantly female practice (as shall be discussed below), historian of religion Ann Braude argues that,

> Spiritualism provided a platform and a network of support for a relentless group of women's rights advocates, who operated outside the mainstream of the women's movement. (Braude 1989, 80)

And yet, for the most part, whichever way Spiritualism moved and manifested itself, it tended towards any socially reforming movement–although which social value was dependent on who claimed its truth, as Spiritualism was available to anyone who would claim it. One example of such a reforming drive appears with the publication of the *Radical Spiritualist*, a newspaper that pursued a reformatory agenda including "Spiritualism, Socialism, Anti-Slavery, Non-Resistance, Woman's Rights, Anti-Oath-taking and Office-holding, Temperance, Vegetarianism, Anti-Tobacco (Tea, Coffee) and every other Reform which requires the practice of a higher life" (Quoted in Braude 1989, 64).[299]

The Media of Spiritualism

Although there were leading male figures in the spiritualist movement, such as the those who sponsored and supported the Fox sisters, and medium D.D. Home, the majority of individuals

[298] For spiritualism as a response to the Victorian crisis of faith, see Barrow 1986, Harris 1993 and Cerullo 1982. For spiritualism as productive of female emancipation, see Owen 1989.
[299] The reforming profile of Spiritualism also fed into and off of the reform of female dress, and the reform of spelling from alphabetic to phonetic (Braude 1989, 152).

involved with Spiritualism, both séance attendees and mediums themselves, were women.[300] Indeed the concept of the medium was largely understood as feminine, and vice-versa; female mediums were conferred with a greater sense of legitimacy as spirit media, as,

> Time and again it was noted that women picked up the techniques of mediumship more rapidly and effectively than men, and were often swift to move to the fore as developing mediums. (Owen 1989, 5)[301]

This mutually supportive underpinning of spiritualist practice, media as ideally feminine and femininity as ideally fitting to the practice of spirit communication, manifests itself in the construction of nineteenth century womanhood and the spirit world. As has been argued above, nineteenth century womanhood was constructed in opposition to manhood–passive in contrast to men's activity, frail in contrast to men's strength, a high sense of the moral and the spiritual in contrast to men's amoral instincts (Russett 1989; and Owen 1989, 6). In order to communicate with the spirit world, it was necessary for the earth-bound medium to be receptive, to be in synchronicity with the values of the spirit world, and be able to be taken over by an individual spirit; there was a necessity for medium passivity and affinity, the key personality characteristics that the nineteenth century construction of womanhood built on. Therefore the features of nineteenth century womanhood provided a 'fit', as one feature of womanhood mapped and answered the needs of the spirit world, as Alex Owen notes,

> Women adapted particularly quickly to the knack of 'mind passivity', somewhat akin to the meditative process of ridding the mind of all thoughts, and readily complied with spirit instructions to receive 'prayerfully and passively' whatever might come. (Owen 1989, 213)

Or, as one contemporary nineteenth century spiritualist writer noted,

> Women in the nineteenth century are physically sick, weak and declining ... [But if] the functions depending on force and muscle are weak ... the nerves are intensely sensitive .... Hence sickness, rest, passivity, susceptibility, impressionability, mediumship, communication, revelation! (Quoted in Braude 1989, 83)

Whilst there are examples of women and girls from the working class becoming spiritualist media, Spiritualism soon became a practice predominantly performed domestically, oftentimes with the meeting presided over by the lady of the house.[302] Indeed, by the 1860s, invitations to tea were given out and accepted as being invitations to tea and table-tilting, a development of the rappings within the walls into the movement of household objects. In performing spiritualist practices in a domestic setting, in an environment led by the woman of the house, the construction of the domestic and of woman herself, of the angels of the home, gained an added, somewhat gothic dimension, as these angels began to commune with the dead.

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[300] See, for example, Owen 1989; and Braude 1989.

[301] Braude argues further that, certainly in the early days of Spiritualism, it was adolescent girls in particular (amongst women in general) who were conferred with greater legitimacy as spirit media, particularly describing adolescent girls' agency within this framework. There is a sense, that as Spiritualism 'grew up' in the nineteenth century, so did the ideal female medium, becoming the lady of the house (Braude 1989, 23)

[302] Perhaps the most famous 'working class' medium was Florence Cook of Hackney, who, in the 1870s, manifested the spirit of her guide Katie King. Cook became the key medium of study to the prominent scientist and spiritual investigator Sir William Crookes. See Crookes 1870; and Crookes and Spiller 1871.

Drawing on the argument on women and the feminisation of typewriting from the previous section of this thesis, the construction of middle-class women's labour was as not only non-commercial, but also, importantly, non-creative. The accomplishments women were expected to learn, practise and perform were skills that were modes of expression of their femininity. It was through their dexterous hands, and their non-creative bodies that women developed their ability to clearly communicate their character within the terms of gender construction. This combination of working within the home, in a non-capitalist system by predominantly women, has led historian of Spiritualism Janet Oppenheim to note that "... mediumship could be, in its fashion, as domesticated and feminine an art as embroidery" (Oppenheim 1985, 9). Literary scholar Helen Sword goes further, arguing that mediumship was one of the few professions open to women in which "women of virtually any social or educational background could earn money, engage in high-profile careers, lay claim to otherworldly insight and subvert male authority" all the time "conforming to normative ideals of feminine passivity and receptivity" (Sword 2002, 13). However, at the same time as these domesticated women were often understood as performing a paradigmatic practice of their feminine being whilst subverting it; they were telegraphing women, "wholly realized cybernetic beings–electromagnetic devices bridging flesh and spirit, body and machine, material reality and electronic space" (Sconce 2000, 27)

The use of the telegraph as a metaphor for tying together the material and spiritual worlds in women's bodies is not coincidental; the telegraph was the dominant contemporary metaphor used to technologically situate female media in the nineteenth century (Sconce 2000, 21-58). The use of this metaphor reveals that the nineteenth century concept of agency is conceptually distinct from the materiality, from the material body, as media historian Jeffrey Sconce has noted in *Haunted Media: Electronic Presence from Telegraphy to Television*, when he argues that that the 'historical proximity and intertwined legacies' of the electromagnetic and spiritual telegraphs is 'hardly a coincidence', in that the creative cultural power of the telegraph came through its 'apparent ability of separate consciousness' from the material body (Sconce 2000, 24-25). For as with the electromagnetic telegraph system, the spiritualist medium could not 'see' who was sending the message. However the separation of the message from the material body, the lack of material indexical trace (the voice, the image), did not empty out the possibility of agency; rather it set up agency as something to be detected, to lie behind the abstracted technological code; presence becomes telepresence, as media historian Lisa Gitelman notes when she writes that these media that seem to transmit rather than represent, like telegraphs,

> ... offer a keenly persuasive representations of text, space/time, and human presence, in the form of code connection and what critics today call "telepresence," that feeling that there's someone else out there on the other end of the line. (Gitelman 2006, 4)

Additionally, the combination of the telegraph/spiritual medium as a transmissive rather than representational media and the closure of the possibility to be presented with an indexical trace of a present body opened up the possibility of communication with those who did not have bodies by definition; it opened up the possibility of communicating with the dead.

Yet in paying closer attention to the metaphor of the telegraph as applied to spiritual media from the other side, from its application to its use in describing communication with the spirit world, the body can be revealed; the body can reveal itself. For the telegraph metaphor is built not just on the networked communication aspect of the technology–that is, the electrical signals which pass from one telegraph machine to another, from the spirit to the material

world–but also contains an inscription element, one which marks down the electrical signals into comprehensible messages, into the written language. Setting the veracity of the central tenet of Spiritualism aside, what these female media were actually doing was becoming and performing acts of inscription, through their planchettes and their dial-plate devices, through their talking boards and tilting tables; these women were ghost typewriters, inscribing the spirit world onto the material one, making the unintelligible intelligible, pulling the signals out of the noise, as cultural historian Marina Warner noted,

> She [the medium] occupied the role of transmitter, in an analogous fashion to the wireless receiver, catching cosmic rays whose vibrations produced intelligible phantoms and presences. (Warner 2006, 300)[303]

Women's use of their bodies to communicate with the spirit world becomes tied down in more tangible ways with the realisation that the starting point in the nineteenth century history of Spiritualism is the Fox sisters' literal use of their bodies as writing machines; in *The Death Blow to Spiritualism*, a biography of the Fox sisters written in conjunction with them by Reuben Briggs Davenport in 1888, it was revealed that the girls had cracked the joints in their skeleton to produce sounds that were then decoded not only as written communications, but as communications from those not physically present, from the world of dematerialised identity; this chapter will return to this (supposed) admission below.

The Technologies of Spirit Media

Although Spiritualism is given the official start date of 31 March 1848, the history of human communication is itself haunted by the messages from the world of the dead. Indeed perhaps the most relevant in discussion of the technology, spirits and the crisis of evidence, Spiritualism can be seen as a partial inheritance of eighteenth century Gothic Romanticism, a cultural veil through which the novels of Ann Radcliffe, Horace Walpole and Mary Shelley, the compositions of Henry Fuseli, the poetry of John Keats and Samuel Coleridge, and the art of William Blake were drawn, and the technological formation of the spirit became located as proto-cinematic.[304] The magic lantern, a piece of image projection technology most often attributed to Giovanni Baptista della Porta (1535-1615) and Athanasius Kircher (1602-1680), was used by Paul Philidor (also known as Paul de Philipsthal, dates uncertain) and Etienne Gaspard Robertson (1763-1837) in the late eighteenth and early nineteenth century to create the ghostly projections of the extra-ordinarily named Phantasmagoria, Enlightenment horror shows, at the same time as the material clockwork models of the body in the form of Vaucanson's automata were touring Europe (Figure 4.37).[305] The shows of the Phantasmagoria were never understood or promoted as 'real', but as part of entertainment and spectacle (albeit the spectators felt it to be real); when Philipsthal exhibited his Phantasmagoria show at the

[303] The veracity of the claims of Spiritualism is still a contentious issue among those who write about nineteenth century Spiritualism. For example, Steven Connor, in his essay 'The Machine in the Ghost: Spiritualism, Technology and the 'Direct Voice'' stresses emphatically that his intellectual project is based on the absolute and complete rejection of the claims of Spiritualism, such that "The establishment of the truth of spiritualist beliefs would be enough to collapse my argument" (Connor 1999, 206). In a later essay in the same collection, Ralph Noyes is quick to write that "I must declare an interest" as he explains he is a member of the Society for Psychical Research, and believes that "ghosts in their several forms ... are not only a common element of human experience but sometimes provide powerful tokens of their independent existence." (Noyes 1999, 244). These two extremes positions, both within the same collection of academic essays, displays how Spiritualism, even as an object of study, is still able to entertain a wide variety of intellectual positions.

[304] The veil is also a popular metaphor to describe the boundary between the land of the living and the dead. This spiritualist terminology draws through Baxter's cloak and Weber's iron cage of materialism and rationality, by their very materiality.

[305] Giovanni Baptista della Porta wrote of the projection of mirror writing in his book *Magiae Naturalis Libri Viginti* (1589). He also wrote a number of books on cryptography, the telescope, and on physiognomy.

Lyceum in London in 1801, it was offered alongside a display of optical illusions and technologies, and a display of automata. In displaying these articulated and articulate eighteenth century automata as illustrative of the physical body, the co-exhibiting of the phantasmagoria experience in the same show places these early ghostly projections as themselves illustrative of the spiritual.

The location of these eighteenth century meetings between ghosts and technology highlights the key difference between the practices of the Gothic Romantic tradition and of Spiritualism; the materialisations of Romantic Gothic movement were only ever illustrative, whereas with Spiritualism these materialisations became evidentiary.[306] In this way belief, and knowledge itself, become imbued within the very fabric of the material of Spiritualism, as the legitimisation of these encounters became foregrounded. In order to understand how this saturation of the material came about, it is necessary to understand the technologies of spiritual practice.

Spiritualist practice in the nineteenth century varied widely in the technologies and techniques it could use. In connecting to the world of spirits, the centre of any communication with the spirit world was the material of communication. Whilst Spiritualism began with rappings, other techniques and technologies of communication with the spirit world were incorporated both because of and despite its claims of truth. Rapping sounds were soon taken over by other modes of communication, as both spirits and media learnt and explored other channels including into table turning, musical instruments playing by themselves, physical interaction with séance attendees (usually performed in the dark), writing, trance speaking, painting or drawing, and healing.[307]

The first mode of communication to join the spiritualist channel of rapping was 'table-turning' and 'table-tipping' in which participants in a séance are seated around a table which then moves (Figure 4.38). Whilst this practice may seem vastly different from spirit rapping–the former being a demonstration of the effect of the spirit force through the movement of a physical object, whilst the latter is a sound produced seemingly unattached to the material–the leading French Spiritualist Allan Kardec (1804-1869), the pseudonym of Hippolyte Léon Denizard Rivail, situates them together as modes of communication, operating at two different levels. Thus he links 'calling rapping' and table-tilting that operates as rapping (in that the movement of the table as it strikes the ground raps) under an alphabetic understanding of communication, calling the former 'typtology' and the latter 'swinging typtology'; and when

[306] While there was no explicit attempt on behalf of the projectionist to convince the viewers of the phantasmagoria that what they were seeing was real–it was understood as entertainment–there are accounts of viewers being so terrified of the spectacle that they ran from the projection room, fainted, attempted to strike the ghostly visions as they seemed to approach (in actual fact, the result of a magic lantern on wheels, which enabled the projectionist to 'move' the ghost towards the viewer). For more on the phantasmagoria, see Warner 2006.

[307] The last four practices are outlined in detail by Maskelyne in his *Modern Spiritualism* under the chapter title of 'The Mediumistic Craft', demonstrating how at once these were skills learnt rather than virtuoso events, and how these technological practices of spirit media were elisions of practices that could be understood as both machine-like skill and human capability (Maskelyne 1875, 80-96). The famous twentieth century psychical researcher and conjuror Harry Price, founder of the Magic Circle and its Library, listed several techniques as forming spiritualist practices that utilised mental techniques. These included telepathy, thought-transference, thought-reading, clairvoyance, clairaudience; hypnotism; psychometry or tactile clairvoyance; billet-reading; automatism, whether that be writing, painting or speaking; precognition, prediction; crystal-gazing or scrying; dowsing or divining; hyperaesthesia; xenoglossy; veridicial dreams; spirit healing; and other mental phenomena (these are noted as being pathological mental states). However, the focus of this chapter is on the physical evidence, the material form, of spiritual practices, and in contra-distinction to Harry Price's formulation, foregrounds the material over the mental, rather than mental over material (Price 1939, 39-47).

Maskelyne details the séances of Annie Eva Fay, described as 'a fascinating American blonde' who held meetings in the Hanover Square Rooms at which she was placed in the centre of a circle of attendees, including her husband. She began to clap her hands, and "when darkness was made 'visible'", the sound of the clapping continued as musical instruments on the attendees laps began to play and attendees felt some physical interaction with their bodies; "the guitar was strummed in the air, bells were rung, knees pinched, whiskers tugged, old fogies chucked under the chin by, oh! Such nice little hands, and the other interesting work of the spirits at séances were gone through." For description and explanation of how this communication was performed, and what became of Annie Eva Fay, see Weatherly 1891, 192-4.

table-tilting is used by the spirits to communicate emotional states, such as anger, kindness, or affection, Kardec calls this sematology.[308] Thus meaning is understood to operate on two different levels, the literal and the attitudinal. Furthermore, when the spirits developed their rappings to sound out at the correct point when a medium was speaking the alphabet, Kardec names this alphabetic typtology.

Focussing on writing, a particular spirit writing technology that linked the body of the medium and the product of the spiritualist technology was the practice of slate writing. Made famous by Dr. Henry Slade and later taken up by the medium William Eglinton, a questioner would write their question on a slate board which would then be tied to a blank slate board, face to face, sealed in some sort of container and placed under the séance table. The medium would then hold the container, concentrating their efforts in channelling the spirits' communiqué into the world, and after his work was done, the slates would be unwrapped and unbound to reveal the formerly blank slate as containing the answer. Undoubtedly a consummate performance when performed well, slate writing was an extremely popular form of spiritualist communication.[309] Even after its initial practitioner Dr Slade was exposed in court in 1875 as a fraud, William Eglinton's performance of slate writing still legitimately contributed to his reputation as a medium.[310]

The slate was written on blind, as was claimed, but by the medium themselves rather than a spirit; for liquid glue, iron filings and powdered chalk were pre-mixed and then added by the medium before the container was sealed. The medium would then mirror-write on the back of the blank slate with a magnet, drawing the mixture over the surface of the slate and thus also the powdered chalk. In slate writing there are multiple transferences through media occurring. The medium is transferring the communiqué between the spirit world and the real world, whilst the glue and iron filings are the medium through which the writing, the powdered chalk on the surface of the blank slate, is carried.[311]

However there were also examples of more 'free' writing, so called 'spirit' writing, a performance through which a medium would handwrite text herself, whilst in a trance-like state, such as that performed by the Indian spirit guide 'Ski' through the body of a Mrs Hollis. The possibility of possession of a writer by a spirit led *Fraser's Magazine* to conclude that "If spirits have such a power, there is an end of moral responsibility" (*Fraser's Magazine* 71, 42; Quoted in Maskelyne 1875, 87). This apparent jump from writing practice to the end of all morality might seem somewhat dramatic, but the questions were real and frequently articulated; for if writing could be argued to be the product of the spirit world within a séance, how could any writing ever be the product of the writer? Surely, the ability of non-physical beings to write carried with it the implication that writing did not depend on the body of the writer, and therefore there was no guarantee of the authenticity of the author position.

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[308] If the table is repeatedly and forcefully struck to the ground, it can be read that the spirit is angry and or impatient; if the table is gently inclined to a specific individual at the beginning and end of the séance, it can be read that the spirit is not only kind, but also polite (Kardec 1874, 183-4).

[309] For a detailed account of a slate writing séance, see Cox 1876.

[310] Maskelyne writes "At that time I possessed considerable knowledge of slate tricks; but the Doctor had invented a few new dodges, which were rather difficult for me to discover inasmuch as all my information had to be obtained second hand. ... However, from the reports of my deputies and others, the secrets were in my possession within a few weeks, and I was planning a grand exposure, when Professor Lancaster and the late Dr. Donkin caught the gentleman red-handed, and prosecuted him and his manager." At the trial, Maskelyne was called as a prosecution witness, appearing in the witness box on 10 October 1875, where he demonstrated how slate writing was done. Slade was convicted of fraud, and sentenced to three month's hard labour. However, at appeal, he got off on a technicality and subsequently fled to continental Europe (Weatherly 1891, 194-195; and Jenness 1967, 37).

[311] The magical technology of slate writing implies an underlying industry as Harry Price, in building his famous magic library, discovered only one publication that was evidence of a 'spiritualist' industry in all his searches. A catalogue issued by E. Sylvestre & Co. entitled *Gambols with Ghouls: Mind Reading, Spiritualistic Effects, Mental and Psychical Phenomena and Horoscopy* (1901), this publication is marked that it must be returned to sole agent (no pun intended) George L. Williams, of Syracuse Indiana, which Price takes as an assumption that this catalogue was intended only for private circulation to be returned with an order for the tricks outlined therein. However, as Price also notes, no details of how the trick is performed appear in this publication, only the effects they produce (Price 1939, 208).

The other forms of spirit writing technology, the dial-plate machines–the Spirit Telegraph Dial, the Spiritoscope, the Table Girardin and the Psychograph–compressed 'swinging typtology', the domain of the demonstrable force of the spirit, into a writing machine. In the shift from an entire table to a small device, ghost writing became compressed as its effects were minimised. So with less of an object to move–only a plate, rather than a whole table–writing became more direct; in moving from table tilting to small hand held device, (ghost) writing itself moved further into the mind, as the bodily movement required for inscription decreased. And with this movement, Kardec was able to argue for the tool-like nature of these writing devices and the primacy of the spirit author, setting up equivalences between spiritualist writing technologies and more traditional ones, so that,

> In fact, as has been seen, tables, planchettes, and baskets are only unintelligent instruments, though momentarily animated with a factitious life, which can communicate nothing of themselves; it is taking the effect for the cause, the instrument for the principal; as well might an author add to the title of his work that it was written with a steel pen or a goose quill. (Kardec 1874, 199)

This movement towards interiority, towards writing in the mind, can be seen with Kardec's identification and description of 'interior typtology', his term for the rapping as practiced by the Fox sisters. Under Kardec's understanding, the medium is writing on physical objects without touching them; she is the literal medium through which the spirit writes the message. Of course, under this understanding, automatic writing becomes a central strand of spiritualist communiqué, a form of automatic writing with pen and paper.

Automatic writing, whether with a planchette or just a pen and paper, was able to yield a huge variety of writings, from drawings to works of fiction, to works of religion, as many spiritualist publications testify.[312] By the start of the twentieth century, the types of communication that could be received through the planchette made the device artist, architect, author, explorer, inventor, geographer and counsellor, as well as gramophone, telegraph and Turing test machine, as spiritualist and psychometrist Ida Ellis noted in 1904,

> Planchette can draw symbols, pictures, portraits, plans of buildings, forts, etc., maps of hitherto undiscovered land; it can reveal the whereabouts of hidden treasure, or lost wills; it can transmit messages in languages totally unknown to the operator, and can write new airs and harmonies in music; it can give details of inventions, repeat conversations between individuals, one or more of whom are long since dead, and reveal secrets from the dead to the living, thus proving the presence of some conscious intelligence; it can transmit messages from one quarter of the globe to another, between friends, and in this way is often an aid in smoothing the troubled waters of discord in families, or repair damage caused by lovers' quarrels, and in fact all that one

[312] Although there are some examples of the publication of automatic writings in the nineteenth century, the practice of publishing these communiqués became hugely popular in the first half of the twentieth century. Examples of automatic writings include Stead 1898; Lane and Beale 1920; Lane and Beale 1920; Dresser, Rafferty et al. 1922; Graham and Graham 1923; Leslie 1923; Niven and Niven 1923; Cole 1924; Harmsworth and Owen 1925; Hayes 1927; Moore 1928. Perhaps one of the most intriguing publications is one received from Oscar Wilde by the medium 'Lazar' who is described as having written "leaden quips of a mediocre stand-up comedian." It is filed in the British Library Catalogue under the author name of 'Wilde, Oscar'. See Wilde 1928; and Stokes 1996, 5-7. According to bibliographic and cataloguing rules and regulations, used both by the British Library and the Library of Congress, "If a medium receives some work from a dead person and has it published, the work will be entered under the heading for the spirit of the dead person, *not* under the name of the medium" (Bowman , 121). To see more on the history of cataloguing works by spirit authors, see Sword 2002, 24-31.

> loving intelligent soul can do to help another can be done by means of Planchette. (Ellis 1904, 11-2)[313]

In explaining direct writing by the spirit without a medium, which he calls Pneumatography, Kardec writes that "...the possibility of writing without a medium is one of the attributes of the spirit", and then describes how because initially spirits were known to move objects, a pencil was always left with a piece of paper, so that spirit writing could appear; however it was then learnt that spirits do not need pencils to write, only paper, as they can 'create' writing from the ether (Kardec 1874, 191). This new knowledge of the capabilities of the spirit world, Kardec claimed, 'completely changes the aspect of the phenomenon'; for in this move, not only does the capability to write rest entirely in the mind, but even the material to inscribe–the ink, the graphite itself–becomes redundant; the spirit force is able to inscribe from out of nowhere (Kardec 1874, 193) This is not just disembodied writing in form, but also in substance. Kardec's argument, that the spirit is able to make himself (always himself) matter and instrument, enables him to then sketch out Pneumatophony, the practice of making sounds by themselves, tying it to Pneumatography to elide between speaking and writing, an elision already present in the spirit alphabet and the talking board.

This melding of speaking and writing, and the ability to write either without any body or through another body was another driver in the displacement of writing agency in the nineteenth century. In the following section, this thesis will pick up the thread of how this displacement of agency was established, and the various methodologies employed in testing the claims of spiritualist practices.

[313] Although a committed Spiritualist, Ida Ellis was somewhat more reticent than earlier planchette users about where the author of these writings was located, writing that "... this entity may be the ego, or higher self, or sub-conscious self, of one or the other whose hand is in contact with the board; or it may be another ego or soul, with whom these operators are more or less in harmony or sympathy, but whose consciousness is more powerful, or whose will is more highly developed than theirs" (Ellis 1904, 14).

4.3 Investigative Practices and Legitimate Knowledges

From its very beginnings, wherever Spiritualism appeared, so did its evidentiary support. From the investigation carried out on the Fox sisters by their neighbours in Hydesville, to the more formal Rochester Investigative Committee and the Seybert Commission (amongst a handful), the industry for investigating the validity of the claims made by the spiritualist media expanded with the number of media themselves. This section of the chapter examines these investigative organisations and committees, and their methods of working, to show how the two different but interlocking methodologies around the discourse of evidence were manifestations of the rational and the magical that contained within them the enchanted and the materialist. Through the Society for Psychical Research and the self-proclaimed 'Royal Illusionists and Anti-Spiritualists' John Nevil Maskelyne and George Cooke, this section will show how Spiritualism as a practice was evaluated, whether the conclusion went to either debunk or legitimise its practice, or, as in most of the cases, do both at the same time.

The Beginnings of Investigative Practices

Whilst it was later argued that Spiritualism's early popularity was due to it being against conventional scientific belief, the scepticism (if not outright rejection) it met from the scientific community of mid-nineteenth century America and Britain neither suppressed it nor decreased its popularity. With the spread of belief in and practice of Spiritualism, and the interwoven growth in the discovery of mediumistic capabilities amongst the general population, came a concurrent desire to test its validity. Indeed, it could be argued the hinge of Spiritualism's existence was the test itself, that its very subject was in fact the establishment (or not) of its own validity. By relocating Spiritualism from an anti-materialist system to a practice of testing enables the practices and performances themselves to be foregrounded, as it was the spiritualist media's techniques and technologies that became the site of testing; for it was these techniques and technologies that created the documents (broadly considered) that were able to stand independent of the bodies that created them. For in the production of rappings and the movement of objects, there was a physical action with a material effect–a rapping was created from a type of force striking an object, the table or musical object could only move or play through some force engaged with the material form itself–although 'without appreciable agency'. It was the presence (or not) of a force under direction that became the focus of spiritualist investigation and this process of exteriorisation the spiritualist 'documents' were (supposedly) created independent of their 'authoring' bodies, attesting in their very to construction the 'evidence' for the truth of spiritualist practice (Sargent 1869).

The foregrounding of techniques and technologies of Spiritualism and the construction of evidence began almost concurrently with the birth of Spiritualism itself. The investigation and testing of Spiritualism was both external and internal to the Spiritualist practice. Internally, any communication with the spirit world would carry some claim for the message's validity, or rather the truth of the agent of the message; Epes Sargent notes that within weeks of the first rappings at Hydesville,

> ... almost any one, in coming into the presence of the two girls [Maggie and Kate Fox], could get a communication from what purported to be the spirits of his departed friends, the same often being accompanied by tests which satisfied the interrogator as to the spirits' identity. (Sargent 1869, 33)

In the same time period, the Fox sisters were externally investigated, firstly informally, by their Hydesville neighbours in 1848, and then formally, through three separate self-proclaimed Committees of Investigation. The first of these Committees was formed in the town of Rochester in November 1849, where the Fox sisters had recently moved, and included a sub-committee of women who strip-searched the two girls. In 1851, the Fox sisters underwent another examination by committee, this time self-appointed in response to the girls' success in public exhibitions, by a group of three faculty members of the University of Buffalo, Dr. Austin Flint, Dr. Charles A. Lee and Dr. C. B. Coventry. Through a system they called Reasoning By Exclusion, the Buffalo investigators argued that the rappings could not have been made either by spirits, artificial devices (as the girls were searched again) nor machinery.[314] To the doctors, these exclusions were evidence that the rappings involved an effort of will by the sisters, one that manifested itself not in their muscles but in their skeletons. The doctors concluded that "the *Rochester knockings* emanate from the knee-joint" (Flint, Lee et al. 1851; quoted in Podmore 1902, 184-185).[315]

The third investigative organisation was established under the name of the Seybert Commission, named after the philanthropist and spiritualist Henry Seybert who, under the terms of a legacy to the University of Pennsylvania for a chair in Philosophy, stipulated that a fixed proportion of the funds should sponsor an investigation into "all systems of morals, religion or philosophy which assume to represent the truth; and particularly modern Spiritualism."[316] The Seybert Commission, which ran from 1883 to 1887, was an investigative committee of seven men from the faculty of the University of Pennsylvania, led by Dr. Horace Howard Furness (1833-1912). Over the period of four years, it investigated fourteen spirit mediums, all presenting different spiritualist techniques, from slate writing as in the case of the infamous Dr. Henry Slade, to spiritualist photography with the work of W.M. Keeler.[317] And yet, as an investigative committee, its intention was for its investigators to be unprejudiced, such that from its outset each of Commission's members,

> ... expressed his entire freedom from all prejudices against the subject to be investigated, and his readiness to accept any conclusion warranted by facts... (The Seybert Commission 1887, 5)

The positioning of its investigators as dispassionate observers is part of the scientific method, working on the assumption that the process of investigation and examination of the practices of spiritual media would be detached from any affective influence. However, as can be seen from the Commission's Preliminary Report of 1887, and its investigation of one of the most famous mediums of the age, Maggie Fox, during the a series of séances from 5-7 November 1884, the personality of not just the medium but also the séance attendees clearly play a prominent role in the investigation. On the first night, she produced spirit rappings answering

[314] The doctors' reason for their methodological choice is that of logical necessity, namely the same method used to diagnose disease (Davenport, Fox et al. 1888, 135).

[315] The exclusion of spiritualist forces as the cause behind the rappings seems to rest on a peculiarly circular argument, for they argued that "It is to be assumed, first, that the manifestations are not to be regarded as spiritual, provided they can be physically or physiologically accounted for. Immaterial agencies are not to be invoked until material agencies fail. We are thus to *exclude* spiritual causation in this stage of the investigation." Furthermore, the settling on the knee-joint-cracking theory was introduced because the doctors had heard the case of a woman able to snap her knee joints at will (Quoted in Davenport, Fox et al. 1888 135).

[316] Whilst alive, Henry Seybert had founded a 'Spiritualist Mansion', in which he installed the recently widowed Margaret Fox Kane (Davenport, Fox et al. 1888, 164-7). He also founded the Seybert Institution, which still currently operates a charitable foundation, and still funds a Chair in Moral Philosophy at the University of Pennsylvania.

[317] Furness, the chairman, was himself a literary scholar. Other members of the Commission included William Pepper (medical doctor), Joseph Leidy (palaeontologist), George Koeing (chemist), Robert Ellis Thompson (social scientist), George Fullerton (philosopher) (Davenport, Fox et al. 1888, 170). These seven later recruited four others, Coleman Sellers II (an engineer), James W. White, Calvin B. Knerr, and S. Weir Mitchell.

questions to which only the séance attendees would know the answer, but on the second and third the Commission began its more in-depth testing, by having her stand on four upside down glass tumblers and then position herself physically in different positions around the parlour. Although she later claimed she did not allow the Seybert Commission to make a full physical examination of her body, so that, she notes, they could never entirely refute the spirit rappings, she did allow Furness to hold her feet whilst she rapped, an investigative practice which she herself suggested the Commission should use to test her, and about which Furness proclaimed,

> This is the most wonderful thing of all, Mrs. Kane, I distinctly feel them [the rappings] in your foot. There is not a particle of motion in your foot, but there is an unusual pulsation. (University of Pennsylvania 1887, 47)[318]

And yet although Maggie Fox claims that the Commission could never get to the proof of her rapping, the Seybert Commission itself acknowledge its inability to test the internal workings of media bodies, noting that,

> The difficulty attending the investigation of this modern spiritualistic manifestation is increased by the fact, familiar to physiologists, that sounds of varying intensity may be produced in almost any portion of the human body by voluntary muscular action. To determine the exact location of this muscular activity is at times a matter of delicacy. (Carvill Lewis 1887; quoted in Davenport, Fox et al. 1888, 202)

Despite these investigations and examinations, the conclusions of these boards, committees, and commissions did little to counter the increasing following of the Fox sisters or of Spiritualism itself and indeed, any official declaration did not put the sisters out of business, but rather was followed by their ever-increasing success as spirit media. One measure of the success of Spiritualism itself was when on 17 April 1854, a petition of 15,000 names was submitted to the United States Congress to ask the Federal government to run a formal investigation of Spiritualism's claims, not with a view to it being dismissed but rather for it to be established as true and therefore legitimate.[319]

Investigation and examination were not the only processes through which evidence for Spiritualism was produced; there was also demonstration and personal testimony. One case of demonstration was given in 1850 by a Dr Lee, a Professor of Bowdoin College, who exhibited another man and his ability to crack joints in his skeleton louder than the Fox sisters. However, the demonstration, rather like the examination, could not offer any internal, embodied knowledge, only the effects of the body, which resulted in its curious backfiring, as the exhibition became a source for belief in Spiritualism rather than for its disavowal, much to the surprise of Dr Lee, who noted,

[318] "Conjectures, it is true, have groped in that direction [of toe-rapping], time and again–but they never have done more than to grope" and "This [proof of toe-rapping] they (the Seybert Commission) were unable to prove however, by any use of their five senses, which they were permitted to make" (Davenport, Fox et al. 1888, 168-9).

[319] The petition was presented by Senator Shields of Illinois and in its administration through the political system, in attempting to place its debate before the most expert group of citizens, Davenport writes "Mr. Petit proposed to refer the petition of the Spiritualists to three thousand clergymen. Mr. Weller proposed to refer it to the Committee on Foreign Relations, as it might be necessary to inquire whether or not when Americans leave this world they lose their citizenship. Mr Mason proposed that it should be left to the Committee on Military Affairs. General Shields himself said he had thought of proposing to refer the petition to the Committee on Post Offices and Post Roads, because there may be a possibility of establishing a spiritual telegraph between the material and the spiritual worlds" (Davenport, Fox et al. 1888, 151-9).

> Many in the audience who now for the first time witnessed something in the spirit knocking line, became converts to the doctrine and still refer to my exhibition as the strongest kind of demonstration in its support. (Wesley Fornell 1964; quoted in During 2002, 154)

Perhaps the most compelling form of evidence was personal testimony. However, like investigation and examination, testimony itself, perhaps more so than other forms of evidence, was particularly divisive.[320] One famous example of spiritualist testimony was the deposition made on 17 April 1851, by a Mrs Norman Culver, sister-in-law to Ann Leah Fox, to the town magistrates of Arcadia, which was later published in the *New York Herald* (Maskelyne 1875, 24-27). Whilst the reason for her deposition is unclear, Mrs Culver explains how she became suspicious of her relations' behaviour after two years of sincere belief in their ability to communicate with the spirit world. On voicing her suspicions, she claimed that Kate Fox explained to her that the sisters were rapping with their toes; from this testimony, the Fox sisters had not only learnt but practised how to crack the joints in their toes (or knees, depending on which account one reads) to produce loud 'rapping' noises, which, through misdirection, enabled the sisters to convince their audience that the sound came from elsewhere in the room to their own bodies (Davenport, Fox et al. 1888).[321] Certainly the investigations, examinations and testimony circle around the technique of 'rapping', a bodily performance involving throwing bodily sounds, mirroring the performance of ventriloquists who are able to 'throw' their voices, as if their bodily-produced sound stemmed from a physical space other than their own vocal systems.[322]

In an interview with Maggie Fox with the *New York Herald* some thirty years later in 1888, the journalist recounts how, in an attempt to prove the 'rappings' as illusions, Maggie attempted to show him the deception at first hand,

> "You want to know what are the points of my coming exposé? First the 'rappings'."
>
> Mrs Kane paused here, and I hear first a rapping under the floor near my feet, then under the chair in which I was seated, and again under a table on which I was leaning. She led me to the door and I heard the same sound on the other side of it. Then, when she sat on the piano stool, the legs of the instrument reverberated more loudly, and the rap, rap, resounded throughout its hollow structure.
>
> "It is all a trick?"
>
> "Absolutely. Spirits, is he not easily fooled?"
>
> Rap, rap, rap!
>
> "I can always get an affirmative answer to that question," she remarked.

[320] Of course, the accounts of examinations and investigations can themselves be seen as testimonies, for there is no other supporting documentation. However, with the Seybert Commission's investigation of Maggie Fox, a stenographer was hired to transcribe the séances, so that she/he would be the recording device of spiritual activity (University of Pennsylvania 1887, 33-49).

[321] The sisters' later testimony in a biography by Rueben Briggs Davenport of 1888 describes how they began their 'rapping' on 31 March 1848 as a trick on their mother. However such was the effect of their trick, and such was the credulity of their mother, and so short was the period of time before their entire community was involved that the sisters felt unable to admit their trickery. Their subsequent immersion into the world of spirit media was inextricably linked to the level of belief in their audience; the greater the number of people who believed in the power of the Fox sisters to communicate with the spirit world, the more the Fox sisters felt that they could not admit to the truth of their behaviour (Davenport, Fox et al. 1888). An interesting section of this book is that the opening page contains a written testimony from Margaret Fox Kane and Catherine Fox Jencken, which says "We hereby approve of Mr. Reuben B. Davenport's design to write a true account of the origin of Spiritualism and of our connection therewith, and we authorize him to make proper use of all data and material that we furnish him. New York, 15th Oct., 1888." This text is a printed reproduction of a typewritten letter, and the testimony is confirmed by the reproduction of the handwritten signatures of the two women (Davenport, Fox et al. 1888).

[322] For more on ventriloquism, see Connor 1999; and Connor 2000.

(Davenport, Fox et al. 1888, 37-8)

What seems so extra-ordinary about the case of the Fox sisters is that even their own testimony against themselves was insufficient to assuage the belief of Spiritualism's followers. Indeed, such was the disbelief with which the demonstrations by and the testimony from the sisters were met, that the sisters returned to the stage to perform their communiqué (sometimes testified to be on accounts of impoverishment) but never again committing themselves to assigning their rappings to another world.[323] This strength of belief in the medium's own performance over and above any other form of evidence, in personal experience over written evidence, also manifests itself in Epes Sargent's account of the practice of slate writing, when Sargent writes,

> But if he [Mr. Charles E. Watkins, a slate writer] should come out to-morrow and declare his slate-writing was all jugglery, it would not make the slightest impression on me, or on some hundred other investigators, *unless* he could teach us how to reproduce the same thaumaturgic results under the same condition. (Sargent 1877, 107)

The Society for Psychical Research

At around the same time as the establishment of the Seybert Commission in Pennsylvania, the Society for Psychical Research (SPR) was established in Great Britain by individuals, which, like the Seybert Commission, were committed to the dispassionate study of Spiritualism.[324] Like the Seybert Commission, the SPR was formed from the ranks of academia, centred around a group within Cambridge University's Faculty of Philosophy. However, unlike the Seybert Commission, the SPR had a much wider field of investigation, from mesmerism to ghosts, dreams to thought transference. It was intellectually preceded by three other organisations, with leading members of the SPR having been members of the (latter) two societies: The Psychological Society of Great Britain (1875-79); Oxford Phantasmological Society (1879-1885); and the University of Cambridge's so-called Ghost Society, formally called the Cambridge Association for Spiritual Inquiry (formed 1850) (Oppenheim 1985, 123). In parenting the SPR, the inclusion of the Psychological Society of Great Britain led to a hesitancy in naming the SPR, whether it should be called Psychical or Psychological; this doubling demonstrates how the mind, or, more accurately, the psyche, was at one and the same time part of the scientific and non-scientific discourse; the mind and its ability to perform acts in the world was itself a fault line between scientific materialism and idealism, as it was the site for the production of as yet unexplainable phenomena or effects; and it was on this fault line that the SPR attempted to position itself.

The SPR's remit was to investigate under a scientific framework particular phenomena that had not, as yet, fallen under the remit of any other body or organisation. In order to produce evidence that could be considered valid, as with any formal institution, the SPR was established as a bureaucratic organisation, run by a President, Professor of Philosophy Henry

[323] By 1884, Maggie Fox (by then Maggie Fox Kane) was not claiming the sounds as evidence of existence of the spirit world, telling the Seybert Commission "I do not even say the sounds are from Spirits; and, what is more, it is utterly beyond human power to detect them. I do not say they are the Spirits of our departed friends, but I leave others to judge for themselves." (University of Pennsylvania 1887, 42). Furthermore, the later testimony of the Fox sisters against themselves is often ascribed to their being (a) destitute, (b) alcoholic, or most interestingly (c) hysterical, and sometimes all three factors together.

[324] The SPR stated its aim to investigate psychic and spiritual phenomenon "without prejudice or prepossession of any kind, and in the same spirit of exact and unimpassioned enquiry which has enabled Science to solve so many problems, once not less obscure not less hotly debated" (Quoted from Gauld 1968, 138). It was formally established on 20th February 1882, only six weeks after the death of Charles Darwin, at the house of Darwin's cousin, Hensleigh Wedgwood.

Sidgwick, and a Council of about twenty members. It had offices, a small library and a paid secretary, and its investigations into psychical claims and phenomena were divided between different specialist committees.[325] The most powerful was The Literary Committee, run by Edmund Gurney (1847-1888), a medical student at Cambridge University, and Frederic W.H. Myers, a former student of Sidgwick's; it collected "reports of dreams, coincidences, second sight and apparitions ... both at first hand and in references in biographies and foreign work" (Haynes , 12).[326] However there were also committees dedicated to researching Mesmerism, run by Frank Podmore (1856-1910); the Reichenbach Experiments into the so-called Odic Forces, run by W.H. Coffin; Physical Phenomena, run by F. S. Hughes; and Apparitions and Haunted Houses, run by E. R. Pease.[327] In the second published proceedings of the SPR in 1884, eighteen investigative reports were included, of which only four were on ghosts and hauntings; the remaining fourteen covered thought-transference, mesmerism and hypnotism, activities which would be classed as parapsychology, but psychological nonetheless. This outline of the work done by the SPR and its investigators demonstrates the nature of the core work done under the term psychic research and the broad church of spiritualism.

The peculiar position of the SPR, as an organisation attempting to scientifically investigate psychic and spiritualist practices, drew together intellectual positions and forms of knowledge most often located as antitheses of each other. However with the work of the SPR, it becomes possible to see these knowledges as lying at either end of a discursive spectrum, one that is productive of an intellectual and investigatory tension. For example, Myers, in an explanatory note to the First Report of the Committee of the Society of Psychical Research, describes how those with the ability to communicate with the spirit world by whatever means, were examples of individuals further evolved, in the Darwinian sense, than the majority of the population, noting,

> He [the medium] is merely standing at a more advanced point than we in the evolutionary series in which all sentient beings are included. He has powers of analysis and synthesis as much ahead of ours as ours are ahead of the savage's, or as the savage's are ahead of the brute's. (Committee of the Society for Psychical Research 1884, 29)

This explanation drew together the extreme idealistic position of Spiritualism, with the extreme scientific materialist position of Darwinism. In 1884, the SPR formed a special investigative committee to examine the Theosophical Society. Formed in 1875 by Colonel Olcott and Madame Blavatsky, the Theosophical Society's aim was to promote certain eastern philosophical practices or, as was called, occult wisdom.[328] The Committee were investigating two phenomena connected to the Theosophical Society: 'projection of astral forms' wherein individuals appeared in places their bodies were known not to be; and 'precipitation', which

[325] The SPR's first offices in London were at 14 Dean's Yard, and latterly 19 Buckingham Place. On its establishment, its President donated 180 books to begin its library, and this was added to not least by the SPR's publications, *Proceedings of the Society of Psychical Research* and its *Journal of Psychical Research* (Gauld 1968, 138).
[326] The Literary Committee is particularly interesting as it treats written reports, appearing in biographical books, as evidence, creating a double-written spiritualist experience, that of the original spiritualist encounter experienced through a spiritualist media, itself encountered through the medium of the written word.
[327] Frank Podmore was a man slightly outside the academic leanings of the SPR, being a civil servant in the Post Office. The Reichenbach Experiments Committee was focussed on investigating the work of the recently deceased German chemist Baron Karl von Reichenbach (1788-1869), specifically his investigations into human sensitivity.
[328] The Committee comprised the medium Edmund Gurney, Frederick Myers, Frank Podmore, J. Herbert Stack and R. Hodgson. SPR President Sidgwick was also a member of this Committee. The first report was an investigation into the materialisation of a letter to Blavatsky and Olcott reportedly from a Mahatma. Their first report, marked clearly as private and confidential not only because of placing the evidence of so-called witnesses in the public domain, but as to their so called "state of suspense of judgement" as to "genuineness and significance" of the phenomena the Committee investigated and then documented in their report (Committee of the Society for Psychical Research 1884, 4-5).

was the appearance of letters and/or drawings on previously blank pieces of paper, with no author present (Committee of the Society for Psychical Research 1884, 20). Both tenets, a body present where it is known not to be and writing appearing without a body, cut to the heart of this chapter. For certainly the description of writing with no physical author present as with 'precipitation', implies that the writing was in the air, was part of the ether that materialised at the will of the author. It is as if this form of magical writing was the result of a telegraph system, but with no writing machine, no inscriptive device; spirit medium writing was writing with no medium, demonstrating agency with not only no automation, but no material method at all. Myers discusses in his explanatory notes to the first report the phenomenon of precipitation in further detail, noting that,

> ... if an Adept in Thibet [sic] wishes to transmit a letter to a friend in Madras he can proceed in various ways. If his friend is himself gifted with occult power it will suffice for the Adept to imprint the intended words on the akâs by an effort of will. The disciple will then discern them in the akâs, and if necessary can himself precipitate them on to an ordinary sheet of paper. Or else the Adept can write his letter on ordinary paper in Thibet, and then disintegrate the paper, - keeping the particles, however, sufficiently close for ultimate reunion, - convey the disintegrated or *virtual* missive through intervening obstacles, and re-integrate it in Madras. Or he can write a letter in Thibet by ordinary means, elicit its astral image, project that image to Madras, accrete visible matter thereto, and thus create a *duplicate* of the original letter, which duplicate he can render either temporary or permanent. Or he can simply precipitate both paper and handwriting from the akâs at Madras, without any previous preparation or transmission. (Committee of the Society for Psychical Research 1884, 31)[329]

Like Professor Robert Hare, the chemist and physicist Sir William Crookes (1832-1919), a Fellow (later President) of the Royal Society, turned to investigate psychic and spiritualist phenomena for only a short period, from 1870-75, becoming an Honorary Member of the SPR.[330] Taking it upon himself to investigate the medium D.D. Home, Crookes aimed to apply scientific methodology to spiritualist phenomena, publishing his first investigative spiritualist reports in the early 1870s in the *Journal of Modern Science*, to demonstrate how possible, or pregnant with possibility, spiritualism was within a scientific context. In setting out the intention for his investigation, Crookes writes in his first scientific-spiritualist paper 'Spiritualism Viewed by the Light of Modern Science',

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[329] The akâs which Myers refers to is what he calls "the foundation of thought and brain alike", noting it to be "such stuff as dreams are made of" (Committee of the Society for Psychical Research 1884, 30). Myer's (mis)quotation from Shakespeare's *Tempest*, a play of knowledge and magic, locates the working practices and foundational beliefs in the magical and the scientific forms of knowledge. (The correct line is "we are such things as dreams are made on". (Shakespeare Act IV, Scene I, 156-7)). This relationship between the scientific and the magical lends itself to Arthur C. Clarke's Third Law of predicting the future, added to his 1973 revised edition of *Profiles of the Future*, that "Any sufficiently advanced technology is indistinguishable from magic" (Clarke 1973 [1962], 21).

[330] Crookes was an industrious and wide-ranging Victorian scientist, described as man of "substantial reputation", who discovered the chemical element thallium in 1861, worked in scientific journalism for most of his life, launching *Chemical News* and editing the *Quarterly Journal of Science*. He worked for the British government on public health issues including reporting on the use of disinfectants, serving as a director of the Water Inspection Laboratory and was part of the Explosives Committee of the Ordnance Board. He became a Fellow of the Royal Society in 1863, was knighted in 1897, became president of the British Association in 1898, was awarded the Order of Merit in 1910 and became President of the Royal Society from 1914-16. His investigation of cathode rays directly led to J. J. Thomson's work and discovery of the electron. A scientist very much of the Victorian establishment, his interest in spiritualism is claimed to have begun following the death of his brother Philip from yellow fever in 1867 and to have been consolidated by 1870 as a fully formed personal belief. The library of the Spiritualist Association of Great Britain is named for Crookes. An outline of Crookes involvement with Spiritualism can be found in Oppenheim 1985, 338-354. William Crookes, F.R.S., 7 Kensington Park-gardens, London is listed as an Honorary Member in the membership list of the SPR (Society for Psychical Research 1884, 317).

> I think, therefore, it will be of service if I here illustrate the modes of thought current amongst those who investigate science, and say what kind of experimental proof science has a right to demand before admitting a new department of knowledge into her ranks. (Crookes 1870)

Again, the peculiar position of knowledge itself, the legitimatisation of claims and testimonies, investigations and examinations, lies at the heart of Crookes' scientific approach to spiritualist phenomena. While in the twentieth century philosopher of science Thomas Kuhn argues for all scientific knowledge being conjectural knowledge–that is admitted into the ranks of scientific knowledge until it is not–literary scholar Roger Luckhurst argues for something more subtle, what he calls an 'unevenness' in the terrain of expert knowledge of the 1870s, noting that,

> Psychical researchers did not produce counter-knowledge to a scientific naturalist monolith: there was no simple structure to oppose. Rather, their knowledge emerged along the fault-lines with a fragile edifice. (Luckhurst 2002, 21).[331]

The emergence of the 'fragile edifice' of Spiritualism along the fault lines became, as part of the emerging discourse on expert knowledge–indeed as knowledge per se–intimately connected with both magical and scientific practice. However this was not the religious magic, but rather a secularised one, one which involved deceptions and trickery, and it is perhaps here in the metaphorical moving of the tectonic plates of faith and reason that the fault lines that Luckhurst argues for appear. However Spiritualism was haunted by the ghost of religiosity, by its ability to cause wonder, as both magic and science claimed to do, whilst being subjected to magical and scientific analysis through investigation by magicians and scientists. It was not the case of spiritualists vs. magicians/scientists, as sometimes spiritualist media themselves worked to expose the trickery/deceit of other spiritualists–undoubtedly because this manoeuvre not only laid down a claim for the truth of their own work but that it also 'thinned out' the market of spiritualist media. The most prominent medium to employ this tactic was D.D. Home, who drew back the veil to reveal the workings behind the magic in his book *Lights and Shadows of Spiritualism* (1877).[332] In a chapter called 'Trickery and Its Exposure', Home outlined ways in which sleights of hand was performed by spiritualist media, with specific attention to the ways in which audiences were tricked into believing in the presence of full-form body materialisation, or 'spirit forms'. It is however in his accounts of various séances and the attendees' behaviour that the credulity of nineteenth century audiences seems almost fantastical, not just for a contemporary reader, but for Home himself, who notes that "Their [the audience] credulity rapidly mounts to fever-heat", a clear reference to Spiritualism's infectious nature (Home 1877, 396).

However, the peculiar tension within Spiritualism between the magical and the scientific can be seen as a challenge to epistemological grounding; if some knowledge sits on the fault lines as a fragile edifice, how does one achieve any degree of certainty; how does one ground knowledge? At the SPR's Eighth General Meeting of 1884, Sidgwick spoke to the peculiar tension of Spiritualism as one created from a question of evidence,

[331] The questioning of the grand narratives of expert knowledge can also be found in Collini 1991.
[332] In the third part of his book, *Modern Spiritualism*, David Dunglas Home dedicates two chapters, Chapters VIII and IX, to 'Trickery and Exposure', outlining how sealed letters are read, the problems of spirit photography, the ordinary dark séance, and how rope-tying and handcuffs can be overcome (Home 1877, 384-440).

> The question, then, is merely whether evidence enough has been produced. And here I have always admitted, and indeed emphatically maintained, that what we allege to be facts are so contrary to the analogy of experience–at least so far as experience has been systematised by science–that until a large number of mutually corroborative testimonies are collected we cannot expect the scientific world to be converted. (Society for Psychical Research 1884, 153)

Historian of psychology (and amateur magician) Peter Lamont identifies the problem of Spiritualism as not a crisis of faith, but rather as a crisis of evidence, as Sidgwick's 1884 address seems to support (Lamont 2004). In this address, Sidgwick discusses in detail what evidence is and how it should be grounded. Indeed the practice within and subsequent structure and layout of the first investigation into psychical experiences, the *First Report of the Committee of the Society for Psychical Research* (1884) sets out Spiritualism precisely within this framework of evidence, with the Appendices to the Report, that form the greater part of the publication, containing almost an excess of evidence, with transcriptions of witness interviews carried out by the SPR investigators, copies of the psychic telegrams received and written testimonies from other witnesses and experts (Committee of the Society for Psychical Research 1884).

In considering the evidentiary aspect supplied by Spiritualism, the questions concerning what is a necessary condition for knowledge and what is sufficient have to be considered, and it is with these questions in mind that this chapter will now turn to another set of individuals who examined and challenged Spiritualism albeit under another rubric; the stage magician John Nevil Maskelyne and his partner George Cooke.

Maskelyne and Cooke

John Nevil Maskelyne (1839-1917) and his partner George Cooke (1825-1905) were Cheltenham-raised artisans–Cooke a cabinet maker, and Maskelyne an apprentice jeweller and watchmaker–who became the leading anti-spiritualist performers of the mid- to late-nineteenth century (Jenness 1967, 25; and Egyptian Hall 1877, 4).[333] In 1864, the well-known American spiritualist performers, brothers Ira and William Davenport, toured the UK, appearing in one evening in Cheltenham. The Davenports' main spiritualist performance, which they called their spirit cabinet and somewhat cryptically referred to as being an adaptation of the Indian Rope Trick, involved having their hands tied with rope by members of the audience and then being tied to chairs within a wooden cabinet, where each brother was separated from the other by a wooden partition. On the closing of the box, musical instruments that had been placed in the box began to play, hands would appear at the aperture, and then the instruments would fly out into the room (Figures 4.39 amd 4.40). On re-opening the box the Davenport brothers were found to be tied in exactly the same manner as they had been when the box was claimed.

Crucial to understanding the importance of the Davenport brothers' trick was their claim to the supernatural; indeed their show was introduced by Dr. J.B. Ferguson, a confirmed spiritualist and (allegedly) a sincere believer in the brothers' supernatural capabilities. It was this claim to the supernatural that so angered the watchmaker's apprentice Maskelyne that in an effort to debunk the Davenports, he volunteered to be one of those who tied up one of the brothers, one of the so-called investigative committee.[334] According to Maskelyne's own

[333] Both Maskelyne and Cooke also belonged to the Band of the Volunteer Rifles, in which they both played the cornet (Jenness 1967, 25; and Egyptian Hall 1877, 4).

[334] In his autobiography Maskelyne claims that the two most important events of his early years were his near drowning (where he claims he technically died and saw his mother performing her daily duties) and his visit to the 1851

testimony, it was whilst he was standing next to the box after it had been shut that 'a piece of drapery' fell away from one of the windows of cabinet, allowing him to see what Ira Davenport was doing inside the box. This unintentional drawing back of the veil was the event that enabled Maskelyne to work out how the trick was performed.[335]

With the aid of his cabinet maker friend George Cooke, Maskelyne recreated the Davenports' trick within a few months, this time claiming, contrary to the Davenports, that his performance was pure trickery rather than pure Spiritualism. It was the performance of this trick, named by the magicians as Magic Box Illusion, that Maskelyne and Cooke developed into a full magic show, one with which they spent the next seven years touring the English provinces, before moving to London in 1873 to perform in St. James's Hall in Piccadilly.[336] Such was their success that on 26 May 1873 Maskelyne and Cooke moved to The Egyptian Hall, also on Piccadilly, to take up a residency in the Large Hall, where they remained for the next thirty-one years.

The cornerstone of Maskelyne and Cooke's show, in its exposure of spiritualist practice, was the Musical Box Illusion; indeed the exposure of spiritualist practices as pieces of trickery and illusion became the bedrock of all the Maskelyne and Cooke's magical creations. At a typical Maskelyne and Cooke show in the 1870 and 1880s, the Musical Box Illusion was followed by a levitation feat by Maskelyne (in direct answer to the most famous incident of a spiritualist, The Levitation of D.D. Home), a walking stick that moved by itself across the stage, and then a performance called Chinese Plate Dancing (Jenness 1967, 28-29) (Figures 4.41 and 4.42).[337] Amongst these individual performances, Maskelyne and Cooke also staged magical short plays, most often of a comedic nature, in which the ghostly or gothic was exposed as trickery, such as the popular 'Will, the Witch and the Watch', in which a set of people were locked in a box and later appeared elsewhere in the theatre.[338] Extending the ghostly performances, Maskelyne and Cooke specifically addressed spiritual practices with their séance

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Great Exhibition, where he saw the automaton Piping Bullfinch. This combination of human death and mechanical life as the self-declared cornerstones of Maskelyne's life are of interest to note in relation to his work as an anti-spiritualist magician, and in some regards, in relation to the work of Alan Turing, and of D.D.Home (Maskelyne 1901, 311-312).

[335] Intriguingly Maskelyne describes what he saw, in that he saw Ira Davenport "securing himself with marvellous dexterity" (Egyptian Hall 1877, 5). In a later publication Maskelyne writes,

> "I was one of the committee of investigation elected by the audience, and in that capacity I was seated at one side of the stage. Once, whilst the centre door was opening and the instruments flying out of the cabinet, a small piece of drapery fell from the window behind me. A ray of sunlight shot into the cabinet upon Ira Davenport, whose actions thus became visible to me. There sat Ira, with one hand behind him and the other hand in the act of throwing. In an instant both hands were behind him. He gave a smart wriggle of his shoulders, and, when his bonds were examined, he was found to be thoroughly secured." (Maskelyne 1901, 314)

From this description, it would seem to suggest that the brothers were contortionists.

[336] A figure that ghosts Maskelyne not only for being a Victorian secular magician, albeit in a slightly earlier period, but also for the tricks he performed and in the building of automata is Jean-Eugene Robert-Houdin (1805-1871). In his levitation trick, The Ethereal Suspension, philosopher of literature Joshua Landy notes that its importance is because Robert-Houdin "presented it as a miracle of *science*, with himself acting the role of *professor*, and his performance gaining the feel of an *experiment*" (Landy and Saler 2009, 107). Additionally, at the Universal Exposition of 1844, he exhibited an automaton called "The Writer", a class of machine he named as an android. This device is described as being able to not only write but also draw (During 2002, 120-121). To read further on Robert-Houdin, see Robert-Houdin and Wraxall 1859; Evans and Robert-Houdin 1932; During 2002; Landy and Saler 2009, 102-129. Such was his influence that Ehrich Weiss not only wrote a major work on the magician, in order to undermine claims within the world of magic for his genius and inventiveness, but also it is from Robert-Houdin's name that Weiss took his stage name of Harry Houdini (Houdini 1909). Finally, of interest to note is that Robert-Houdin also worked in the new field of ophthalmology, developing machines for seeing the interior of the eye called an iridoscope. In his interest, he mirrors Arthur Conan Doyle, a figure who appears below in this chapter who, like Robert-Houdin, not only doubly expresses the spiritual and the rational, but also practised ophthalmology, albeit rather unsuccessfully (Henry and Robert-Houdin 1943).

[337] The Levitation of D.D.Home is one of the most famous incidents of nineteenth century Spiritualism. The Magic Box Illusion became the subject of an early movie called 'The Cabinet Trick of the Davenport Brothers', made in 1902 by David Devant, who as well as being an early cinematographer and moving image maker, was also the protégé of John Nevil Maskelyne (During 2002, 159).

[338] With the magical play 'Will, The Witch and The Watch', cultural historian Simon During notes that "for the first time in a magic show fictions of the real were thoroughly integrated into narrative fictions of the true", demonstrating how even in the structure of the performance there was an elision between fiction and fact (During 2002, 158). Another magical play was 'Modern Witchery' of 1895, a pantomime of Theosophy, with its recent spearhead figure of Annie Besant represented as the central character.

section of the show, with performances named the Decapitation Illusion and the Floating Lady. What becomes evident in reviewing Maskelyne and Cooke's show and the tricks they performed, especially the Magic Box Illusion, the Walking Stick and the Decapitation Illusion, is that Maskelyne was able to move objects at a distance, the trick lying in the belief of the audience that in their automation, the agency of the objects rested in the objects themselves, or in some external (to Maskelyne), 'other' force.

This ventriloquism of agency that Maskelyne and Cooke performed is the same performance on which the tenets of Spiritualism rest. Additionally, like the magical, spiritualist performances also were interwoven with, if not built on the foundations of, technological inventions and discoveries in the scientific world, most notably (as discussed above) wireless telegraphy and the discovery of the electromagnetic spectrum. Both of these forms of communication, telegraphy and the general field of electromagnetic waves, are demonstrative of forces that can act at a distance, invisible to the naked eye. It is this invisible action, or rather the effects of invisible action, that opened the door for the possibility that movements of objects in the physical world can be enacted by the most fundamental non-physical force of all, the spirit of the dead. Thus, whilst there was an 'unknowability' around the spiritual world, the possibility of there being an 'unbeingability' of the spirit world could be rejected.

In moving to the prominent and popular Egyptian Hall, Maskelyne attempted to establish what has been described as a "headquarters of ... anti-spiritualist activity" (Oppenheim 1985, 26). However, in a curious response to the work of Maskelyne and Cooke, instead of defending the practices of mediums as somehow different to Maskelyne and Cooke's show, spiritualists attempted to absorb the magicians into their practice, proclaiming them as "the best of living mediums" whatever the two magicians said, printed or proved.[339] This evidentiary clash, between the performers' intention and the reaction of their audience–or rather, a section of its audience–continues what literary scholar and historian of the gothic Terry Castle has called a 'strange rhetorical recoil' where attempts to explain away the spirit world through rational exposition reinforces the belief in and therefore validity of the spirit world (Castle 1988, 30).[340] Thus both Maskelyne and Cooke's show and the phantasmagoria shows link to the Fox sisters' later testimony on the production of rapping to fashion an antinomial shape out of modernity, where, even in the face of expert testimony from themselves, their relations and members of the scientific community, the effects of the performance, the physical demonstration, were received as a more reliable and therefore more valid source of knowledge than the verbal explanations of the performers.

The curious relation between knowing and believing in relation to nineteenth century Spiritualism is also articulated in relation to the work of Maskelyne and Cooke. Their very success in exposure, and the remarkable consistency with which they did so, led some to believe that because spiritualist practice on many occasions failed, this itself was evidence as to its credibility, for magical was mechanical, whilst spiritual was vital, as noted in this 1874 review of their show in the *Illustrated London News*,

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[339] "The amazed jugglers [Maskelyne and Cooke] were gravely congratulated on the excellence of their physical mediumship. Denial availed nothing. In spite of all they could say, print, or prove, rabid credulity continues to rejoice over them as "the best of living mediums for the production of strong physical manifestations." Surely Spiritualism must have fallen very low, when a couple of professed conjurers [sic] are hailed by Spiritualists themselves as its best exponents" (Home 1877, 397).

[340] Castle makes this analysis in relation to image projection technologies of the eighteenth and nineteenth century. Although she notes that early magic lantern shows were "mock exercised in scientific demystification, complete with preliminary lectures on the fallacy of ghost-belief and the various cheats perpetrated by conjurers and neuromancers over the centuries", the eighteenth century phantasmagoria shows became re-enactments of spiritual experience, because of the desire by the performer not to reveal how the visions were actually produced, so that "even as it supposedly explained apparitions away, the spectral technology of the phantasmagoria mysteriously re-created the emotional aura of the supernatural" (Castle 1988, 30).

> These gentlemen aim directly at exposing spiritualist illusions, and succeed to an unprecedented extent. We are not quite sure that their success is not too great; for their experiments always succeed, which is far from being the case with the illusionists whom they would expose. It may be urged that this is the exact difference between vital and mechanical processes. We give the spiritualists the benefit of the doubt; but there are so many rational grounds of suspicion in the record of their doings, that we dare not assert anything of their manifestations with certainty. (1874)

In this report of the illusionists' exposure of spiritualist practices, the difference highlighted between 'vital and mechanical processes', an important conceptual axis applied to Spiritualism (the vital) and magic/illusion (the mechanical), is an inverted articulation of the eighteenth century discourse of automata.[341] For, as historian of technology Jessica Riskin argues, it is the vitality of these machines in their appearance to breathe, to move their eyes, to play, rather than an understanding of them as elaborate musical instruments that elevates their status beyond the mere mechanical, the mere clockwork (Riskin 2003). And this discussion is not irrelevant to Maskelyne's work either; for he too invented a number of automata that performed for the audiences at The Egyptian Hall, England's Home of Mysteries (Maskelyne 1901, 316).

Maskelyne's Automata

On 13 January 1875, Maskelyne and Cooke introduced their audience to Psycho, a whist-playing automaton (Figure 4.43).[342] Documented as being an idea bought from a Lincolnshire farmer John Algernon Clark, who had been attempting to invent a card playing machine, Psycho was introduced in the Egyptian Hall authored pamphlet of 1877 with direct reference to Vaucanson's Mechanical Duck, 'an android...which played several airs upon the German Flute' and 'a similar figure to play upon a Shepherd's pipe' (Egyptian Hall 1877, 15-16). The pamphlet then goes on to broadly document the history of automata including those of Maillardet, Robert-Houdin and finally of de Kempelen and his chess-playing Turk. It is to the last automaton that the author devotes most of his time, as he exposes the machine's trickery, as being operated by a legless Polish man, Worouski; the author then contrasts the concealed and hidden nature of the Turk with the transparency and visibility of Maskelyne's Psycho, in an attempt to establish it as a self-operating device, a machine of its own right, describing it as,

> A mild-looking Hindoo figure, some twenty-two inches high, seated, cross-legged, upon a small box, which in its turn rests on a cylinder of clear glass, occupies the centre of the stage. The isolation obtained by the cylinder is rendered more perfect by a small temporary platform which–as also the glass–can be examined by the audience before Psycho is placed upon them. (Egyptian Hall 1877, 19)[343]

The machine primarily works as follows: cards are dealt to four parties, one of whom is Psycho. Maskelyne takes up the cards and places them in a semi-circular frame in front of the body of the automata, but also part of the machine as a whole. When it is the machine's moment to play, its right hand moves in a circular motion over the frame and with his thumb and fingers, he chooses a card; then "by a new vertical movement of the hand and arm, he extracts it from its place, lifts it high in the air, and exposes it to the view of the audience. Maskelyne then takes

[341] For more on eighteenth century automata, see section 1.2 'Copying Bodies (Sometimes Writing)'.
[342] Maskelyne's automaton Psycho currently resides in the Museum of London's collection.
[343] Like Kempelen's Turk, Maskelyne's Psycho is constructed to tie into 'the Oriental' for its power and mystery.

the card from the hand of the machine and lays it on the table to play the trick (Egyptian Hall 1877, 19). Invariably the automaton wins the game, whomever it plays. What differentiates the machine from other automata, and aligns it with Kempelen's Turk, is that to play whist is to exercise judgement–to evaluate one's hand within the rules of the game and to strategise. Again, even though it was known to be 'only' a machine, spiritualists' claims became interwoven with Maskelyne and his practices as evidence of Spiritualism's own legitimacy, a factor that one witness to Psycho's capabilities, a Mr Pole (described as a well-known authority on whist and author of *The Scientific Game*) notes,

> I confess that to me, standing besides this little wooden doll, apparently isolated from any human agency, and seeing it not only imitate human motions, but exert human intelligence and skill, the effect seemed weird and uncanny; and I could hardly wonder at the Spiritualists, who seriously conjecture that Psycho may be one of the manifestations comprised in their own Psychological creed. (Egyptian Hall 1877, 22)

However, Maskelyne made no claims for the spiritual or magical nature of Psycho declaring that,

> There is no trickery whatever about it, but purely mechanical and self-acting being isolated upon a piece of clear glass and the audience is allowed to examine every part inside and outside and to walk around it whilst at work. (Letter from J. N. Maskelyne to Mr. J. W. Cockerhand, dated 14 January 1875; Quoted in Jenness 1967, 33)

Maybe it was because these feats of whist playing were not the only actions of this machine. For it could also perform the audience-marked card in a pack trick, through hitting a bell 'to tell the suit, rank and number of spots' and is also described as being able to 'imitate handwriting he has never seen' and 'spell words only known to those who have written them' (Egyptian Hall 1877, 24). One of Psycho's opponents, a well-known whist-player called Cavendish, noted that,

> There does not seem to be any connection via thread, wire, or other tangible agent between the figure and the exhibitor, and the wonder therefore is, how the figure can play whist at all, and how it can apparently exercise intelligence in choosing the appropriate card. (Egyptian Hall 1877, 23)

Again, what becomes clear from these descriptions of Psycho, and from a frontispiece photograph of the device from the Egyptian Hall programme is that Maskelyne was able to make material move at a distance. Indeed, staring at the frontispiece photograph of Maskelyne and Psycho in the programme, it becomes possible to see that maybe one of Maskelyne's arms is not 'real'; that maybe the 'other' hand is concealed under Maskelyne's shirt (Figure 4.43). And from these possibilities, a viewer may suppose that Maskelyne is controlling the machine through some electromagnetic device, a Victorian remote control, that moves the whist-playing machine.[344] Although Maskelyne went on to invent and construct three more automata–a drawing machine called Zoë, a cornet playing machine called Fanfare, and in a curious echo of

[344] In his book *Exclusive Magical Secrets* (1912), magician Will Goldston put forward one explanation of how Psycho's mechanism, which be attributed to a bellow system, which altered the air pressure in a series of pipes in the machine, which then moved the internal mechanism of the machine so that it moved and picked a card. These bellows, he proposed, were operated by an assistant hiding behind a curtain, or being backstage; thus the game was played by the assistant rather than by the machine or Maskelyne (Goldston 1912, 388-397). However, this does not explain the breadth of feats the machine could perform and, as noted by the Museum of London, the current owners of Psycho, no proposal put forward as to the workings of Psycho have been sufficient in explaining his operation.

Erasmus Darwin, a euphonium playing machine with mechanical lips called Labial–it was always Psycho who received star-billing because rather than performing musical and drawing feats, he could perform intelligence (Figures 4.41, 4.44 and 4.45).[345] Perhaps through Psycho, Maskelyne threw his own agency into the automation of the machine.

The desire to make matter move at a distance also saw a desire for agency to operate outside of a body, for agency to operate automatically through the machine; for, returning to the spiritualist and scientist Professor Robert Hare, his intention in inventing his Spiritoscope device was to build "an apparatus, which, if spirits were actually concerned in the phenomena, would enable them to exercise their physical and intellectual power independently of control by any medium" (Hare 1858, 11). In the next section, this chapter will argue that this doubling of the rational and the magical were to be found interwoven within both the most magical and rational fictions of the nineteenth century, Lewis Carroll's *Alice in Wonderland* and Arthur Conan Doyle's *Sherlock Holmes* stories.

[345] On 21 May 1877, Maskelyne released another automaton, as a sister to Psycho. Named Zoë, this mechanical android in young female form, seated on a pedestal, with a drawing frame at arms' length, could draw ten preset sketches of the famous faces of the day. A Zoë showcard in George Jenness' *Maskelyne and Cooke, Egyptian Hall, London* reproduces Zoë's sketches, which include the Prince of Wales, Mr. Gladstone, the Earl of Beaconsfield, and Charles Darwin, with ape companion (Jenness 1967, 44). On 29 April 1878, he introduced a third automaton which played the cornet, and which Maskelyne named Fanfare. The wind-instrument playing automaton must be technologically linked to Vaucanson's players, with their systems of pulleys, weights and bellows; and reports seem to indicate that he was supplied with air from bass tubes connected to large bellows (Jenness 1967, 43). Introduced on 2 September 1878, a euphonium player called Labial. The latter two machines, Fanfare and Labia, had mechanical lips, another appearance of the desire to produce a speaking man as had been pursued by Kempelen, Erasmus Darwin and others, as mentioned in ftnote. 42, of section 1.2 of this thesis, 'Multiplying The Line: 'Facie-Traces', Copying Machines and Polygraphs'. The history of the creation of automata with mechanical lips is noted by the author of the Egyptian Hall booklet on Maskelyne and Cooke, who writes "The most noted "speaking machines" have been those of De Kempelen and Sir Charles Wheatstone; both were admirably constructed and marvels of ingenuity, but very, very far short of perfection; though, doubtless, almost as perfect as any articulating machines will ever be made" (Egyptian Hall 1877, 25; and Clarke, Faur et al. 1910-11). Maskelyne's order of the creation of these machines seems to be a direct inversion of that history traced out previously; for there the functional development went from music to drawing and writing, to game playing.

4.4 The Magical, The Spiritual, The Fantastical and The Typewriter

The final section of this chapter explores Pamela Thurschwell's construct of magical thinking, taking what Joshua Landy and Michael Saler have called the antinomial approach to consider how the typewriter appeared as an object both magical and deeply rational. Moving from John Nevil Maskelyne's automata described in the previous section, it begins with another Maskelyne machine invention, a typewriter, before moving on to the life and work of Charles Lutwidge Dodgson, an early typewriter adoptee, and Arthur Conan Doyle, the first author to use the typewriter as a central literary device in a short story, to show how the paradigmatic fictions of magic by Dodgson and rationality by Conan Doyle were at one and the same time expressive of the other, forming a synthesis of writing, the magical and the rational.

Maskelyne's Typewriter - Dodgson/Carroll - Conan Doyle/Holmes

Under an advertisement for a Maskelyne Mechanical Cashier and Book-Keeper, the 1893 Egyptian Hall programme displays an advertisement for The Maskelyne Type-Writer, sometimes described as the first British invented typewriter (Figure 4.46).[346] Described as 'Entirely New in Principle, no Ink Ribbon required', the Maskelyne keyboard/typebar writing machine was the first machine whose keys operated the typebars by the 'grasshopper' action.[347] The other noticeable feature of the Maskelyne typewriter is the appearance of differential spacing technology, a technology by which the space between the individual letters typed on the paper was proportionally mechanised. However, whilst this typewriter did not see commercial success and mass production, becoming a footnote in the biography of the founder of a three-generational family of magicians–because it was not sturdy enough against the force of the typewriting body–the invention of such a machine by Maskelyne demonstrates how magical practices, whether claiming to be evidence for spiritualistic or not, were not only deeply technological in their use of hidden mechanisms, and/or intricate networks of physical movement, but also flowed around and through technologies of inscription (for an example of a later Maskelyne typewriter (1893), see Figure 4.47).[348] Indeed it was the magical technology and the establishment of spiritualist writing as automatic that combined to discursively realise the Maskelyne Type-Writer, at one and the same time deeply rational and logical, whilst having the effect of magic and enchantment, where a writer can write at a distance, in an automated manner, whilst his/her agency is both present and not. This heady combination of magic and rationality expressed through bodies, texts and machines finds its apotheosis in two of the late nineteenth century figures, predominantly now understood as literary figures: Charles Lutwidge Dodgson and Arthur Conan Doyle.

Although best known for his fantastic stories *Alice's Adventures in Wonderland* (1865) and of her further adventures in *Through the Looking-Glass and What Alice Found There* (1872), culminating in *Alice's Adventures Under Ground* (1886), penned under the name Lewis Carroll, the figure of Charles Lutwidge Dodgson embodies the intertwining of magic and

[346] This advertisement appears underneath one for Maskelyne's Mechanical Cashier and Book-Keeper, a "machine is so simple in its operation that a child 12 years of age can be taught to use it in ten minutes, and can do the work of two or three Clerks" (Programme from the Egyptian Hall, London of 1892; Reproduced in Jenness 1967, 58).

[347] The 'grasshopper' action was that the individual type-bars rested on an ink pad, which when the corresponding key is struck, is lifted from the ink pad, darts forward and strikes the paper on the platen before returning to its original position. The Maskelyne typewriter is outlined in detail in Mares 1909, 115-8. A Maskelyne typewriter forms part of The Science Museum's Typewriter collection and Maskelyne typewriters were said to be owned by Thomas Casson, an amateur organ-builder (Jenness 1967, 69).

[348] John Nevil Maskelyne was the father of Nevil Maskelyne, also a stage magician, and of Jasper Maskelyne (1902-1973), better known as Lieutenant Maskelyne of the Royal Engineers, who made the city of Alexandria and the Suez Canal 'disappear' to deceive German bombers during WWII. For further reading see Fisher 2004. Whilst the machine might not have been commercially successful, Maskelyne himself certainly put his faith in its existence, forming The Maskelyne Type-writer and Manufacturing Company as a limited company registered at 41 Holborn Viaduct, London. (Mares 1909, 116-7).

rationality, of numeracy and literacy, of image and text.[349] The Oxford don of mathematics, Dodgson penned both nonsense poetry (such as *The Hunting of the Snark* (1876)) and mathematical treatise (such as *An Elementary Treaty on Determinants* (1867) or *The New Method of Evaluation as Applied to Pi* (1865)), as well as working in between these two extremes through writing mathematical and logical problems for children as a series of short stories (such as *The Tangled Tale* (1885)).[350] Yet to separate his works under these categories is, to a larger degree, to falsely construct them as works of such categories; for in reality his written works are oftentimes double expressions of the magical and the fantastical, at one and the same time as of the rational and the logical.[351] Certainly the *Alice* series can be read both as a work of deep fantasy or as a series of logical and mathematical puzzles; and *The Tangled Tale*, a series of mathematical puzzles, can be read as a series of short stories.[352]

In addition to this double expression of logic and fantasy in his written work, Dodgson/Carroll was also engaged with the emergent technologies of inscription. Although more well-known for his early adoption of, and experimentation with photography, what is lesser known is that Dodgson/Carroll also bought and used new technologies of writing.[353] In 1877, Dodgson/Carroll bought a Thomas Edison Electric Pen (Figure 4.48), followed by a Stylographic Pen, the first mass produced fountain pen, and a Hektograph, a chemo-mechanical copying device.[354] In 1888, Dodgson/Carroll added to his collection of writing devices and machines with a Hammond Type Writer, which he used to write letters, as well as to write his revised edition of *Memoria Technica*, a guide to his cryptographic system for remembering dates (Figure 4.27).[355] Dodgson's choice of a typewheel writing machine can

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[349] Alternative pen names Dodgson suggested to the editor of *The Train*, Edmund Yates, included Edgar Cuthwellis (an anagram of Charles Lutwidge), Edgar U.C. Westhill (another anagram), Louis Carroll (derived from Lutwidge Charles) and Lewis Carroll (derived from Lutwidge Charles) (Letter from Dodgson to Edmund Yates, 11 February 1865; Quoted in Hudson 1976, 80).

[350] It has been argued that Dodgson was not a very strong or innovative mathematician, even though he was a mathematics don at Christ Church, University of Oxford. For more on this debate, see Pycior 1984.

[351] G.K. Chesterton, in arguing that Edward Lear was a greater poet than Carroll, wrote "Lewis Carroll's nonsense was merely mathematical and logical" (Chesterton 1969; quoted in Hudson 1976, 184). In his essay on nonsense poetry, Chesterton goes on to write about Carroll that,

> We know what Lewis Carroll was in daily life: he was a singularly serious and conventional don, universally respected, but very much of a pedant and something of a Philistine. Thus his strange double life in earth and in dreamland emphasizes the idea that lies at the back of nonsense—the idea of *escape*, of escape into a world where things are not fixed horribly in an eternal appropriateness, where apples grow on pear-trees, and any odd man you meet may have three legs. Lewis Carroll, living one life in which he would have thundered morally against any one who walked on the wrong plot of grass, and another life in which he would cheerfully call the sun green and the moon blue, was, by his very divided nature, his one foot on both worlds, a perfect type of the position of modern nonsense. (Chesterton 1969, 30)

Another factor important to consider in the life and work of Dodgson/Carroll is the state of mathematics in the nineteenth century, which was, to a greater degree, split between those who advocated algebra as its own field, separate from its historical use as a methodology for geometry, and those who wanted to preserve the link between geometry and algebra, the so-called geometers. For the latter group, which was dominant in Britain in the nineteenth century and of which Dodgson/Carroll was an advocate, new concepts such as irrational and complex numbers were non-sensical, or, more accurately, unreal, because they could not be expressed through geometry and algebra as a field lacked logical rigour because of it had no axioms or proofs (Irwin 1994, 332-336).

[352] Whilst on the surface Alice seems to be going through a series of nonsensical mathematical sums, she is in fact progressing a series of quite correct sums, albeit in a series of different bases – base 18, base 21 etc. The reason she will never get to forty is that the mathematical progression she is following does not hold for the calculation that results in the answer of forty, as it is in base 42, giving the answer 84 (in base 10). For further mathematical problems in Alice, see Carroll, Gardner et al. 2000. Pycior argues that the *Alice* series is an argument against, or rather tussle with the emergent field of symbolic algebra, specifically the concepts of negative and imaginary numbers.

[353] Charles C. Lovett claims that "The camera allowed him [Carroll] to pursue art, and especially portraiture, in spite of his shortcomings as a draughtsman ..." (Lovett 1990, 3).

[354] The Stylographic Pen was invented by Charles Livermore in the early 1880s. A Hektograph is a gelatine tablet onto which the written text is pressed, and the subsequent (reversed) impressed ink on the tablet can then be used to print a new copy. For further information see Curator 2010.

[355] It is claimed that Carroll/Dodgson used the Electric Pen to write his *Memoria Technica*, a cryptographic system based on work of Richard Gray, in the eighteenth century, through which he could overcome his lacuna for memorising faces and dates. It assigned alphabetic consonants to individual numbers, from which words were assigned. These word representations of numbers were then used to form rhyming couplets (Bakewell 1996, 224-5). However Lovett claims that the text was composed on the Hammond Type Writer, which Carroll/Dodgson bought on 4 May 1888, although, as there were multiple copies of were made, all carrying the typeface of the Hammond Type Writer's italic font, he is unsure as to how these duplicates were made. (Dodgson's possession of a Hektograph must surely point towards the solution to this problem.) In the twentieth century, the Hammond Type Writer was still being used, most

perhaps be understood for the availability of seven different fonts (although only two types came as standard with the machine) which would fit in with his often typographically inventive style of writing. Whatever the reason, this did not mean that Dodgson/Carroll found the Hammond Type-Writer was easy to use, as he soon advertised that he "would be glad if any one, who understands Hammond's Type-Writer would call at his rooms any day" (Lovett 1990).[356] Although he did take it on holiday with him in 1888 and 1889, Dodgson/Carroll did not use Hammond Type-Writer heavily, and it was not part of the sale of his effects following his death.[357] However, what is important to note, is that Dodgson/Carroll was interested in new technologies of inscription, new writing technologies, and in new image making technologies, both practices that were the crux of spiritualist practice. These burgeoning practices, of writing and of communing with the dead, circled around Dodgson/Carroll's experimentation with and purchase of new technologies and techniques of writing, leading to an intense interested in Spiritualism, because, by his owns words,

> That trickery will *not* do as a complete explanation of all the phenomena of table rapping, thought reading, etc. I am more and more convinced. At the same time I see no need as yet for believing that disembodied spirits have anything to do with it. (Letter from Reverend C. L. Dodgson to Langton Clarke, 4 December 1882; quoted in Haynes , 13)[358]

This perplexity, this double believing both in and not in Spiritualism led to Dodgson/Carroll becoming one of the founding members of the SPR in 1882 and remaining a member until his death in 1898 (Society for Psychical Research 1884, 319).[359] That Dodgson/Carroll should have been involved with ghost hunting and telepathy is a part of his life that is often ascribed to the fantastical Carroll rather than the rational Dodgson; and certainly, as literary historian Gemma Twitchen has noted, ghosts and telepathy abound within his fictional works, from his poem about communicating with ghosts 'Phantasmagoria' (1869) to the haunted worlds of Wonderland, Fairyland and Dogland in the *Alice* series and in *Sylvie and Bruno*. However the rational Dodgson, with his substantial personal library of spiritual and psychical tomes, as well as interest in, and pursuit of, spirit photography and membership of the SPR, demonstrates not least that the common binary characterisation of Dodgson/Carroll is a fallacy but also that Spiritualism, as previously argued, was a broad enough epistemological church to admit those who were deeply religious, deeply scientific, or both.[360]

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notably by pre-eminent fantasy writer J. R. R. Tolkein who wrote the entire manuscripts of *The Hobbit* and *The Lord of the Rings* on the same machine (Lovett 1990, 8).

[356] This advertised request which was responded to within the month by a man called Henry William Chandler (Lovett 1990).

[357] There are records only of fifteen typed letters in his archives, and none after 1891 (Lovett 1990).

[358] There were different levels of membership to the SPR: President; Vice-Presidents; Honorary Members; Corresponding Members; Members; and Associates. Rev. Charles Lutwidge Dodgson, M.A., Christ Church, Oxford, appears in the membership list of the SPR as a 'Member' (Society for Psychical Research 1884).

[359] The double of expression of spiritualist practices and of writing, in a semi-Ur form, can be seen in the inception of the *Alice's Adventures in Wonderland* as a story told on the 4 July 1862, on a boat from Folly Bridge to Godstow with Ina, Alice and Edith Liddell. Dodgson rowed at the bow, his friend Robinson Duckworth at stroke, whilst Alice acted as the cox. Duckworth recounts how the story was told by Dodgson over his shoulder to the three young girls; the presence of an invisible voice speaking fantastically surely resonates with the overall theme of this chapter (Hudson 1976, 112-115).

[360] In Twitchen's essay on Lewis Carroll and Psychical Phenomena, she herself describes Carroll/Dodgson as living a "kind of divided life", between "the staunchly logical Charles Dodgson ... and the whimsical Lewis Carroll" claiming that "these two worlds rarely come together". However, as has been discussed above, Carroll/Dodgson used his ability with pattern and codes, in both numeric and linguistic forms, to create logical whimsy and whimsical logic. Twitchen carries her argument through to suggest that between science and religion there lay "a great void of uncertainty"; and that Spiritualism was a hybrid of these two forms of knowledge. However this would rest on the assumption that there was such a fixed and certain thing as science, rather than the historically more accurate description of an emerging field of science. It is within this nascent period for formal scientific enquiry and 'science' that any practice of Spiritualism needs to be read against (Twitchen 2007, 177-190). Dodgson's library included 18 Volumes of the *Society*

A fellow SPR member and equally representative figure of the double expression of magic and rationality, was Arthur Conan Doyle, a general practitioner who, whilst attempting to specialise in the new and lucrative field of ophthalmology, became a literary sensation through his Sherlock Holmes stories.[361] Conan Doyle's fictional creation is most often positioned as the antithesis of Carroll's fantastical world of Alice, with Holmes standing as an archetype of scientific rationality, discerning clues and making deductions. However, the world of Holmes contains more than scientific deduction; in fact it consists of what Holmes himself called 'scientific use of the imagination'; and it is precisely through the imagination that the gaps exist for the magical and the enchanted to fill.

In charting the magical and the rational in the life and work of Conan Doyle, one root can be found in 1882, when Conan Doyle, after becoming a GP in Southsea, became deeply engaged with the emerging field of nineteenth century psychology, specifically mesmerism, which he incorporated into his early short stories, alongside thought transference and ghosts.[362] It was also whilst in Southsea that Conan Doyle became a spiritualist, albeit at this stage a somewhat sceptical one, attending numerous séances, most often through his membership of the Portsmouth Literary and Scientific Society (PLSS); he attended his first séance in 1880 and often hosted séances at his own home in Southsea up until 1890. In 1887, in a desire to expose spiritualist practice to scientific methodology, Conan Doyle carried out a series of experiments on telepathy with a fellow member of the PLSS, followed by participating in a hypnotism demonstration in 1889.[363] That this creator of Sherlock Holmes should become engaged with the supernatural and the spiritual often strikes commentators and historians and even some of Conan Doyle's own friends and acquaintances at the time as itself an illogical contradiction, leading to his friend Harry Houdini's bewilderment as one biographer has noted,

> ... he [Houdini] found it incomprehensible that someone with Conan Doyle's power of deduction and logical thought, so well displayed in the Sherlock Holmes tales, could be so utterly credulous [about Spiritualism]. (Booth 1997, 327)

Conan Doyle's deductive methodology of Holmes is most often credited to being a translation of the diagnostic methodology practised and taught by Conan Doyle's own professor of medicine at Edinburgh, the surgeon Joseph Bell.[364] However, Holmes' deductive methodology

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for Psychical Research's Proceedings and *Journal, Confessions of a Medium, Phantoms of the Living, Natural Law of the Spirit World*, amongst others (Shaberman 1972, 4-7).

[361] Like Dodgson/Carroll, Conan Doyle's own name was something of a figment, as it was in reality just Doyle, taking Conan from his maternal uncle Michael Conan. Like the magician Robert-Houdin, Conan Doyle was engaged with the new science of the eye, ophthalmology. In 1887, he began studying optics at Portsmouth Eye Hospital. In 1891, Conan Doyle returned from a stay in Vienna to London, where he set up a specialist ophthalmology practice in Upper Wimpole Street. He also registered as a member of the Ophthalmologic Society of the United Kingdom, and affiliated himself with the Royal Westminster Eye Infirmary. He was not a successful ophthalmologist, in that he did not treat many patients and soon returned to general practice; however it was whilst he was waiting for patients that he wrote his first Sherlock Holmes stories for *Strand Magazine* (Booth 1997, 138; and Ravin 1991).

[362] In 1883, Conan Doyle had published the short story ' The Ghosts of Goresthorpe Grange' in the publication *London Society*. Conan Doyle's short story 'John Barrington Cowles', published in April 1884 in *Cassell's Saturday Journal*, was the story of a vampiric female hypnotist, Kate Northcott. In 1885, his short story 'The Great Keinplatz Experiment' about thought transference was published (Jones 1989, 55-60).

[363] In the 1920s, Conan Doyle met and became friends with Ehrich Weiss, better known as Harry Houdini. They first met in 1920 after a show by Houdini in Portsmouth, where Conan Doyle had urged the illusionist to admit to his supernatural powers. Houdini, an avowed and avid anti-spiritualist, replied that he had no supernatural powers, he was but an illusionist. Even with this answer, Conan Doyle was insistent on Houdini's spiritualist powers, leading him to write to him in 1922 that "You have certainly acquired very wonderful powers, whether inborn or acquired." Trickery and illusion claimed as part of spiritualist practice, even against the performers' own words, seems to be a strong theme running through Spiritualism more broadly, from the Fox sisters' testimony, through to Maskelyne's show. For more on the intensely interesting relationship between Houdini and Conan Doyle, see Booth 1997, 326-330; and Jones 1989, 183-7.

[364] Conan Doyle would later write "I thought of my old teacher, Joe Bell, of his eagle face, of his curious ways, of his eerie trick of spotting details. If he were a detective he would surely reduce this fascinating but unorganised business to something nearer to an exact science" (Booth 1997, 111). There is also a hard evolutionary stance embodied in Conan Doyle's appropriation, with an implicit link made between crime and disease, as Conan Doyle himself notes in an

does not solely rest on the detailed observation of the minute, a deeply ocular practice, but also on the mental processing of the 'data' gathered into information, as Conan Doyle's biographer Kelvin Jones notes of Bell,

> In Bell's hands science was no longer the province of mere cause and effect: it depended also on a series of inferences which took into account psychological factors. (Jones 1989, 35)

Frequently the character of Sherlock Holmes is read as a product of scientific materialism and rationality, with his keen eye for observation and clues. And yet for all his modernity, Holmes performed acts that seemed magical to other characters and to Conan Doyle's readers alike, albeit that Conan Doyle always swept away the veil, revealed how Holmes' trick was done because Doyle took from Bell the idea that,

> ... the human being [was] not merely a lump of matter or a functioning machine but a self-determined entity driven by motives both conscious and unconscious. (Jones 1989, 35)

By attending to the psychological, the effect of Holmes was magical, almost contra-rationality. Again and again Watson, the main chronicler of the Holmes stories, and a stand-in for the reader, declares his bewilderment at Holmes' feats of deduction; in 'The Adventure of the Blanched Soldier' (1926), the enquirer, the soldier James P. Dodds, declares "Mr. Holmes, you are a wizard", after the detective pronounces Dodds' regiment and most recent foreign station; and on numerous occasions a desperate public called on the services of Conan Doyle, a stand-in for Holmes, at times of crisis (Conan Doyle 2009 [1926]).[365] Holmes performed a re-enchantment of world through the gaps left in the 'iron cage of rationality' as literary historian Michael Saler argues,

> Sherlock Holmes became a modern icon partly because he utilized reason in a manner magical and adventurous, rather than in the purely instrumental fashion that many contemporaries feared was the stultifying characteristic of the age. He expanded the definition of rationality beyond the narrow, means-ends instrumentalism to include the imagination – he calls the procedure 'the scientific use of the imagination' – resulting in a more capacious concept that can be termed 'animistic reason' because it imbues its objects with meaning. (Saler 2003, 604)

This imbuing objects with meaning can be seen as a literary echo to the work of both spiritualist media, their audiences, the work of the SPR and the shows of Maskelyne and Cooke. And imbuing objects with meaning was not only confined to the internal workings of the Holmes stories, but also spilled out of the covers and into real life. For such was the belief in the character of Holmes, that for many of the stories' readers it was Holmes and (to a lesser extent) Watson who were the 'real' figures, and Conan Doyle who was the fiction, even until relatively recently; another case of belief in the effect over testimony, demonstration and

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gramophone recording made for HMV where he says "I thought I would try my hand at writing a story where the hero would treat crime as Dr Bell treated disease, and where science would take the place of chance" (Booth 1997).

[365] Conan Doyle was called upon by his readers to investigate their own mysteries, including disappearances, thefts, and accusations of murder. One of the most famous incidents he was called to investigate was the case of George Edalji, made famous by author Julian Barnes, in his book *George and Arthur* (Booth 1997, 261-273).

examination, as found in the relationship between spiritualists, their investigators and their exposers (the magicians/illusionists).[366]

However, it was not just a shared interest in and membership of the SPR that joined Dodgson/Carroll and Conan Doyle; nor was it photography, a practice both men were interested and engaged with; nor was it the entwining of the magical and the rational; nor was it the friendship between first year undergraduate Sherlock Holmes and fellow Reverend C.L. Dodgson at Christ Church, Oxford, in 1872; it was also the typewriter.[367] For not only was Conan Doyle an early purchaser of a typewriter, but also it is in Conan Doyle's short story of 1891 'A Case of Identity' that the typewriter makes its first appearance on the fictional stage, as the technological crux on which the story of the typewriting Miss Mary Sutherland and her missing fiancée Hosmer Angel rests.[368] The appearance of the typewriter in this story results in the mystery being solved not by the rationality of the machine and its effect in the depersonalisation of the author (as Heidegger would later argue), but by its veritable indexical relationship to its user, in its personalisation; for it is the unique inscription of the type of a particular individual typewriter on the page that enables Holmes to deduce that the machine used by her stepfather is the same machine used by Hosmer Angel, leading Holmes to say (and Conan Doyle to write),

> "It is a curious thing", remarked Holmes, "that a typewriter has really as much individuality as a man's handwriting." (Conan Doyle 2009 [1891], 256)[369]

However, Holmes does not stop his engagement with typewriters there; he goes on to write the first forensic treaty on the typewriter in 1890 (Holmes 1890). Indeed, there are a number of books in Holmes' bibliography which attend to the acts of inscription and the process of making, including tracts on dating documents, tattoo marks, footsteps, hands as signifiers of specific trades, cryptography and, perhaps the most Darwinian, the most Bertillonate, on human ears (Holmes 1877; Holmes 1878; Holmes 1878; Holmes 1886; Holmes 1888; Holmes 1888; Holmes 1896).

Echoing the methodology of the Seybert Commission, Holmes' methodology follows the law of exclusion, the same investigative procedure followed by those investigating spiritualist phenomena; this methodology, perhaps one of the most famous lines in contemporary literature, is described in the following way,

> The process ... starts upon the supposition that when you have eliminated all which is impossible, then whatever remains, however improbable, must be the truth. (Conan Doyle 2009 [1926], 309)

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[366] In 1962 William S. Barring Gould published *Sherlock Holmes: A Biography of the World's First Consulting Detective*, a remarkable book for its sheer veracity as a work of biography, and one in which Conan Doyle is described as "Dr. Watson's friend, literary agent and occasional collaborator" (Baring-Gould 1962, 283). Martin Booth, Conan Doyle's biographer, notes in the Foreword to his book that on month's long stay at a small hotel in Naini Tal, a village in the foothills of Northern India, in 1986, he was told by the hotel's proprietor that Holmes (and definitely not Conan Doyle) had stayed at his hotel sometime before the war, before the proprietor was born. Booth speculates that this might come from the story about Holmes' years spent hiding from Professor Moriarty after the Reichenbach Falls incident, where it is claimed he travelled to Tibet, of which Naini Tal is on one of the ancient routes to Lhasa (Booth 1997, xi).

[367] Although Dodgson was a well-known photographer, Conan Doyle also was involved in photographic practice, having had eight articles published in the British Journal of Photography by 1883, including technical papers on development processes (Jones 1989, 51). To read more about the friendship between Holmes and Dodgson, see Baring-Gould 1962, 22-25.

[368] The second appearance of the typewriter is in a early feminist themed novel, The Odd Women by George Gissing, in 1893 (Gissing 1980)

[369] Holmes goes on to say he is thinking of writing a monograph on typewriting and crime, one of the first forensic appearances of the typewriter. Conan Doyle's knowledge of typewriters came from owning a typewriter in the early 1880s, although he rarely used it, as he was very fast at handwriting, privately estimating he could write 3,000 words a day (Booth 1997, 139).

However, this superlative Holmesian quotation more than often than not leaves out the concluding sentence of the method, one that reveals how the gaps in the iron cage are made possible,

> It may be that several explanations remain, in which case one tries test after test until one or other of them has a convincing amount of support. (Conan Doyle 2009 [1926], 309)

The supposition that the elimination of the impossible will always leave one and only one answer is the iron cage; the several explanations which are then likely to remain are the ones that admit the possibility of enchantment and the magical.

Conclusion: Moving in the Iron Cage

Although the keyboard/typebar typewriter was the first commercially successful form of writing machine, other kinds of writing machines in the form of the index writer and the typewheel writer soon appeared on the market post-1874, and soon proliferated. Rather than placing type on individual typebars, these machines held it on a plane, and thus located the act of inscription not as presence/absence, as with the typebar machines, but as a plane, a two-dimensional continuum. In this location, index and typewheel writers contained the same writing plane as the 'talking boards' of Spiritualism. Most notable in the latter type of writing technology, agency became displaced, transferred from the medium and/or séance attendees to the writing technology itself. In fact, the ascription of agency to inanimate objects was central to establishing the validity of the claims of Spiritualism; if human agency could not be read out from the message, and following Marshall McLuhan, the medium by the séance attendees, then the spirit medium had failed in her performance–for once agency had been ascribed, the possibility that someone else other than the spirits was communicating could be dismissed by the attendees. However, what was actually happening when the spirit world was communicating with the mortal world–whether that be through the tipping of the dining table, the writing of the planchette, or the use of a talking board–was that agency was being ventriloquised by the spirit medium (and possibly to a lesser extent, by the séance attendees) through these spirit writing technologies.

Meaning speaking from the belly, ventriloquism is important in understanding the subtle strategy of how Spiritualism attempted to validate its claims. For if this writing could be understood as speaking–if spirits did not use typewriters but talking boards–then the authenticity of the communication could be underlined. Speaking, with its indexical relation to a material body, was (and is) more 'natural', more 'real' than writing. Therefore, while interpreting writing as speaking validated the claims of Spiritualism, it also led to a contradiction, a place of confusion, as underneath the content of the spirit communication lies the premise implicit in the medium: that the 'speaking voice' of the spirit world had a present, alive, real, material body, that the spirit had a belly from which the words were being spoken

Reflecting this ventriloquism of agency and spirit writing technologies back into the developing commercial typewriter, female operators of the typewriter often referred to themselves as amanuenses, the same term used by spirit mediums. Both these groups of women referred to themselves–and were referred to by others–as servants of the hand, as secretaries, as those who took dictation. Certainly in considering the typewriter operator and spiritual medium's acts of writing, both the typewriter operator and the spirit media are performing writing through their bodies, both were/are understood as vessels for through which communication was performed; yet one body is understood as purely material, as machine, as ten dexterous fingers attached to a body; whereas the other body is understood as (somehow) immaterial, as the ethereal telegraph machine through which the spirit world could perform its communication, could act in the material world. Additionally, both these practices can be considered to ventriloquise agency, writing out the agency of another–whether that be their physical or spiritual master. It is through this ventriloquism of agency that the act of writing can be seen to be as magical as it is deeply rational.

In his analysis of the nineteenth century roots of psychoanalysis, Roger Luckhurst notes that spiritualist Frederick Myers' formulation of a subliminal consciousness offered an alternative to Freud's construct of the mind and with its publication in a series of essays in the *Proceedings of the Society for Psychical Research* between 1891-5, Myers was more widely

read than Freud at the time. In offering this alternative, Myers outlined his 'waking consciousness' as being merely

> ... a narrow band on the spectrum of consciousness, and the unknown ends of his continuum could be used to explain anything from dreams, somnambulism, automatism, multiple personality, telepathy, and the ghost as a form of physico-mental projection of psychic energy. (Luckhurst 1999, 58)

This mental continuum offers a psychic plane, a plane of being which can finds itself writing, whether alive (index writer) or dead (talking board/Ouija board), on and through a technology that similarly offers a plane of alphabetic forms; indeed it could be argued that this plane of consciousness is mutually reflective of the writing plane, such that each finds itself mirrored in the other.

However, with this mutual mirroring come problems, not least in the displacement of agency, spiritualism and writing. One clear problematic is found in the words of Mrs. Leonora Piper, the leading female researcher of the SPR, and sometime medium for examination, who spoke of her work as explicitly tied to mechanisation. For when she noted that "in the service of the Society [for Psychical Research] I have acted simply as an automaton", Mrs. Piper exposes spiritualist communication as a doubling of mechanisation and authorship, with a curious displacement activity where the author is somehow elsewhere–although where that 'where' is seems elusive (Luckhurst 2002, 231).[370]

Furthermore, this agency from elsewhere had important consequences for authorship and knowledge itself. The case of the medium Geraldine Cummins' successful law suit of 1927 against one of her séance participants Frederick Bligh Bond highlights another problem around displaced agency, writing and authorship. Although Cummins is reported to have been more concerned about breaching the Witchcraft Act, it was the law of copyright that her spiritualist practice became entangled with, when she discovered that the communiqués from one of her séances had been published by one of the attendees–Cummins had performed automatic writing, to produce messages from the spirit world; Bond had taken these messages, typed them up and then published (Cousins 2008, 5). Cummins won her case, it being declared that the medium and the spirit were co-authors, but copyright rested with the medium due to the jurisdictional limitations of the court. However Cummins was quick to note that her case held important implications for the entire concept of authorship and the practice of writing, when on winning her case she recounted that,

> A lawyer informed me that if I had lost the case, any author's typist could claim, and might successful establish, that he was the exclusive owner of the book he was employed to type. (Geraldine Cummins quoted in Sword 2002, 26)

In addition to the gender of Cummins' typist, the other notable element about her words is the difference she makes between automated handwriting and the copying fingers of the typist, which makes peculiar claims on automation and agency, such that there is an authenticity to her hand, and to her mediumship, which is not present and which is the mere mechanical reproduction of her messages when placed at the fingertips of the copying typist.

In drawing typewriting through ghost writing, writing, and therefore knowledge itself, becomes considered within a plane rather than the form of either/or, presence/absence.

[370] Mrs. Piper's quote also provides an echo of the writing machines met at the start of this thesis, in its reference to automata.

Within this plane of knowledge it becomes possible to escape Weber's 'iron cage' through the gaps, by locating oneself within a shape of knowledge where the world is re-enchanted, if one subscribed to the argument that it ever became wholly disenchanted in the first place.

When Kate Fox, on April Fools Day 1849, instructed the rapping noises she (and her sister and her mother heard) to 'Do as I do', she was ghosting Turing's imitation game, where in a form of written communication, the presence of an agent, a message of telepresence, could be discerned, which stood in for the indexical trace of handwriting itself. The possibility of writing without a physical agency did not necessarily mean the absence of agency per se; rather the agency of the writer could be evidenced through their ability to write, an ability that Turing would, one hundred years later, make the very condition of intelligent consciousness.

5: Write Me, Read Me

Concluding Remarks

"Whatever they emitted and received was writing."

Friedrich Kittler, *Gramophone, Film, Typewriter* (1986)[371]

"While undermining the spirit's tendency towards disembodiment, print also appears as both the sign of a split between spiritual and embodied modes of being and the means of its suture."

Margaret Linley, 'Conjuring the Spirit: Victorian Poetry., Culture and Technology' (2003)'[372]

To close this thesis on writing machines and bodies, on copying and robots, on the fragment, on inscription and intelligence, on hands and labour, on magic and modernity, I offer two small stories, the first year from the final year of this project and the second from its first year.

In an event potent with endings, earlier this year, on 25 April 2011, the last manual typewriter manufacturer Godrej & Boyce closed its typewriter business. Based in Mumbai, Godrej & Boyce had been manufacturing typewriters since it founded its typewriter factory in 1955 and, at the peak of its production in the 1990s, was producing 50,000 machines a year, in forty different languages. Even in the midst of the computer revolution of the 1990s and 2000s, Godrej & Boyce was reported as still producing 10,000-12,000 machines a year, until it closed its typewriter production business in 2009 (Jacob 2011; and Awal 2011). With the shutting down of Godrej & Boyce's entire typewriter business in 2011, which was widely reported in the media with more than a hint of sadness, the commercial viability of the typewriter has come to an end; the computer has superseded the typewriter, much as the typewriter was promoted as a machine to supersede the pen during the 1870s ("Type Writing Machine" 1867).

The other story is anecdotal. At the start of this project, a rather technologically adept small boy, a friend of my daughter, visited our house. On spotting my typewriter on the dining room table, he pointed with outstretched arm and asked, "What is that?" On being told it was a typewriter, and seeing a small sample of what it could do, he asked if he could 'have a go.' "Of course," I answered, and off he went, striking the keys with an obvious pleasure at the noise and movement of the machine. However, he soon paused, and a quiet moment passed between us before he asked, *sotto voce*, "How do you get the Internet on it?" This small boy's question, whilst being deeply amusing, was also very astute; for it highlights how the typewriter is an object strangely recognisable and almost disturbingly familiar to a child who has never set foot in the twentieth-century, a child brought up on the computer.

These stories, the newsworthy and the anecdotal, point to a number of issues when considering the end of the typewriter. The first story speaks to the typewriter's passing away, declaring it a dead technology; with the closure of the Godrej & Boyce typewriter business, perhaps the last few letters and numbers can be chiselled into the typewriter's tombstone, marking its death on 25 April 2011. However, there are objections to this potential final act, not least articulated by the second story. For as the small boy's question demonstrates, the ghosts of the typewriter still circle around contemporary twenty-first century writing technologies, in

[371] Kittler 1999, 8.
[372] Linley 2003, 537-538.

a remediated form; the typewriter is still, in a certain sense, present, at the tips of our fingers. And so, as its ghostly form still is active, the stone carver's tools must be left to lie where they are

This thesis has set out to answer the double question of how has the body written and how has writing 'written' the body, through the emergence of mechanised writing in the eighteenth and nineteenth century. In exploring these questions, this thesis has aimed to make complex the history of writing technologies, approaching the other design propositions for a writing machine made both prior to and after the Sholes & Glidden Type-Writer of 1874 on their own terms so as to avoid both an *idée fixe* concept of writing and a teleological account of technological development. In order to do this, this thesis embedded mechanised writing within a broader cultural history of inscription and of the changing discursive state of the body, to understand the changing state of writing in modernity.

This thesis has argued that in the eighteenth century, mechanised writing machines can be best understood through the tropes of the copy and the supplement, linked to other inscriptive devices and machines such as automata, polygraphs, pantographs, physiognotraces, Erasmus Darwin's Bigrapher, James Watt's Copying Press and Tom Wedgwood's silver pictures. Through these machines, devices and processes, this thesis has argued that during the eighteenth century, the practice of writing was woven into other inscriptive technologies and techniques, most notably, drawing and music–not least demonstrated by the actions of the Jaquet-Droz automata–as a set of accomplishments, as a set of practices aimed to express higher social standing, all pursued in an effort to capture the fleeting, the ephemeral.[373] Through the tri-articulation of copying in writing, drawing and music, the movement towards inscriptive copying devices can be seen to be the result of a pursuit of Platonic ideals, for a more perfect version of a piece of writing, a drawing or a piece of music. And in their pursuit of perfection, these inscriptive devices and practices can also be seen as attempts to make the ephemeral material.[374] Therefore 'typewriters' of this period, in their supplementarity as machines for the blind, were conceived of, and had their patents filed as printing rather than writing machines. This thesis has argued that this was because writing by hand was the act of authentic human being, an understanding of writing exploited by eighteenth century automata makers Jaquet-Droz and Maillardet in their 'human-all-to-human' machines. This mark of authenticity in the hand writing produced a necessary artificiality to mechanised writing, as a pathological practice by pathological bodies.

However another discourse around the body and writing began to take hold towards the tail end of the eighteenth century, one which begins the process of saturating the body with text, through the birth of Enlightenment physiognomy and phrenology. These two 'sciences' proposed to understand the body through reading its signals and in order to do this, they converted the body into a set of fragments that could function as an alphabet, as the building blocks of the language of Nature. Through the cultural permeation of physiognomy and phrenology from the late-eighteenth century onwards, this shift towards the textualisation of bodies became the foundation on which Victorian gentleman-scientist Francis Galton built his system of anthropometry and on which the police clerk Alphonse Bertillon built his system of

[373] The mythical origins of drawing and painting are elegantly captured and expressed by Pliny the Elder in his *Natural History*, through the legend of Dibutades, a Corinthian maiden. When her lover is on the eve of leaving her, to take a journey, Dibutades, traces the outline of his shadow on the wall on which the shadow is cast. This legend was, according to Marina Warner, intensely popular and influential in the seventeenth and eighteenth century, explored by a number of influential artists. One of these, Joseph Wright of Derby, was commissioned to paint this scene by Josiah Wedgwood, who was no doubt interested in this story in relation to his production of ceramic cameos his business was so famous for (Warner, 159-162)

[374] With music this capture of the ephemeral was especially noticeable, with the invention of these music writing machines being described as an attempt to "preserve music that is as fragile as a soap bubble" so that it can be caught "in mid-air" and "the most beautiful pieces of music" could be made to live longer (Richards 2001, 77).

Bertillonage, two practices aimed at making the individual body uniquely identifiable through its physical features, for identification and capture/exclusion from the social body. At the same time as anthropometry and Bertillonage were being formed and practised, there was a shift in the understanding of media transparency, built on a notion that the marks of inscription technology and techniques were uncomplicated signals that acted as straight and clear roads to 'meaning', whether that be handwriting as the transparent media form from which an individual psychology could be read out, or photography as the transparent media form from which the objective truth of an individual body could be read out. Language itself came underneath this discursive umbrella, a shift that can be seen in the numerous attempts in the 1880s and 1890s to construct and establish a universal language, under the International Auxiliary Language project. It is in this period that the typewriter emerges as a writing machine feeds into and off of these tropes of the fragment and medium transparency as a technology of writing that 'fits' the cultural landscape between the body and language. For in its discrete keyboard operations, the typewriter fragments writing into its individual technological forms, and presents a seemingly transparent form of writing in the style of printed letters.

Furthermore during the 1880s, the decade in which the typewriter was rapidly absorbed into mass culture, there was an organisational paradigm at work within the ideological construction of the human body, one which, it has been argued, can be found within the typewriter itself. For just as the work of Galton and Bertillon wired bodies into the personal, social and political/economic networks of late nineteenth century, so the typewriter as a newly emergent mass writing technology successfully operated as a node in different sets of networks to reconfigure the act of writing. In the first instance, the typewriter introduced a new writing technique that networked the individual into the machine culture of the late-Victorian age, continuing the blur between the machine and the operator. Secondly the typewriter, in slotting alongside other communication technologies, specifically the telegraph, formed a node in an information communication network of machines and bodies. Lastly, by being a technology for the 'more' efficient production of the written word, the typewriter tied into the efficiency drive of modernity, driven by an all-consuming perpetually hungry capitalist system. Thus the absorption of type, in being personalised, in being personally written, and bodies, in being typed by anthropometry and Bertillonage, by both state bureaucracies and commercial organisations in the 1880s came about not only because each form of technology, writing and bodily analysis, was able to slot into personal, operational and social networks but also because there was an organisational paradigm in operation in both that made each coherent to the other. Finally, it should be noted that these attempts to read the body through physiognomy, phrenology and latterly anthropometry and Bertillonage can be seen as attempts to rationalise the body in the eighteenth century and nineteenth century, attempts that became increasingly rigorous and invasive. In this rationalisation, the progressive fracturing of the body into standardised parts mirrored the fracturing of writing into discrete, standardised alphanumeric writing units with the emergence of the typewriter and with the handwriting pedagogies of Platt Rogers Spencer and A.N. Palmer. Yet this fracturing of the written word also led to the spatialisation of the alphabet through the typewriter keyboard. This processes of fracturing and spatialisation is part of the move towards material standardisation, one that forms not only the writing space of typewritten text, but also the writing space of the keyboard. Deeply rational and firmly circumscribed, the typewriter became one of the leading paradigms of modernity, as this new technology of writing became the symbolic machine of the clerical worker, of the modernist writer, of the hardboiled modern detective in the twentieth century.

Yet, it would keep us in good stead to be reminded that the formal laying-out of the alphabet on a keyboard as points on the grid is, in many ways, internal to the western alphabet

itself. And as the elements of the Western alphabet become points on the typewriter keyboard grid, whether that be a keyboard-typebar machine or an index typewriter, so necessarily there are gaps, spaces between the alphabetic keys as there are spaces between individual alphabetic letters and words in a piece of text, present because of the need for letter differentiation. These gaps can be found throughout the move towards materialism and positivism, reflecting back into the construction of the discrete and standardised body, as this thesis has argued through the photographic work of Francis Galton, Alphonse Bertillon, and Etienne-Jules Marey. For in the representation of the positivist and materialist construction of the body, whether that be through scientific theory or photography, a gap can always be found, a point in time and/or space when the body has eluded capture, where representation demonstrates its inability to re-present.

At the same period as Galton, Bertillon and Marey were typing bodies through their photographic and graphic methods, the typewriter was becoming stereotyped, as it became gendered as a particularly feminine technology, a gendering that under the ideology of separate spheres would seem to be peculiar, as women were constructed were aligned with nature (as opposed to culture and technology), passivity (as opposed to activity) and the domestic (as opposed to the commercial and industrial). However, as has been argued, through the emerging life sciences of the nineteenth century, this construction of women also led to her stereotyping as mechanism, as passive medium in contrast to the construction of men as machines, as active engines of society. As passive imitative human beings, adept at performing repetitive acts, women's dexterity, the manual skill learnt in performing domestic accomplishments with the needle and at the piano, became contextualised as part of a biologically essentialist understanding of women, as evidentiary of their recessive arrested nature. However as passive agents with a high level of manual skill in the operation of their hands at a keyboard and with gridded space, women became the ideal bodies to operate the new writing machines, especially highlighted through the nineteenth century debate The Woman Question. Indeed female typists were available in such large numbers and at such cheap rates that as the Society of the Promotion of Employment for Women noted, within only a few years, trained female typists far exceeded the demands of the market. By taking their dexterous labour out of the domestic sphere and into the commercial one, passive female mechanisms became a critical part of modernising Western capitalist industry, and therefore attacked their defined lowly social position from the underneath.

In the spirit of the underneath, this thesis has historicised and theorised a particular design form of the typewriter, so-called index typewriters, that has received little scholarly attention. By contextualising these machines that lie under the history of the typewriter with an other contemporaneous and similar writing device, the Ouija Board, this thesis has argued that the ascription of writing devices with their own agency did not suddenly begin in 1872 with the Sholes & Glidden Type-Writer but was already present in a host of spirit writing machines, including Isaac T. Pease's Spirit Telegraph Dial, Hare's Spiritoscopes, an army of planchettes and latterly the Ouija Board, all of which worked in much the same way as index typewriters.

The different spatialisation of the writing space of these index writers, taking the form of a grid, is an echo of Weber's famous characterisation of modernity as an iron cage, that like both the typewriter's writing and keyboard space, is a gridded network of nodes, connected with iron wires. However in thinking through this metaphor for both the period, the body and writing technologies, it becomes clear that between these nodes and their wires, there are spaces, gaps in the fabric through which the rational and materialist drive can become re-enchanted, so much so that what is held to be true can, at one and the same time, be held to be

false, and which speaks of the late-nineteenth century as a period of deep ontological and epistemological uncertainty.

One important thread of this thesis that can be found partially present in a number of chapters is the relation between device and machine. In drawing this thread to the surface, one place to start is with the frequent inclusion of polygraphs and their drawing cousins pantographs in a number of typewriter histories, an inclusion that is often presented falsely because they are then subsequently dismissed because "such a device is no machine" (Adler 1973, 53). This inclusion and subsequent dismissal highlights the conceptual differences between a device or tool and a machine, even though both polygraphs and typewriters require human action to write; for, as the media theorist Jay David Bolter notes,

> Writing technologies are never external agents that invade and occupy the minds of their users. These technologies are natural or naturalized only in the sense that they are constituted by the interaction of physical materials and human practices. (Bolter 2001, 17)

Establishing typewriters as machines rather than tools or devices, following Bolter, was therefore an attempt to naturalise typewriting, to make it a more 'natural' act of writing than other writing technologies and techniques through an implicit claim on the typewriter as somehow automatic, operating without a human hand. Classifying this new writing technology as a machine can therefore be seen as an attempt to overcome the newness of this writing technique by naturalising it, seemingly paradoxically, through a machine rhetoric. However this thread of device/machine does not lie in the objects alone, but can also be found in the operators of the writing technique, in the discursive construction of the typists themselves. This classification of these technologies as machines rather than devices had another effect, not just on the practice of writing, but on the bodies that wrote on these machines. For by calling a typewriter a machine rather than a tool, the implication of self-action on the part of the writing instrument resulted in the 'giving-over' of agency to the machine and led to it absorbing the human operator, to the absorption of the typist by the typewriter. In turning the metal and wood object from a writing instrument into a writing machine, the typist, in an important way, became effaced and the writing machine becomes haunted by an unspecified agent. This effacement had a number of effects including the feminisation of typewriting, due to women's discursive position as mechanistic creatures, saturated with passivity and with the ability to be only repetitive rather than creative. However in their performance of passivity at the typewriter, increasing numbers of nineteenth century women were able to subvert their discursive construction under the ideology of separate spheres to become part of the modern capitalist labour force. By taking the role of passive inscriptors from the domestic space to the office, a role that involved writing 'other' agencies nineteenth century women were able to become the speaker, the writer, the actor, the conductor, and thereby claim from beneath the active subject position. Likewise this positioning was also leveraged by armies of women under the banner of Spiritualism, who utilised and exploited these self-same attributes to become the media, the transparent media, between the spirit and material world. Therefore, in its discretion, typewriting became a matrix, and provided another way of being for women, a way which nested into the work women had already done as part of the larger matrix, demonstrating women to be, as philosopher Luce Irigaray notes, "an "infrastructure" unrecognized" (Irigaray, 1993, 84). This discursive move, or rather discursive expansion, of women from angels of the home to angels of the office had political implications, making them "the really dangerous guerrillas in his [man's] midst" as Sadie Plant noted, who goes on to describe them as,

> ... those apparently inconspicuous, well-behaved little creatures who spent their time making lists, detailing procedures, typing, sorting, coding, folding, switching, transmitting, receiving, wrapping, packaging, licking the envelopes, fingers in the till. (Plant 1998, 76).

Another thread that weaves its way through a number of chapters in this thesis is the relationship between handwriting and typewriting. In his essay 'The Mechanized Philosopher', Kittler declares, somewhat dramatically, that the "entire metaphysics of handwriting came to a necessary end" with the cultural absorption of the typewriter, as the metaphor of the male 'slate-pencil' authoring itself on white feminine virginal sheets of paper was ended by armies of female typists (Kittler 1990, 195). Certainly when the salesman for the Remington & Co. typewriter, Wyckoff, Seamans & Benedict, established and promoted nineteenth century women's place at the keyboard, it was part of a dramatic change in female labour and, as some would argue, helped pave the way for female emancipation. However, promotional work done by Wyckoff, Seamans & Benedict was leveraging that which was already present; the company was simply articulating a feminisation that was inbuilt in the machine through its remediation of a piano keyboard, and the dexterous passivity necessitated by the agency of operator. And in this sense, the metaphysics of writing was still 'business as usual' as female typewriter operators became the mechanism through which male authors would write their words, albeit now that these women were extended into the writing machine so that both elements, the woman and the machine, were the typewriter. In another sense the birth of the typewriter was heralded as a machine to supersede the pen, another claim to end the metaphysics of handwriting in a particular way, a metaphysics based on authentic handwriting and un-authentic typewriting. However, as has been demonstrated, this authenticity of handwriting is only present at the point of its dissolution; for the birth of contemporary graphology, a practice that guarantees authenticity of the handwriting by reading writing for its unique psychology, only comes into being in 1872, the same year that the first commercially successful typewriter appears on the open market. Furthermore, from the mid-nineteenth century, handwriting became a skill of type manipulation, became penmanship, through the handwriting pedagogies of Platt Rogers Spencer and A.N. Palmer that were built around a formalised and standardised form of handwriting, as formalised and standardised as any typewritten text.

In a reverse manoeuvre, this thesis has also argued that an individual's use of a typewriter produces writing was understood as having a higher level of indexicality than Heidegger argued it to have. Certainly one correspondent to the magazine *The Writer* noted this capability of the typewriter in 1911, when he wrote that he "never asks his three typists to put their initials on their work because "[t]he nature of the occasional errors" and "the touch of the operator" "inevitably revealed to him the identity of the person who wrote it"" (Anonymous 1911, quoted in Olwell 2005, 51; also see Conan Doyle 2009 [1891], 256). Over Heidegger's argument that the typewriter conceals identity and handwriting embodies character, this thesis has argued that it is more fruitful to imagine the typewriter writing over handwriting, imprinting a ghostly form of writing over the hand, an overwriting that holds indexicality within it as the handwriting that lies beneath–albeit an indexicality that is divorced from the psychologised understanding of handwriting as found in contemporary graphology (Heidegger 1992, 80-87). And yet, in the creation of this palimpsest in the later half of the nineteenth century, handwriting and the typewriter discursively split the writer into two writers, one the active psychological writer that can be read through graphological strategies, and the other the passive, machine-like typist.

The final thread I would like to pull up to surface, one which is perhaps the most unexpected yet somehow least surprising, is the motif of love, a thread that feeds itself through the history and culture of writing, technology, representation and identity albeit in a somewhat fragile state. That inscription itself and its technologies often feature, at some level, love is, in one way, not surprising; for the act of inscription can be seen as an act against death and anonymous oblivion, to communicate beyond and outside of time. Therefore, the motif of love presses itself forward as the subject of that timeless communication of inscriptive technologies – whether that be in an effort to claim, or reclaim a love that has died or disappeared, such as that found in spirit writing practice; or as an act that underpins the most influential and elegant expression of intelligence itself, that found in the thought experiment that opens this thesis, Turing's Imitation Game. For, in actuality Turing's *gedankexperiment* is not about machines, or even about writing; it is about the hope that a human consciousness can exist without its material structure, that technology could offer the possibility of containing an individual human subject.[375]

But love does not lie in Turing's hands alone. For when Jaquet-Droz programmed his writing automata L'Écrivain, a machine able to write up to forty different phrases of over 200 characters long, he programmed it to write of love. In doing so, Jaquet-Droz was following in the footsteps of the earlier writing automata by Payen (1771) that in the figure of Eros wrote the word 'LOVE!' with the tip of his arrow. When writing machines became disembodied, such as with Pellegrino Turri's invention of 1805, the love motif appears again within the history of writing technology; Turri invented this writing machine for his blind lover, the Countess Carolina Fantoni da Fivizzono, so that she could write to him while they were apart. That the machine no longer exists but typewritten letters do seems to provide some sort of historical elegance to this thread of writing, love and the trace, as while the writing technology has disappeared, the products of its intention live on. But love motif is woven much deeper into the history of writing technology, when writing and speaking become single expressions of a double act in the late nineteenth century; for when Marey's assistant Georges Demeny was first recording through chronophotography his facial movements whilst speaking, exploring a possible method for teaching 'deaf-mutes' to speak through imitation, the first phrase he spoke and analysed was "Je vous aime", I love you (Braun, 176-7) (Figure 5.1).

Perhaps the repeated presence of a love motif in the history of writing technology can be explained by seeing a universalising atemporal claim in the inscriptive intent of writing technologies, one articulated through a universalising and supposedly atemporal human experience, the act and experience of love. Perhaps the clearest articulation of love in the history of writing technology, as put forward in this thesis, can be found in spiritualist practice, often positioned as a practice that battled (and still battles) against death and the death of love. From its inception, with the Fox sisters channelling a message from the spirit world to their mother about her dead infant, to those seeking to communicate with dead family members or lovers, as well as the desire of psychical researchers for telepathic communication that would over-ride the temporal fleshy body, love drives forward the technology and techniques of spirit writing. For to establish our own subjectivity, following Derrida, it is necessary that we are haunted by other voices, as "there is no coming into subjectivity without coming to be haunted by the other, voices simultaneously distant (*tele-*) and intimate (the *pathos* of touching effect) housed in, even constitutive of, the unconscious" (Luckhurst 1999, 56-7). The double need for distant voices that are at same time intimate, of a subjectivity that is both present and not-

[375] This common account of Turing's intellectual motivation is based on the biographical story of the death of his close childhood friend Christopher Morcom, who died of tuberculosis in 1930 aged 17, an event which to all account devastated the young Turing. Mrs. Morcom, Christopher's mother, recounted how the letters Turing wrote after the death of his friend, were obsessed with the asking what had become of his friend.

present, seems to be the root of text, and points towards the underlying desire in all inscriptive technologies: inscription as the ability to communicate an other's experience of the world within our own minds.

And with these ideas around inscription and love, death and writing technologies, I draw this thesis to its inevitable end. However, as I write these last few sentences, I do so noting that this is being done under the cloud of the recent announcement of Friedrich Kittler's death. That this thesis is written through Kittler's *Gramophone, Film, Typewriter* (1999) is, I trust, self-evident; his work on the typewriter was both the spring board and the landing site for this research project and it is hoped, that in some small way, this thesis can be seen as a continuing contribution to his project of media archaeology.

The End.

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No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
1	1603	Pantograph	Christopher Scheiner	German			A Professor at the German Academy in Dillingen, shown a device by a painter which he then copied, for copying drawings.	Reference only	*Pantographice, seu Ars delineandi*, quoted in the *Transactions of the Royal Society of Edinburgh*, by William Wallace, in 1836; Rhodes and Streeter 1999, p.16.
2	1631	Polygraph	Christopher Wren	British	UK Patent		Writing frame.	Reference only	Wren's Copying Instrument' in *Journal of the Society of Arts*, vol. 47, 1899, p.886; Rhodes and Streeter 1999, p.16.
3	1648	Polygraph	Sir William Petty	British	UK Patent		Called it his art of double writing.	Reference only	William Petty's *A Declaration concerning the newly invented art of Double Writing* (1648); Ward's *Lives of the Gresham Professors*, p.218; Rhodes and Streeter 1999, p.16.
4	1694	Writing Engine	James Young	Scottish			Application to Scottish Privy Council, which he described "an engine for writing, whereby five copies may be done at the same time, which it is thought may prove not unuseful to the nation." Secured sole manufacturing rights for nineteen years.	Reference only	*Domestic Annals of Scotland: Reign of William and Mary*, 1689-1694. Part 5.
5	???		Le Roy					Reference only	Adler 1973, p.365.
6	1711	Typewriter'	James Ranson	British			A twin-keyboard harpsichord-based writer, exhibited at a 1907 exhibition. Comprised rods, strings and an inked ribbon, but viewed as a printing machine.	Reference only	Beeching 1974, p.14; Baber, *Beyond the Desktop*, 1997; and Tepper, 'Controlling Technology by Shaping Visions', 1993.
7	1714	Writing Machine	Henry Mill	British	UK Patent No. 395		Machine for Writing for the Blind. Issued on 7 January 1714. 'An artificial machine or method for the impressing or transcribing of letters singly or progressively one after another, as in writing … so neat and exact as not to be distinguished from print.' Engineer for the New River Water Co.	Patent.	Mares 1909, p.17; TT (1923) p.10; Current 1954 p.23; Bliven 1954 (WWM) p.13; Adler (1973) p.365; Masi 1985, p.24.
8	1730		Nicholas Saunderson	British			Alleged to be a writing machine for the blind. A blind professor of mathematics at Cambridge, successor of Newton. Also known as Sanderson.	None	Adler (1973), p.365.
9	1745	Machina ad Sonos et Conventus	John Friedrich Unger	German			Fullname 'Machina ad Sonos et Conventus quoscunque ope Clavichordii productos in ipso cantationis actu chartae tradendos'. Dissertation to Berliner Akademie in 1753. Adler speculates Unger never built the machine, but Annette Richards claims it was built by a Johann Hohlfeld. A musical writer, also known as The Fantasy Machine, it marked notes as lines with the length of depression equivalent to length of the note depicted. Exhibited at the Royal Academy of Sciences in Berlin, in 1753.As a bi-product, Unger invented the felt pen.	Reference only	Adler (1973), p.49-50, p.365.
10	1745	Melograph	Rev. John Creed	British			A musical writing machine, to be attached to a harpsichord or clavichord that wrote every note played onto paper. Presented by John Freke to the Royal Society in 1747. Published in the *Philosophical Transactions of the Royal Society for the Year 1747* 44/2 (London, 1748), 445-50. Also a reference to a Jacques Creed in 1746 inventing a music writing machine.	Reference only	Adler (1973), p.365; *The Gentleman's Magazine*, February 1748. Also see No. 485, p.445.
11	1749		Pierre Carmien	French			American inventors were alleged to have copied this machine. No existent patent.	Reference only	Adler 1973, p.50, p.365.
12	1753	Writing Machine	Friedrich von Knauss	German		Vienna	Four different models between 1753-1760. Claimed to be the first writing machine; however, all four machines were writing automaton, with the final one being programmable.	Machines	TT 1923, p.12; Bliven 1954 (WWM), p.25; Adler 1973, p.365
13	1762	Copiste Secret	Count Leopold von Neipperg	Austrian		Vienna	Full description in the Imperial and Royal Library. Illustrated in *Export Review* (September 1924). Adler describes it as a form of pantograph.	Reference only	TT 1923, p.12; Bliven 1954, p.25; Adler 1973, p.53, p.365.
14	1763	Copiste Habile or Polygraphe	Cotteneuve	French			Artist, who invented a drawing frame for copying images that he presented to the Royal Academy of Sciences.	Reference only	Bedini, p.38.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
15	1771	The Fantasy Machine	Johann Hohlfeld	German			A musical writing machine. Created in response to hearing of Unger's paper which was read by Euler at the Academy of Sciences in Berlin. Published in 1771 'Description of a machine for noting down pieces of music as fast as they are played upon the harpsichord.' Could be attached to any harpsichord. which has been argued to be the machine outlined by J.F. Unger (No.6). However, it has also been argued that this was quite a different machine, in that unlike Unger's it could be attached to any harpsichord. Reported that Hohlfeld built machine after being told of the invention by Sulzer.	Reference only	Beckman, *History of Inventions and Discoveries* (Longman, 1817), p.21-22; Adler 1973, p.365.
16	1771	L'Ecrivain	Payen	French			Writing automaton, in the figure of Eros. Wrote the word 'Love' in capitals, with the tip of his arrow.	Reference only	*Le Mercure de France*, September 1771, p.175-6; Chapuis and Droz 1958, p.308; Adler 1973, p.365.
17	1772	L'Ecrivain	Pierre Jaquet-Droz	Swiss		Museum of Neuchatel, Switzerland.	Alleged to have adapted the machines of von Knauss and von Niepperg. Part of a set of automata that included a Draughtsman, a Musician and a Grotto. Designed and built in partnership with his son Henry-Louis and with his assistant Jean-Frederic Leschot. First exhibited in 1774, after which the automata collection toured Europe.	Machine	Chapuis and Droz 1958, p.292-295. Adler 1973, p.365.
18	1779	Copying Writing Method	Abbe Rochon	French			According to Adler, this was a portable embossing machine. However Rhodes and Streeter explain that Alexis Rochon, a Member of the French National Institute and director of the Marine Observatory at the Port of Brest, developed a method for copying writing in conversation with Benjamin Franklin. Franklin explained his method of producing multiple copies by writing with gum Arabic ink, pressing sand on the surface, and transferring the sand to a printing surface. Rochon suggested writing directly onto a pre-treated copper-plate.	Reference only	Nicholson's "Useful or Instructive Notions' in *Journal of Natural Philosophy, Chemistry and the Arts (1783)*, p.115; Rhodes and Street 1999, p.23. Adler 1973, p.365.
19	1779	Writing Machine	Wolfgang von Kempelen	German			A printing press for the blind, that printed German Faktur type in relief - although method of 'printing' is not specified. Also invented a chess playing automaton, which beat Napoleon, a 'speaking machine.'	Reference only	*Office Appliances* 1912; Adler 1973, p.365; Metzner 1998, p.178.
20	1780	Writing Machine	Louis Jacquet	Swiss			Most likely a reference to Henri-Louis Jaquet-Droz, the son of Pierre Jaquet-Droz (No.13); therefore the writing machine referenced is most likely to be an automaton.	Reference only	TT 1923, p.12; Bliven 1954, p.25.
22	1780	Machine for the Blind	Jean-Claude Pingeron	French			Designed to emboss letters. Also described as a 'writing frame for the blind', so most likely a polygraph.	Reference only	TT 1923, p.12; Bliven 1954, p.25; Adler 1973, p.365.
23	1778	Bigrapher	Erasmus Darwin	British			A polygraph, of which Darwin Invented four different models, that was created in competition with fellow Lunar Man James Watt.	Reference only, with illustrations from diary.	Rhodes and Street 1999, p.16.
24	1780	Copying Press	James Watt	English	British Patent No. 1,244		A device and system through which writing could be copied. Mass produced through Watt & Co., est. 1780.	Machine	Rhodes and Streeter 1999, p.8-11.
25	1782		Jean-Frederic Leschot	French			Reference to the assistant to Pierre Jaquet-Droz. Most probably an automaton.	Reference only	Adler 1973, p.365.
26	1782	L'Écrivain-Dessinateur	Henri Maillardet	Swiss			A writing and drawing automaton built by the manager of the Jaquet-Droz's London showroom.	Machine	Chapuis and Droz 1958, p.302-308; Adler 1973, p.365.
27	1783	A Writing Automaton	Joseph Neussner				A writing and drawing automaton. Description of how to build one appeared in a manual.	Reference only	Neussner's *Beschreibung einer Alles selbst schriebenden Maschine*, 1783; Adler 1973, p.53, p.365.
28	1784	Machine for the Blind	Franzose L'Hermina	French			Similar to Pingeron's frame, with improvements.	Reference only	Adler 1973, p.53, p.365.
29	1784		Jenkins				Similar to Pingeron's frame, with improvements.	Reference only	Adler 1973, p.365.
30	1784	Copying Press	William and Frederick Fleming	British			Infringement of Watt & Co.'s patent.	Reference only	Rhodes and Streeter 1999, p.11.
31	1790	Draughtsman-Writer Automata	Charles Paris	French			Lazarite monk, sent to replace the Jesuits in 1785. Became mechanic and watchmaker to the Emperor of China, Kien-Long. Under his orders, built a copy of a Jaquet-Droz writing automaton. Reported to have been between 4 and 5 foot tall, writing phrases in praise of the Emperor in Chinese, Tartar, Mongol, and Tibetian.	Reference only	Chapuis and Droz 1958, p.308-9; Current 1954, p.53.
32	1795	Portable Copying Machine	John Folgham	British			Cabinetmaker.	Reference only	Rhodes and Streeter 1999, p.11.
33	1795	Copying Press	Joseph Bramah	British			A hydraulic press, sold by Messrs. Folgham & Sons in Fleet Street, Bramah's manufactory in Piccadilly, and Mr. Baker's in Moorfields.	Reference only	Rhodes and Streeter 1999, p.11.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
34	1796	Method of writing and engraving in Oil	Samuel Toplis	British			Full title reads: Method of writing and engraving in Oil, and multiplying Copies on Paper, Parchment, Linen, and other Materials of flexible Texture. Method was for writing out letters from a complete ink surface, producing white writing on a black background.	Reference only	Samuel Toplis' 'Method of Writing etc.' in *The Repertory of Arts and Manufactures*, vol.4, 1796, p. 111-115; Rhodes and Street 1999, p.23.
35	1798	Copying Press	John Innes	American			Made stationary and portable copying presses. Intended for public offices, and counting houses, as well as for Gentleman to copy their letters.	Reference only	Philadelphia's *Federal Gazette 1798*; Rhodes and Streeter 1999, p.11.
36	1799	Machine for Writing with Two Pens	Mark Isambard Brunel	French	US Patent; UK Patent No. 2,305		US Patent issued on 17 January 1799 and UK Patent issued on 11 April 1799. US Patent subsequently destroyed in 1836 fire.	Diagram.	Rhodes and Street 1999, p.17.
37	1803	Polygraph	John Isaac Hawkins	English/American	US Patent; UK Patent No. 2,635.		A writing-copying device, subsequently manufactured by Charles Wilson Peale. Used by Thomas Jefferson.	Machine.	Rhodes and Street 1999, p.17.
38	1806	Writing Machine	Joseph Bramah	English			Invented the combination lock. Also a banknote numbering device. A series of wheels with letters on which can be added to ad infinitum. Adler notes it as being between a writing machine and printing machine - most likely a reference to his copying press (see above).	Reference only	Adler 1973, p.54-5, p.365.
39	1808	Machine for the Blind	Pellegrino Turri di Castelnuovo	Italian			Also invented carbon paper. Evidence of machine exist in sixteen letters and an essay from 1808. Only printed capital letters. Built for the blind Countess Carolina Fantoni da Fivizzono.	Typewritten Letters.	TT 1923, p.12; Bliven 1954, p.25; Adler, p.365; Masi 1985, p.13.
40	1808		Pastor Schonfeld				A musical writing machine.	Reference only	Adler 1973, p.57, p.365.
41	1808	Penna-polygraph or Pen and Stylographic Manifold Writer	Ralph Wedgwood	English	UK Patent.		A polygraph. Developments of it eventually included the use of carbon paper (also known as carbonic paper). Went on to win a medal at the International Exhibition (1862).	Reference only, with diagrams.	Ralph Wedgwood's 'Penna-Polygraph' in *Repertory of Arts, Manufactures and Agriculture* (1807), p.193-205; Rhodes and Street 1999, p.17.
42	1811	Writing instrument	Ezra L. Miller	American	US Patent.		US Patent granted on 11 May 1811, subsequently destroyed in 1836 fire. From Charleston, South Carolina.	Reference only	US Index of Patents, Class 18 (Arts, Polite, Fine and Ornamental), p.329.
43	1822		Claude Lechet and Franz Huber	French			A mechanical device for the use of the sightless.'	Reference only	Adler 1973, p.57, p.365.
44	1822	Multiplying Facsimile Impressions	Sir William Congreve	British			Variations on printing and engraving techniques.	Reference only	Rhodes and Street 1999, p.23.
45	1823	Tachigraph / Tachigrafo / Tachitipo	Pietro Conti	Italian			Patented in France. Bought by the Academie Francaise for 600 francs. From Cilavegna. For poor eyesight or trembling hands.		Arcadia di Scienze, Lettere et Arti, 1827; TT 1923, p.12; Bliven 1954, p.25; Adler 1973, p.365.
46	1827	Shorthand Writer	Benoit Gonod	French			Inspired by the piano. Played chords to create shorthand forms.	Reference only	Adler 1973, p.365.
47	1829	Typographer	William Austin Burt	American	US Patent No. 6,085	Science Museum and the American History Museum at the Smithsonian Institute.	Burt from Detroit Michigan. Promoted John B. Sheldon. Also called Burt's Family Letter Press. An index machine. Patent signed by Presidents Andrew Jackson and Martin van Buren, 23 July 1829. Exhibited at the 1893 Columbian Exposition in Chicago. 'Looked as much like a meat block in a butcher shop.'	Machine	US Index of Patents, Class 18 (Arts, Polite, Fine and Ornamental), p.329. Also Mares 1909, p.17-18; TT 1923, p.10, p.13; Current 1954, p.23; Bliven 1954, p.25; Adler 1973, p.365.
48	1830	Mechanical Potenografo	Celestino Galli	Italian			Lived in London; no machine or patent but only contemporary reviews and reports.	Reference only	*The Times*, 27 June 1831; Adler 1973, p.365.
49	1831		Drais					Reference only	Adler 1973, p.365.
50	1831	Eine Mechanische Narrheit und Alberne Erfindung	Baron Karl Friedrich Christian Ludwig Drais von Sauerbronn	German			Exhibited in Frankfurt in 1831. Operated by 'chord' principle; square keyboard, 4x4 layout. Invented a shorthand code. Also invented the hobby horse (Draisine-Science Museum). A bicycle manufacturer	Reference only	TT 1923, p.13; Adler 1973, p.61, p.365.
51	1833	Machine Krytographique	Xavier Projean or Progin	French	French Patent No. 3,748		Filed on 6 September 1833. Patented the first keyboard. First down-stroke machine. Not a printer from Marseilles, but a hommes des lettres. A visible writer, with differential spacing. Progin proposed removal of alphabetic letters, and replacement with musical or other characters, even cutters to turn it into a stereotyping machine. "Typographic machine or pen." Letters on bars arranged in a circular arrangement.	Patent.	Mares 1909, p.18; TT 1923, p.10; Adler 1973, p.365.
52	1835		Samuel Morse				Most probably Morse's telegraph machines.		Adler 1973, p.365.
53	1835-1865	Writing Machine	Paul-Gustave Froment	French			Dates 1815-1865, an engineer who invented telegraphy machines with Hughes, electric motors and in conjunction with Leon Foucault, the gyroscope. Most likely a telegraphy writing machine.	Reference only	Adler 1973, p.365.
54	1836		Berry				Possibly the circular index writer machine discussed and illustrated in Mares 1909, p.18-19. (Dated 1836, but noted as being in France.)	Reference only	

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
55	1837	Cembalo Scrivano	Guiseppe Ravizza	Italian			Writing Harpsichord. A lawyer from Novara. Died in 1885. Made 12 machines in all. Sold machines for 300 lire. Patent issued on 31 March 1856. Exhibited at the Exhibition of Turin 1858, awarded a silver medal. Called a writing cymbal.	Reference Type	TT 1923, p.13.
56	1837	Writing Machine	Gustave Bidet	French			Watchmaker.	Reference only	Mares 1909, p.18; Adler 1973, p.365.
57	1837		Vail					Reference only	Adler, 1973, p.365.
58	1838		Johann Knie				Director of the Breslau Blind Institute.	Reference only	Adler, 1973, p.365.
59	1838		Davy					Reference only	Adler, 1973, p.365.
60	1838		Steinheil					Reference only	Adler, 1973, p.365.
61	1838	Writing Machine	A. Dujardin	French			Also built a machine for recording speeches. Keys resembled a piano. From Lille.	Reference only	TT 1923, p.13; Adler 1973, p.365.
62	1839	Machine Tachygraphique	Louis Jerome Perot	French			Machines and devices for typographic, lithographic and tachygraphic impressions, with a special view to use on paper.' Allegedly sold a number amongst commercial businesses in Rouen.	Reference only	TT 1923, p.13; Adler 1973, p.365.
63	1839		Pierre Foucauld/Foucault/Foucaux	French			A pupil at the Blind Institute, Paris, from Corbeil. Founded a School for the Blind in Paris. Had only ten keys; each key corresponded to a section of an alphabetic form. Therefore chord technique required to write. Blind inventor, initially invented machine for the blind. Some sources quote Foucauld as becoming an assistant to Braille.	Reference only	Adler, 1973, p.365.
64	1840	Writing appliance	Jaan Jaackson	Russia			From Riga. 'It was an appliance absolutely without value, an impractical invention for which we are unable to locate the date as to when it was devised.'	Reference only	TT 1923, p.13; Bliven 1954, p.25; Adler, p.365.
65	1841	Mechanised Writing Machine	Alexander Bain and Thomas Wright	British			A machine for writing Morse characters for telegraphic purposes. UK Patent No. 9,204, in 1841, given for typewriter ribbon.	Reference only	Typewriter entry in *La Grande Encyclopedie*. TT 1923, p.13; Adler 1973, p.365.
66	1841		Charles Wheatstone	British				Reference only	Adler, 1973, p.365.
67	1841	Universal Compositor	Baillet de Sondalo & Core	French			Recommended for those who could read but not write; for the blind; and for cryptographers. Right hand turned a dial to choose a letter; the left hand was for alignment; and the foot operated a pedal to print the letter. Alphabet could be replaced with syllables.	Reference only	TT 1923, p.13; Adler 1973, p.365.
68	1843	Thurber's Patent Printer	Charles Thurber	American	US Patent No. 3,228	Smithsonian; Illustration accompanies patent.	First Movable Carriage. Patent date issued 26 August 1843. From advertisement for Remington: 'The original may be seen at the Boston offices of Messrs. Wyckoff, Seamans and Benedict.' Worcester MA. Built several models. (See below.) Intended for blind.	Machine.	US Index of Patents, Class 18 (Arts, Polite, Fine and Ornamental), p.327; *Scientific American*, 30 April 1887; TT 1923, p.14; Current 1954, p.24; Adler 1973, p.365.
69	1843	Rapigraphe	Pierre Foucauld/Foucault/Foucaux	French			Second model of 1839 machine.	Reference only	TT 1923, p.14.
70	1843		Alexis Kohl				Alleged to have invented a writing ball; possible mistaken for Malling Hansen. In actuality invented a cypher machine	Reference only	Adler, 1973, p.365.
71	1844		Spencer					Reference only	Adler, 1973, p.365.
72	1844		Henry Pape	France			Reinvention of Dujardin's Tachygraphe. A piano manufacturer.	Reference only	TT 1923, p.14; Adler, 1973, p.365.
73	1844	Letter Printer	Littledale	British			Designed to be used by the blind. Embossed letters onto typing paper. However could also used 'manifolding' paper (carbon paper), to create typewritten visible text. Exhibited at the British Association at York by Rev. W. Taylor FRS.	Reference only	C. Jenkins, 'Type-Writing Machines', Journal Society of Arts, vol. 42, 1894; Mares 1909, p.20; TT 1923, p.14.
74	1844	Stereographe	Labrunie de Nerval	France			A series of type-wheels mounted side-by side on an axel. Design was the same as Bramah's machine (No. 26).	Reference only	TT 1923, p.14; Adler 1973, p.365.
75	1844	Draughtsman-Writer Automaton	Jean Eugène Robert-Houdin	France			Similar drawings to the Jaquet-Droz automaton; speculation that this was not a new automaton but rather a repaired one, from another maker.	Reference only	Chapuis and Droz 1958, p.309.
76	1845	Printing Telegraph	Royal Earl House and Jacob Brett	American			From Vermont and Buffalo, NY., and was Samuel Morse's competitor in the telegraphy industry. This reference may well be to the House Letter-Printing Telegraph, which he invented between 1844 and 1846. Constructed with a typewheel. Patented by Brett in the UK and House in the USA. Lack of evidence, but described as filed under 'communication from abroad.' Noted as design being similar to a music	Reference only	Adler 1973, p.365.
77	1845		Brett				See above.	Reference only	Adler, 1973, p.365.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
78	1845		De Leavitt	American			From Kentucky. Used by Mr. Prentice, editor of Louisville journal, who is recorded as writing, "A friend of mine, a very ingenious man, has just invented a typewriter." No reference to Leavitte in *US Index of Patents, 1790-1847*.	Reference only	Typewriter entry in *La Grande Encyclopedie*; Mares 1909, p.20-1; Adler 1973, p.365.
79	1845		Dr Salntard and Saint-Gilles	France				Reference only	Adler 1973, p.365.
80	1845	Chirographer	Charles Thurber	American	US Patent No. 4,271; British Patent No. 1,805 (1857)	Worcester Historical Museum, MA, USA.	Intended for the blind and designed to produce something akin to handwriting. Current 1954 claims it did not work.	Machine.	C. Jenkins, 'Type-Writing Machines', *Journal Society of Arts*, vol. 42, 1894; Crabtree, *The Marvels of Modern Mechanism*, 1901,p.612; Mares 1909, p.19-20; Current 1954, p.24.
81	1847		Gustave Froment	France			Model built and put on display at the Musee of Arts and Métiers, Paris in 1847.	Reference only	TT 1923, p.14; Adler 1973, p.365.
82	1847		Rohlfs and Schmidt	German				Reference only	Adler, 1973, p.365.
83	1847	Letter Embosser	Alfred Ely Beach	American			Editor of the *Scientific American*. Machine to emboss a narrow paper tube.	Reference only, with illustration.	Mares 1909, p.22; Adler 1973, p.365.
84	1848		Fairbanks	American			A calico printer. "..he elaborated a machine in which the patterns desired were affixed at the ends of rods, all of which worked up to the same point. (Mares 1909, p.22)	Reference only	Mares 1909, p.22.
85	1849		Bianchi	Italian				Reference only	Adler 1973, p.365.
86	1849		Sorenson					Reference only	Adler 1973, p.365.
87	1849	Clavier Imprimeur	Pierre Foucauld	French			Piano Printer. Pupil at the Institut des Aveugles. Awarded gold medal by the Paris Board of Encouragement. Also awarded prize at 1851 Great Exhibition. Made a number of machines; sold them for £20 each.	Reference only	Mares 1909, p.23; TT 1923, p.14; Current 1954, p.24.
88	1850	Phonetic Writer	John B. Fairbanks	American	Yes	Smithsonian	First machine with continuous paper feed. Date from *La Grande Encyclopedie* is 1848, and credited to a Mr. Fairbank.	Machine.	TT 1923, p.27; Adler 1973, p.365.
89	1850	Calico Printer	John M. Jones	American			130 machines, destroyed in a factory fire. Of Clyde, NY.	Reference only	TT 1923, p.27.
90	1850	Printing Machine	Oliver T. Eddy	American	US Patent No. 7,771	Illustration accompanies patent.	Machine the size of a baby-grand piano. Used a piano keyboard, and used an inked ribbon. Detailed description of its operation in Mares 1909: Current 1954 quotes "designed to furnish the means of substituting printed letters and signs for written ones in the transaction of everyday business."	Reference only, with illustration.	Typewriter entry in La Grande Encyclopedie; Mares 1909, p.24; TT 1923, p.14; Current 1954, p.26; Adler 1973, p.365.
91	1850	Typograph	G. A. Hughes	British		Science Museum	Director of the Henshaw Institute for the Blind, Old Trafford, Manchester. His machine won prize at 1851 Great Exhibition. Adapted to produce type.	Machine.	TT 1923, p.14.
92	1850		William von Siemens				Numerous telegraphic inventions, so most likely a telegraphy machine. Became first President of the Society of Telegraph Engineers.	Reference only	Adler 1973, p.365.
93	1850		Marchesi				Was exhibited, according to Mares, but has disappeared without record.	Reference only	Mares 1909, p.25; TT 1923, p.14; Adler 1973, p.365.
94	1850		William Hughes				Description of machine as an index writer, with embossed letters on a circular disc.	Reference only	Mares 1909, p.23-4; TT 1923, p.14; Adler 1973, p.365.
95	1850		Wight					Reference only	Adler 1973, p.365.
96	1851	Machine to Print Telegraphs (First Machine)	Charles Wheatstone	British		Science Museum	Piano Keys. Invented a number of machines. Professor of Experimental Physics at Kings College, London. Built one machine pre-1850, one complete at the time of the Great Exhibition and 1855-1860 had six different machines, three complete.	Machine.	Mares 1909, p.28-32.
97	1851		Levitte					Reference only	Adler 1973, p.365.
98	1851		Lariviere					Reference only	Adler 1973, p.365.
99	1851		Hirnel					Reference only	Adler 1973, p.365.
100	1851		Ehlwein					Reference only	Adler 1973, p.365.
101	1851		Tollputt					Reference only	Adler 1973, p.365.
102	1852	Mechanical Typographer	Henry Harger	American			Possibly mistaken for invention below.	Reference only	
103	1852	Mechanical Typographer	John M. Jones	American	US Patent No. 8,980	Illustration accompanies patent.	Of Clyde, NY. Patent issued for a Mechanical Typographer, for improvements in copying manuscripts. Circular index writer. Masi claims it to be the first mass produced and commercially intended invention.	Reference only	Mares 1909, p.26; TT 1923, p.14; Adler 1973, p.365; Masi 1985, p.13.
104	1854	Typograph	R.S. Thomas	American	US Patent No. 10,995	Illustration accompanies patent.	Of Wilmington, North Carolina. Also an index writer, with a description of depressing a type of marked rolling pin onto the fixed sheet of paper.	Patent.	Mares 1909, p.27-8; Current 1954, p.27.
105	1854		Devincenzi					Reference only	Adler 1973, p.365.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
106	1855	Cembalo Scrivano o Machina da Scrivere a Tasti	Giuseppe Ravizza	Italian			Shown at the Industrial Exhibition, Novara. Also entered in 1858 Exhibition in Turin, awarded silver medal. Called a writing harpsichord.	Patent.	TT 1923, p.10.
107	1855		Clement					Reference only	Adler 1973, p.363.
108	1855	Type-printing Telegraph	David Edward Hughes	Anglo-American			Professor of Music at Bardston College, Kentucky (1850-3). Machine worked on a 'golfball' system. Also invented a carbon microphone.	Reference only	Adler 1973, p.365.
109	1856		J. Marzolo		British Patent No. 145		Patented on 18 January.	Patent.	B.P.O., Class 100, 1855-63, p.14.
110	1856		J.H.Johnson		British Patent No. 679		"A telegraphic transmitting-instrument is described in which a recording devices comprising a type-wheel and paper strip is associated with the transmitting keyboard." Perhaps on behalf of Minie, C. C. E., and Bregeut, L. F. C.	Patent.	B.P.O., Class 100, 1855-63, p.16-17.
111	1856	Writing Machine	John H. Cooper	American		Smithsonian, Cat No 251,211.	Paper Feed. Of Philadelphia. Had a typewheel. Paper held vertically.	Machine.	*Scientific American*, 6 December 1856; Mares 1909, p.28; Current 1954, p.27; Adler 1973, p.365.
112	1856	Typewriter	Alfred Ely Beach	American			Called an "Improvement in Printing Instruments for the Blind." Dated 1855 in La Grande Encyclopedie.	Patent	*Scientific American* Supplement, 1 January 1887. Current 1954, p.24.
113	1856	Machine to Print Telegraphs (Second Machine)	Charles Wheatstone	British	British Patent No. 1,239.	Science Museum	Second version. Patented 2 June 1858. Wrote upper and lower case. Pin depression, rather than piano keyboard.	Machine	B.P.O. Class 100, 1855-63, p.57; Mares 1909, p.30.
114	1856	Machine to Print Telegraphs (Third Machine)	Charles Wheatstone	British			Third version. Returns to piano keyboard. Upper and lower case letters. Had a heavy touch.	Machine.	Mares 1909, p.32.
115	1857	Writing Machine for the Blind	Peter Hood	Scottish		Sent to America (??) and Science Museum (damaged)	Index typewriter	Machine	
116	1857	Printing Machine	Samuel W. Francis	American	British Patent No. 1,969	Smithsonian, Cat No. 180,060.	Action similar to a piano. William Beaumont engineer was employed to construct it. Looks like Ravizza's second machine. Followed by later models. Sold for $100. British patent filed by J. H. Johnson. Mares 1909 claims it looks like Wheatstone's machine.	Patent.	B.P.O., Class 100, 1855-63, p. 41-2; Mares 1909, p.32-3; TT 1923, p.15; Current 1954, p.27; Adler 1973, p.365.
117	1858	Writing Machine	Giuseppe Ravizza				Another version of (88).	Reference only	
118	1858		Henry Harger	American			Of Delhi, Iowa.	Reference only	TT 1923, p.15; Current 1954, p.27; Adler 1973, p.365.
119	1859	Machine for the Blind	Adolphe Charles Guillemot	French	French Patent.		1924 Exhibition. Chambre Syndicale de la Mecanographique. Piano keyboard	Reference only	TT 1923, p.15; Adler 1973, p.365.
120	1860		Cox					Reference only	Adler 1973, p.365.
121	1860	Caligraph	Charles Thurber	American	US Patent No. 30,777	Illustration accompanies patent.	Follows on from patent issued on 23 June 1857.Description appears to be for a machine which mechanises the paper rather than the writing.	Patent.	US Patent No. 30,777.
122	1860		W. E. Newton		British Patent No. 215.	Illustration accompanies patent.		Patent	B.P.O., Class 100, 1855-63, p. 83.
123	1861		Codvelle-La Basee					Reference only	TT 1923, p.15; Adler 1973, p.365.
124	1861	Keyed Type Writer	Thomas Hall	American			Later achieved typewriter success with the Hall typewriter, and index writer. This machine however was a keyboard typewriter. Two machines were built in 1865 and one exhibited at Paris Exhibition in 1867.	Reference only	*Phonographic World*; Mares 1909, p.33.
125	1862		Martin					Reference only	Adler 1973, p.365.
126	1862	Stenograph	Michela			Illustration in Adler.	A three-legged stenographic machine which printed on a paper tape, with piano keyboard.	Reference only	Adler 1973, p.365; Adler 1997, p.12.
127	1863	Writing Machine	Flamm	French			Wrote in syllables.	Reference only	TT 1923, p.15; Adler 1973, p.365.
128	1863	Permutation Typographer	Benjamin Livermore	American	British Patent No. 2,031.	Illustration accompanies patent.	Of Hartland, Vermont. Uncle to Analdo M. English, inventor of the Simplex (1891). Its novelty was character signs. Filed British patent by A. V. Newton.	Patent.	B.P.O., Class 100, 1855-63, p.133; TT 1923, p.15; Adler 1973, p.365; Current 1954, p.27; ETCetera 2008, March and December.
129	1863	Printing Apparatus	F. A de May	American			From New York. A machine similar to Thurber's.	Reference only	TT 1923, p.15; Current 1954, p.27; Adler 1973, p.365.
130	1863	The Writing Machine	John Pratt	American	US Patent No. 3,163.	Illustration accompanies patent.		Patent	Scientific American, 6 July 1867; B.P.O., Class 100, 1864-1874, p.179-80; Adler 1973, p.365.
131	1864	Writing Machine	Peter Mitterhofer	Austria		Museo da Macchine per Scrivere Peter Mitterhofer, Partschins, Italy; Vienna Technical Museum; Dresden; Town Museum, Merano.	Built four models between 1864 and 1868. Third model known as the Merano model. From the Tyrol.	Machine.	TT 1923, p.15; Adler 1973, p.365.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor	Nationality	Patent No	Location	Extra Notes	Reference Type	Reference
132	1864		Halstead					Reference only	Adler 1973, p.365.
133	1864		Peters					Reference only	Adler 1973, p.365.
134	1864		Bryois					Reference only	Adler 1973, p.365.
135	1864	Paging-Machine	Christopher Latham Sholes and Robert Soule	American	US Patent No. 44,488	Illustration accompanies patent.	Page numbering machine.	Illustration accompanies patent.	
136	1864		Danel-Duplan					Reference only	Adler 1973, p.365.
137	1865	Typewriter	George E. House	American		Illustration in Mares.	Of Buffalo, New York. Types arranged in a basket. Keyboard machine. Palten revolved rather than moved laterally.	Machine	TT 1923, p.15; Adler 1973, p.365.
138	1865	Writing Ball	Pastor Rasmus Hans Johan Malling Hansen	Denmark	British Patent 1385 (1870). US Patent on 23 April 1872.	German Museum, Munich; Blind Institute, Berlin; Museum of the Wanderer-Werke; and Olympia Office Machine Works, Erfurt.	Solenoid Escapement. Head of the Royal Deaf and Dumb Institute, Copenhagen. Exhibited machine in Copenhagen 1872, Vienna 1873, and won a gold medal at the Paris Exhibition, 1878, as well as having ten orders from Peru. Ribbon added in 1878. Nordice Telegraph Co used them for telegrams. Up to 185 machines produced.	Machine	Malling Hansen Society. Adler 1973, p.365; Masi 1985, p.14.
139	1865		Smith					Reference only	Adler 1973, p.365.
140	1866	Writing and Printing Machine	Abner Peeler	American			Of Webster City, Iowa.	Reference only	TT 1923, p.15; Adler 1973, p.365.
141	1866	Writing Machine	Peter Mitterhofer	Austria			Priced at 80Kr. Subsequent third model, sold to Polytechnic Institute in Vienna for 60Kr.	Machine	TT 1923, p.15.
142	1866		H. Gensoul	French	British Patent No. 3,932 (1868)		Filed by J. H. Johnson, on 24 December. "Messages for transmissions by electric telegraph are printed stenographically on metallized paper."	Patent.	B.P.O., Class 100, 1867-76, p.37; Adler 1973, p.365.
143	1866		Dillies					Reference only	Adler 1973, p.365.
144	1866		Sweet					Reference only	Adler 1973, p.365.
145	1866		M. Nelson	British	British Patent No. 1,186	Illustration accompanies patent.	Filed on 27 April. Type-writer related to stereotype matrix machines. Different type wheels for alphabets, signs, characters, designs for borders and musical types.	Patent	B.P.O., Class 100, 1867-76, p.166-7.
146	1866	Pterotype	John Pratt	American	British Patent No. 3,173 (1866); US Patent No. 81,000 (1868)	Science Museum; Illustration accompanies patent.	Built prototypes in conjunction with a scientific instrument maker and a piano manufacturer, Glasgow. Means winged type. Exhibited it to the London Society of Arts. Developed into the Hammond typewriter. Of Centre, Alabama. Fled to UK as a result of Civil War - feared he would not be granted a patent. Models made by E.B.Burge, London.	Machine	Mares 1909, p.34-40, TT 1923, p.15, Current 1954, p.27.
147	1867	Improvements in Typographic Machines	Thomas A. Hall	American	US Patent No. 65,807	Illustration accompanies patent.	Two patents granted: one filed on 26 October 1866 and granted 5 March 1867; the other granted on 18 June 1867.	Patent	Adler, p.119.
148	1867	Writing Machine	Giuseppe Ravizza	Italian			Another version.	Machine	
149	1867	Writing Machine	R. Allen				Much faster than the pen.'	Reference only	TT 1923, p.15; Adler 1973, p.365.
150	1867	Writing Machine	L. H. Fontaine	French	British Patent No. 3679 (1869)	Illustration accompanies patent.	Of Paris. Patent filed by M Henry on 20 December 1869.	Reference only	B.P.O., Class 100, 1867-76, p.52-53. Adler 1973, p.365.
151	1867	Writing Machine	Francisco Jano de Avezedo	Brazilian		Illustration.	A priest. Model of wood and metal. Displayed in Pernambuco, where it was awarded a medal.	Reference only	TT 1923, p.15.
152	1867		Christopher Latham Sholes	American				Patent	Adler 1973, p.365.
153	1867		Lamonica					Reference only	Adler 1973, p.365.
154	1867		Worral					Reference only	Adler 1973, p.365.
155	1867		Ferreira					Reference only	Adler 1973, p.365.

Automata	Writing Copying Devices	Telegraphy Machines	Weakly-Referenced Machines	Writing Machines for the Blind	Music Writing Machines

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
156	23 June 1868	Type Writing Machine	Christopher Latham Sholes, Charles Glidden and Samuel Soule	American	US Patent No. 79,265	Smithsonian Cat. No. 251,210	Dated 1866 in La Grande Encyclopedie. Second Model was patented first.			Current, p.18-19. Description of patent Scientific American, 7 July 1868.
157	14 July 1868	Typewriter	Christopher Latham Sholes, Charles Glidden and Samuel Soule	American	US Patent No. 79,868	Illustration accompanies patent.	This is the patent for the first model, which was patented second. Called Improvement in Type-Writing Machine			Current, p.20.
158	1869	Type-writer	J. Bath		British Patent No. 997		Provisional protection only.			B.P.O, Class 100, 1867-76. p.42.
159	1870	Type-writer	W. Thompson		British Patent No. 1,301	Illustration accompanies patent.	An electric telegraph printer.			B.P.O, Class 100, 1867-76. p.63-4.
160	1870	Type-writer	J. Sax		British Patent No. 1,808	Illustration accompanies patent.	An electric telegraph printer.			B.P.O, Class 100, 1867-76. p.63-4.
161	1870	Type Writing Machine	Charles A. Washburn	American	US Patent No. 109,161	Illustration accompanies patent.	Described as 'new and useful Improvements in Machines for Printing or Writing by hand'. Has piano keyboard.			
162	1870	Type-writer	H. Schoch		British Patent No. 2,547	Illustration accompanies patent.				B.P.O, Class 100, 1867-76. P. 82.
163	1871	Type Writer	Christopher Latham Sholes	American	US Patent No. 118,491	Illustration accompanies patent.	The new axel model of the machine. Developed in 1869 but patented two years later.			Current, p.29-30.
164	1871	Type-Writing Machine	Christopher Latham Sholes	American	US Patent No. 207,557	Illustration accompanies patent.	Another development of the typewriter, a new axel machine. Not patented until 27 August 1878.			Current, p.46-7.
165	1872	Type-Writing Machine	Christopher Latham Sholes	American	US Patent No. 207,559	Illustration accompanies patent.	Machine manufactured by Densmore. Not patented until 1878. First machine in which QWERTY keyboard was fixed. Decided between Sholes and Densmore.			Current, p.56-7.
166	1872	Type Writer	Thomas Edison	American	US Patent No. 133,019	Illustration accompanies patent.	Described as an Improvement in Electrical Printing-Machines.' Printed text on paper so that 'messages, instead of being written, can be printed off by touching finger keys.'			
167	1874	Sholes & Glidden Type-Writer	E. Remington & Sons	American	US Patent No. 199,263		Patent issued to Jefferson M. Clough & William K. Jenne in 1878. Only upper case. Foot treadle. Sold through Densmore, who rented a small typewriter sales shop in lower Manhattan. Arrived 30 April 1874. First sold in July. Sold 400 in first six months.	$125		Current, p.67-73.
168	1875	Crandall	Lucien S. Crandall	American	US Patent No. 170,239	Illustration accompanies patent.	First typewriter patent filed by a competitor to Remington.			Virtual Typewriter Museum
169	1875	Typing Sphere	Rasmus Malling Hansen	Danish	US Patent No. 163,190	Illustration accompanies patent.	First electrical typewriter. Filed under the title 'Improvement in Electro-Mechanical Printing-Instruments.'			
170	1878	Remington No.2	Remington & Sons	American			Both upper and lower case. Typed from the front rather than the back of the paper.			
171	1879	Remington No.3	Remington & Sons	American						
172	1879	Crandall	Lucien S. Crandall	American	US Patent No. 251,338	Illustration accompanies patent.	Patent for a downstrike typesleeve machine. Patent describes purpose was to build a 'type-writing machine of simple and cheap construction and with a greater range of type, combining upper and lowercase letters, figures and punctuation-marks, and working them all with one set of keys merely'. Patent filed 17 December 1879.		Serial Number 18,007	Auction House Breker, 28 May 2011.

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
173	1880	Caligraph No.1	American Writing Machine Company	American			First Competitor to the Sholes & Glidden machine. Manufacture managed by George Yost, former salesman for the Sholes & Glidden/Remington Type-Writer. In partnership with Densmore. Two models - single and double keyboard.	Model 1 $60; Model 2 $80.	Serial Number 3,528	Current, p.102-3; Auction House Breker, 16 May 2009.
174	1880	Hammond	James Hammond	American			Production and sales did not begin until 1884. Multiple models, one with a straight keyboard. Other keyboards were semi-circular.		Serial Number 1,648.	The Virtual Typewriter Museum.
175	1880	Remington No.4	Remington & Sons	American					Serial Number 1,400.	
176	1881	The Hall (New York Model)	Thomas Hall / Hall Type-Writer Company	American			The first index machine.	$40	Serial Number 2,779	The Virtual Typewriter Museum.
177	1881	Typewriter	Thomas Hall	American						
178	1881	Hamilton Automatic	E. M. Hamilton	American			First machine to have proportionate spacing. Production ceased in 1883. Major E. M. Hamilton was a jeweller.		Serial Number 121	
179	1882	Hammonia	A. Hansen-Hamburg / Guhl & Harbeck	Germany			Uppercase only. A linear index machine.		Serial Number 634	Virtual Typewriter Museum
180	1880s	Omnibus Typewriter		American			Exported to India, by H Newman & Co Ltd			
181	1882	Caligraph Model 1 Ideal	American Writing Machine Company	American			Corrected problems with 1882 model. Still all in uppercase. Remained in production until 1896.			Virtual Typewriter Museum
182	1882	Caligraph No. 2	American Writing Machine Company	American			Upper and lower case model.		Serial Number 23,074	Virtual Typewriter Museum
183	1882	New Model	Lucien S. Crandall	British			Mother of pearl inlay, painted on flowers.			
184	1882	The Universal					Index Writer.	$1.50		Early Office Museum.
185	1883	Caligraph No. 3	American Writing Machine Company	American						Typewriter Collector.
186	1883	Columbia	Charles Spiro / Columbia Type Writer Company	American			Index Writer.			Typewriter Collector.
187	1884	Typesleeve Machine	Lucien S. Crandall	British			Patented in 1879; Also patented 23 Nov 1875 understrike typewriter, No. 170,239.			
188	1884	Typewriter	James Hammond	American			Ideal Keyboard			
189	1884	Typewriter	Frank Lambert	American			Filed first patent in 1884. Originally called Francois Lambert (French) but changed name when he emigrated to America in 1876. Machine did not go into production until 1900.			Typewriter Sketchbook, p.10-19.
190	1884	Type-writer	Thomas Edison	American	US Patent No. 295,990	Illustration accompanies patent.	A method of typewriting which perforates the paper. Ink is then forced through the perforated paper to produce the text.			
191	1884	The Daugherty		American			Front Strike Keyboard Writer. Only lasted a few years and was replaced with a model called the Pittsburg.			
192	1884	The Horton	E.E.Horton	Canadian			One model known.		No Serial Number.	Auction House Breker, 16 May 2009.
193	1884	Horton Model 2	E.E.Horton	Canadian			Three models known.		Serial Number 63.	Auction House Breker, Sale on 22 November 2008

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
194	1885	Sun Typewriter	Lee S. Burridge and Newman Marshman	American	US Patent No. 314,996		Established by the Sun Typewriter Company. The first linear index writers. In Great Britain, sold as the 'Invincible'. Three models. Production end before 1890. Three models. Only writes capitals.			Auction House Breker, Sale on 21 November 2009. Typewriter Sketchbook, p.56-57.
195	1885	Columbia Index 2	Charles Spiro / Columbia Type Writer Company	American			Circular Index Writer. Proportional Spacing. Spiro was a clockmaker. Columbia 1 was uppercase only. This model was upper and lower case. Spiro went on to develop the Bar-Lock machine in 1889.		Serial Number 1,016.	
196	1885	Morris	Robert Morris / Hoggson Mfg Co	American			Index typewriter. (Very rare)			Virtual Typewriter Museum
197	1885	People's typewriter	E. Prouty & Company.	American			Chicago. Large Index Typewriter to challenge large expensive keyboard typewriters.			
198	1885	Columbia Music Typewriter	Charles Spiro / Columbia Type Writer Company	American						
199	1886	Standard Typewriter No. 5	Remington	American						
200	1886	Crandall New Model	Lucien S. Crandall / Crandall Machine Co.	American			Highly decorative.		Serial Number 17,705	
201	1886	The World	World Typewriter Company	American			Index writer. Worked using a rubber sheet to stamp letters onto paper. Two models, one uppercase, one upper and lower case.			
202	1886	Prouty	E. Prouty & Company.	American			Front Strike Keyboard Machine.			Mares, p.183-4.
203	1886	Herrington					Index writer.			
204	1886	Ingersoll					Index writer.			
205	1887	Typewriter	George W. N. Yost	American			Designed Caligraph with Franz X. Wagner			
206	1887	Standard Typewriter No. 2	Remington				First to use a shift key.			
207	1887	Typograph	Arthur Wise Cash	American			Typograph Company, Hartford.			
208	1887	The Brooks	Byron S. Brooks	American			Keyboard typebar machine, one of only four made. Made writing visible for first time.			Auction House Breker, Sale on 21 November 2009.
209	1887	The Pocket	Dobson and Wynn and Miniature Pocket Typewriter Company, Rockford	American			Also known as the Miniature.			
210	1887	Velograph	Rymtowt-Prince & Cie	Swiss			Circular Index Writer		Serial Number 364	Virtual Typewriter Museum.
211	1887	The Hall (Salem)	Thomas Hall / Hall Type-Writer Company	American			Improved version of 1881 model, with blue body, carriage release and a bell.		Serial Number 7,551	The Virtual Typewriter Museum.
212	1887	The Crown (Model 1)	Byron S. Brooks	American			3-row type-wheel index writer.		Serial Number 209	Early Office Museum; and Auction House Breker, 19 November 2011.
213	1888	The Boston		American						Typewriter Collector.
214	1888	Smith Premier		American						Typewriter Collector.
215	1888	The Kosmopolit								Typewriter Collector.
216	1888	The Hall Portable	Thomas Hall / Hall Type-Writer Company	American			Speculation that this machine never went into production. Serial Number supposedly fake.		Serial Number 150	Early Office Museum.
217	1888		Angelo Tessaro	Italian			Stamped musical notation onto a zinc plate, that was then used to print sheet music.			Music Printing History
218	1889	Blickensderfer	George Canfield Blickensderfer	American			Scientific Keyboard			
219	1889	Crytograph	Alexis Kohl			Musee des Arts et Métiers, Paris	Similar to Malling Hansen			

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
220	1889	Bar Lock	Charles Spiro	American						Typewriter Collector.
221	1889	International (Double Keyboard)	Lucien S. Crandall	American			Upstroke machine, with double keyboard.		Serial Number T3264	
222	1889	The Maskelyne	John Nevil Maskelyne	British	US Patent 457,903	Illustration accompanies patent.	Produced by the Maskelyne British Typewriter and Manufacturing Company Ltd. Had a shift key that could be operated by hand or foot.			
223	1889	The Morris					Index writer.			Early Office Museum.
224	1889	The Victor					Index writer.			Early Office Museum.
225	1889	The Merritt					Index writer.			Early Office Museum.
226	1889	The Eureka					Index writer.			Early Office Museum.
227	1889	The American					Index writer.			Early Office Museum.
228	1889	The Hall (Boston)	Thomas Hall / Hall Type-Writer Company	American			The last model of the Hall index writer.		Serial Number: 11,187.	The Virtual Typewriter Museum.
229	1889	The Odell	Levi Judson Odell	American	US Patent 399,025	Illustration accompanies patent.	Original Odell machine, jointly assigned with John Edgar Burton and Charles Henry Odell. Issued on 5 March 1889. Odell also worked on developing safety razors.			
230	1890	The North's	North's Typewriter Co	British			Backed by Lord North.			
231	1890	The World No.2								Typewriter Collector.
232	1890	The Rapid								Typewriter Collector.
233	1890	Munson Model 1					Developed in 1898 into the Chicago		Serial Number 1,474	Auction House Breker, Sale on 22 November 2008.
234	1890	Hall Blind Typewriter	Professor Hall	American			Of the Illinois Institution of the Blind. Embossed Braille. Inspired by watching the hands of a pianist.			Mares, p.180.
235	1890	American Index Typewriter					Good machine, sold well.			
236	1891	People's typewriter	Garvin Machine Co.				$15 Index machine			
237	1891	The Williams					A grasshopper style machine, with curved (ideal) keyboard.		Serial Number 1,682.	Auction House Breker, 16 May 2009.
238	1891	Franklin								Typewriter Collector.
239	1891	The Fitch typewriter								
240	1891	The Simplex	Analdo Myrtle English				Index Writer. Nephew to Livermore, inventor of 1863 Permutation typographer. Patent assigned to Philip Becker.			Early Office Museum.
241	1891	The Dollar					Index Writer.			Early Office Museum.
242	1891	The Odell No. 2	Levi Judson Odell	American	US Patent No. 457,840		Art Nouveau design, with entire machine nickel plated.			
243	1891	The Edland	Joe E. Edland	American	US Patent 456,025 (14 July 1891)		Index Writer, Manufactured by The Liberty Manufacturing Company, 259 Hudson Street, New York, USA.			Early Office Museum; and Auction House Breker, 16 May 2009.
244	1891	Music Writer	E.Ball				Circular disk, with rubber stamps embossed with musical notation.			Music Printing History
245	1891	Music Writer	G. Royale				Square device on guide rails, with two slides - one to write the staff, the other with musical notation. Pressed onto the paper to print music. Noted as being the precursor to Keaton Music Typewriter.			Music Printing History
246	1892	The Crary Typewriter	Joseph M Crary	American	US Patent No.s 477,353, 477,404, 477,517 (21 June 1892); and US Patent No. 493,016 (7 March 1893).	Mantelli, Italy; Milwaukee Public Museum	A Book typewriter. Circular keyboard. (Hansen Writing Ball, Daw & Tait, and Lambert.) Serial number is 116. Made by Garvin Machine Company in New York.			Typewriter Sketchbook, p.30-1.

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No.	Image and/or Collection	Notes	Cost	Serial Numbers	References
247	1892	Jewett								Typewriter Collector.
248	1892	Frister & Rossman		American						Typewriter Collector.
249	1892	Engraving Machine	Charles Alison Ker	British	US Patent No. 477,257; UK Patent No. 6,835		A machine for producing musical engravings.			Music Printing History
250	1892	Machine for Printing Music	Louis Durdilly	French	US Patent No. 430,205; UK Patent No. 5,896; FR Patent No. 216,373		Uses autographic paper, aka carbon paper or blue print paper through which to print musical notations on a stave.			Music Printing History
251	1892	North's Typewriter	North's Typewriter Manufacturing Company Limited	British			Based in London. Typebar behind the platen, so allowing visible writing.		Serial Number 1618.	Auction House Breker, 16 May 2009.
252	1892	Salter No. 5							Serial Number 745.	Auction House Breker, 16 May 2009.
253	1893	The Underwood	John T. Underwood / Underwood Typewriter Company	American			Visible Writer. Front Strike Keyboard Writer. First machine fitted with a tabulator as standard. Underwood factory in Hartford Conn., USA. Introduced in the UK in 1905.			Mares, p.186-88; Current, p.98.
254	1893	Maskelyne No.2	John Nevil Maskelyne & Nevil Maskelyne	British	Patent taken out in 1892.		Grasshopper action.		Serial Number 1,246.	Auction House Breker, 22 November 2008.
255	1893	Universal Crandall No.3								
256	1893	Hammond No.2								Typewriter Collector.
257	1893	The Kneist					Index Writer.			
258	1894	Edison Mimeograph Typewriter	Edison	American			AB Dick Co of Chicago. Only produced for a couple of years.			Typewriter Collector.
259	1894	The Burns	Frank Burns				Only in production for 1 year. Upstroke typewriter with double keyboard.			Auction House Breker, 16 May 2009.
260	1894	Remington No.6	Remington & Sons	American						Typewriter Collector.
261	1894	Victor								Typewriter Collector.
262	1894	Elliott-Fisher								Typewriter Collector.
263	1894	Crown								Typewriter Collector.
264	1894	The Hartford No. 1		American			Upstroke machine.			Typewriter Collector.
265	1895	The American/The Globe	Globe Investment Trust	American			Index Writer. 30-40 words a minute.	$5		Mares, p.245.
266	1895	The Graphic		German			Rare index writer, similar to the Hall.			Early Office Museum; and Auction House Breker, 28 May 2011.
267	1895	The Champion					Index Writer.			Early Office Museum.
268	1895	Blickensderfer No.5								Typewriter Collector.
269	1895	Ford								Typewriter Collector.
270	1895	Jewett No.2								Typewriter Collector.
271	1895	Smith Premier No.2		American						Typewriter Collector.
272	1895	Smith Premier No.3		American						Typewriter Collector.
273	1895	Travis								Typewriter Collector.
274	1896	Type Writing Machine	Philander Deming	American	US Patent No. 554,659	Illustration accompanies patent.	Index Writer.			Patent.
275	1896	The Granville Automatic	Mossberg & Granville Manufacturing Company.	American			Front-stroke machine, with 2 carriage release levers.		Serial Number 5937	Auction House Breker, 16 May 2009.

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
276	1896	The Oliver		American			Nickel-plated first model.		Serial Number 288	Auction House Breker, 22 November 2008.
277	1896	Smith Premier No.4		American						Typewriter Collector.
278	1896	Williams No. 2								Typewriter Collector.
279	1896	Blickensderfer No.6								Typewriter Collector.
280	1896	Elliot-Hatch								Typewriter Collector.
281	1896	Granville Automatic								Typewriter Collector.
282	1896	Remington No.7	Remington & Sons	American						Typewriter Collector.
283	1896	Maskelyne Victoria	Nevil Maskelyne	British	US Patent 560,142	Illustration accompanies patent.	Manufactured by the Maskelyne British Typewriter and Manufacturing Company Limited.			
284	1897	Blickensderfer No.7	George Canfield Blickensderfer							Typewriter Collector.
285	1897	Densmore No.2								Typewriter Collector.
286	1897	Munson Model 3								Typewriter Collector.
287	1897	Oliver No.2								Typewriter Collector.
288	1897	Remington No.8		American						Typewriter Collector.
289	1897	Williams No.3								Typewriter Collector.
290	1897	Typewriter	Lee S. Burridge	American	1897		No machine, only patent exist. Combined base of index typewriter with thrust action keyboard.			Typewriter Sketchbook, p.57.
291	1897	Polyglotte, Miniature Pocket Typewriter	Bonnet & Cie	French			Index typewriter from Paris.			Auction House Breker, November 2011.
292	1897	Edelmann		German			Index writer. Alleiniger Vertrieb, Fabrikant A. Greeff & Co., Julius Pintsch of Frankfurt			Auction House Breker, 29 May 2010.
293	1898	Typewriter	Chicago							
294	1898	The Mizpah					Hebrew typewriter.			
295	1898	Megagraph	Charles Augustus McCann	American			Six foot high, 5'10"" high, 3'4" long, weighed 400lbs			
296	1898	Franklin No. 7					Ideal keyboard.			Auction House Breker, Sale on 29 May 2010.
297	1898	Pittsburg		American						Typewriter Collector.
298	1898	Manhattan		American						Typewriter Collector.
299	1898	Jackson		American						Typewriter Collector.
300	1898	Adler								Typewriter Collector.
301	1899	The Cahill	Drag Thaddeus Cahill	American			Electrical typewriter. Based on Remington 2.			Mares, p.160-1.
302	1899	Empire		American						Typewriter Collector.
303	1899	Keystone		American						Typewriter Collector.
304	1899	Saturn		American						Typewriter Collector.
305	1900	Lambert Model 1	Frank Lambert	American			From 1884 patent, went into production in 1900, through the Lambert Typewriter Company. Soon subsumed into the Gramophone and Typewriter Company in June 1900. 3300 machines built. Rotating keyboard.		Serial Number 3,300	Typewriter Sketchbook, p.10-19.
306	1900	Faber's Electrograph	Dr. Faber	German			Resembled Malling Hansen Writing Ball.			Typewriter Collector.
307	1900	Rem-Sho No. 6		American						Typewriter Collector.
308	1900	Smith Premier No. 5		American						Typewriter Collector.
309	1900	Williams No.4		American						Typewriter Collector.
310	1900	Columbia Bar Lock	Columbia Type Writer Company	American						Typewriter Collector.
311	1900	Conover		American						Typewriter Collector.
312	1900	Draper		American						Typewriter Collector.

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

No.	Date	Name of Machine	Inventor / Manufacturer	Nationality	Patent No	Image and/or Collection	Notes	Cost	Serial Numbers	References
313	1900	Sticknet	B.C.Stickney	American			Upstroke machine.			Auction House Breker, 16 May 2009.
314	1900	The Index Visible					Index Writer.			Early Office Museum.
315	1901	Lambert Model 2	Frank Lambert	American			Fixed multiple key.		Serial Numbers 3,300-5,276	
316	1902	Lambert Model 3	Frank Lambert	American					Serial Numbers 4,148 - 8,864	
317	1902	The Postal	Blickensderfer				Discontinued 1910			Typewriter Collector.
318	1902	Practical No. 3					Index Writer.			Early Office Museum.
319	1902	Coffman's Pocket					Index Writer.			Early Office Museum; Typewriter Collector.
320	1902	The Niagara					Index Writer.			Early Office Museum.
321	1902	The Best					Index Writer.			Early Office Museum.
322	1902	The Moya Typewriter	Hidalgo Moya	American / British	US Patent No. 752,792	Illustration accompanies patent.	Established the Moya typewriter factory in Garton Street, Leicester. The Moya Model 1 was a visible machine. Not commercially successful but went on to set up the Imperial Typewriter Company in 1908.			Typewriter Sketchbook, p.40-43; US Patent
323	1902	Densmore No. 4		American						Typewriter Collector.
324	1902	Fox								Typewriter Collector.
325	1902	Oliver No.3								Typewriter Collector.
326	1902	Pittsburg No.10								Typewriter Collector.
327	1902	Remington No. 10		American						Typewriter Collector.
328	1903	Polygraph	Polyphon Musikwerke	German			One of five only five known.		Serial Number 294.	Auction House Breker, 21 November 2009.
329	1903	Cantelo Typewriter	John Louis Cantelo	British	British Patent No. 12,037	Scryption Museum, Holland	Only model known to exist. Used to belong to typewriter collector Michael Adler.			
330	1903	Chicago No. 3		American						Typewriter Collector.
331	1903	Kanzler								Typewriter Collector.
332	1903	Stoewer Record								Typewriter Collector.
333	1903	Yetman								Typewriter Collector.
334	1904	Perfect Typewriter	Alexander Typewriter Co.	American			Only four models known.			Auction House Breker, 16 May 2009.
335	1904	McCool		American						Typewriter Collector.
336	1904	Mignon Model 2		French			Index typewriter - red.			Auction House Breker, 28 May 2011.
337	1905	Fay-Sholes		American						Typewriter Collector.
338	1904	Hammond No.12		American						Typewriter Collector.
339	1904	Hartford No.3								Typewriter Collector.
340	1904	Remington-Sholes Visible		American						Typewriter Collector.
341	1904	Secor		American						Typewriter Collector.
342	1904	Sholes Visible		American						Typewriter Collector.
343	1904	Stearns		American						Typewriter Collector.
344	1904	Williams No.5		American						Typewriter Collector.

Telegraphy Machines	Weakly-Referenced Machines	Index Writers	Music Writing Machines	Writing Machines for the Blind

PART II: FIGURES

LIST OF FIGURES

Chapter 0 Introduction

0.1 Friedrich Neitzsche's Malling Hansen Writing Sphere, purchased in 1881. From Eberwein 2005, front cover image.

0.2 Friedrich Nietzsche's verse on the typewriter, written on the typewriter. From The Goethe and Schiller Archive, Weimar, Germany, reproduced in Avnskog 2006.

0.3 Sholes, Glidden and Soulé Type-Writer Patent, US No. 79,265, dated 23 June 1868. Patented Case Files, 1836-1956; Records of the Patent and Trademark Office; Record Group 241; National Archives, ARC Identifier: 595503.

0.4 Prototype of the Sholes, Glidden and Soulé Type-Writer, 1868, in the National Museum of American History, Smithsonian Institution. Author's Image.

0.5 Sholes & Glidden Type-Writer, 1874. From Curator 2011.

0.6 Sholes & Glidden Type-Writer, 1873, Serial No. 1212. From Auction Team Breker 2009.

0.7 Prototype of Sholes & Glidden Type-Writer, from 23 June 1868 patent. From Smithsonian Institution, reproduced in Linoff 2000, 16.

0.8 Prototype of Sholes & Glidden Type-Writer, from 14 July 1868 patent. From Smithsonian Institution, reproduced in Current 1954, 15 (Fig. 4).

0.9 Sholes Experimental Model, c. 1874. From Auction Team Breker 2009.

0.10 Prototype of Sholes, Glidden and Soule machine, 1873. From Auction Team Breker 2009.

Chapter 1.0 Copying Hands, Copying Bodies

Copying Bodies (Sometimes Writing)

1.1 The three automata built by Vaucanson: Le Fluteur, Le Tambourinaire (Figure Playing on the Tabor and Pipe, also known as The Drummer), 1738; and Le Canard Digerateur, or The Defecating Duck, 1738. Reproduced from Metzner 1998, 161.

1.2 Reproduction of Antoine Coysevox's Le Berger flûteur, 1709, currently in the collection of the Louvre. Image by Gérard Ducher.

1.3 Front cover of Vaucanson's pamphlet on his automata, 1739.

1.4 Mechanism of Vaucanson's Le Fluteur, from the documents of Alfred Chapuis. Reproduced from MIRALab, University of Geneva's microsite on automata, http://research.miralab.ch/automata. AND The inner workings of Vaucanson's flute player. Adapted from illustration in *Jacques Vaucanson: Mechanicien de Genie* (1966), by Andre Doyon and Lucien Liaigre, p.81.

1.5 A nineteenth century illustration of the supposed cross-section of the mechanism within Le Canard Digerateur. From Chapuis and Gélis 1984, 151.

1.6 The Jaquet-Droz L'Écrivain of 1772. From Chapuis and Droz 1958, 293, Figure 361.

1.7 Mechanism of the Jaquet-Droz L'Écrivain. From Chapuis and Droz 1958, 294, Figure 362.

1.8 First text written by the Jaquet-Droz L'Écrivain during the mid-twentieth century. From Chapuis and Droz 1958, 295, Figure 365.

1.9 Second text written by the Jaquet-Droz L'Écrivain during the mid-twentieth century. From Chapuis and Droz 1958, 295, Figure 365.

1.10 Jaquet-Droz's Le Désignateur of 1774. From Chapuis and Droz 1958, 299, Figure 371.

1.11 Mechanism of the Jaquet-Droz Le Désignateur. From Chapuis and Droz 1958, 300, Figure 372.

1.12 Cupid and his butterfly; portrait of Louis XV and Marie Antoinette; a dog; and a portrait of Louis XV - all illustrations were drawn by Le Désignateur. From Chapuis and Droz 1958, 301, Figures 374 and 375.

1.13 Eighteenth century engravings that inspired the Jaquet-Droz family. From Chapuis and Droz 1958, 301, Figure 376 and 377.

1.14 Jaquet-Droz's La Muscienne, 1772-74.

1.15 Mechanism of the Jaquet-Droz La Musicienne. From the Museum of Art and History, Ville de Neuchatel. http://www.mahn.ch/collections-arts-appliques-automates

1.16 Close-up of La Musicienne's hands on the organised harpsichord's keyboard.

1.17 Henri Maillardet's Le Désignateur-Écrivain, both in its original male gender and as it's reconstructed female gender. From Chapuis and Droz 1958, 304, Figure 380.

1.18 Mechanism of Maillardet's Le Désignateur-Écrivain. Courtesy of Dug North.

1.19 One of two Cupid drawings by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 307, Figure 382.

1.20 The second of two Cupid drawings by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 307, Figure 383.

1.21 A drawing of a ship by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 307, Figure 384.

1.22 A drawing of a Chinese pagaoda by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 307, Figure 385.

1.23 Verse written and signed by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 306, Figure 381.

1.24 Verse written and signed by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 306, Figure 381.

1.25 Verse written and signed by Maillardet's Le Désignateur-Écrivain. From Chapuis and Droz 1958, 306, Figure 381.

Multiplying The Line: 'Facie-Traces' and Copying the Quill

1.26 Physiognotrace by John Isaac Hawkins, circa. 1803, drawn by Charles Peale. From Thomas Jefferson Papers, Library of Congress.

1.27 Holloway's Silhouette taking chair, 1792.

1.28 A sure and convenient Machine for Drawing Silhouettes, by Thomas Holloway, 1792.

1.29 Charles Augustus Schmalcalder's Profile Machine, diagram filed with patent application. UK Patent No. 3,000, granted 22 December 1806.

1.30 Gilles-Louis Chretien, Physionotrace, 1786.

1.31 Frontispiece to Raphael Pinion's Limomchia, 1750.

1.32 The Bigrapher by Erasmus Darwin, 1778. From Erasmus Darwin's Commonplace Book, 1776-1787, p.53. Dick and Iles 2004, Donor Ref.: 30/1099.

1.33 The Polygrapher by Erasmus Darwin. From Erasmus Darwin's Commonplace Book, 1776-1787, 78; Dick and Iles 2004, Donor Ref.: 30/1117.

1.34 James Watt's Copying Press by Watt & Co., 1779. From Auction Team Breker 2011.

1.35 An engraving of Graces awakening Cupid by William Wynne Ryland, 1776. From Science and Society Library, Object No. 1884-16 Pt4, Image Ref: 10421397.

1.36 A mechanical painting of Graces awakening Cupid, by Francis Eglinton, 1778-1781. From Science and Society Library, Object No. 1884-16 Pt3, Image Ref.: 10421400.

1.37 Marc Isambard Brunel's writing and drawing machine, The Polygraph, patented in the USA on 17 January 1799. Patent subsequently destroyed in the 1836 Patent Office fire.

1.38 John Isaac Hawkins' The Polygraph, 1803; modern reproduction made by Wilman Spawn, c.1974. From Library of Congress 2010.

1.39 Second view of John Isaac Hawkins' The Polygraph. From Library of Congress 2010.

1.40 The Manifold Writer by Ralph Wedgwood. From Rhodes and Streeter 1999.

1.41 Tom Wedgwood's Silver Pictures. From Review 2008.

Eighteenth Century Types: Hand and Machine Writing

1.42 Johann Fredrich Unger's Machina ad Sonos et Concentus, 1745. From Adler 1973, 49, Figure 30.

1.43 Rev. Creed's Melograph or Megalophone, 1745. From Adler 1973, 19, Figure 25.

1.44 Hohlfeld's Music Writing Machine, 1771. From Adler 1973, 19, Figure 26.

1.45 Benoit Gonod's Shorthand Writer, 1827. From Adler 1973, 58, Figure 40.

1.46 Xavier Projean's Plume Ktypographique, 1833. From Adler 1973, 62, Figure 44.

1.47 Circular Letter Index from Projean's Ktypographique. From Adler 1973, 62, Figure 45.

1.48 Guiseppe Ravizza's Cembalo Scrivano, 1837. From Jon Crel.

1.49 Diagram of Ravizza's Cembalo Scrivano, from 1855 Patent. From Adler 1973, 124, Figure 121.

1.50 Antoine Dujardin's Tachygraphe, 1838. From Adler 1973, 67, Figure 51.

1.51 Pierre Foucauld's Rapigraphe, 1839. From Adler 1973, 69, Figure 52.

1.52 An illustration of the Rapigraphe's Writing. From Adler 1973, 69, Figure 53.

1.53 Pierre Foucauld's Clavier Imprimeur, 1849. From Adler 1973, 69, Figure 78.

1.54 G.A. Hughes' Typograph, 1850. From Adler 1973, 69, Figure 2.

1.55 Letter 'Io No Passati' from the Countess da Fivizzano to her friend Pelegrino Turri, written on Turri's writing machine, 8 September 1809. Letter now missing from State Archives in Reggio Emilia. From Adler 1973, 165, Figure 144.

1.56 Friedrich von Knauss' Writing Machine, first version, 1753. From Knauss 1780.

1.57 Friedrich von Knauss' Writing Machine, second version, 1753-1750. From Knauss 1780.

1.58 Friedrich von Knauss' Writing Machine, third version, 1753-1760. From Knauss 1780.

1.59 Friedrich von Knauss' Writing Machine, fourth version, 1760. From Knauss 1780.

1.60 Detail of the mechanism of von Knaus' Writer. From Chapuis and Droz 1958, 292, Figure 360.

Chapter 2.0 Typing Bodies

Reading the Head, Writing the Body

2.1 Two zoological physiognomies showing man and monkey, and man and bull. From Lavater 1789, Volume 11, 154, plate I. Wellcome Images L0029482.

2.2 Zoological physiognomy comparing an owl with a man. From Lavater 1806-09. Wellcome Images L0025300.

2.3 Frontispiece of Lavater's *Essays on Physiognomy*, showing a facial outline with points of analysis, and a silhouette. From Lavater 1806-1809, volume I, frontispiece. Wellcome Images L0010023.

2.4 Outlines and designs of foreheads, showing their wrinkles and contours, c.1794, after Lavater. Wellcome Images V0009224ER.

2.5 Four depictions of mouths. From Lavater 1804, Volume III, Part II, p.317: Tabula CXXVIII. Wellcome Images L0021915.

2.6 Eye contours. From Lavater 1804, 287, Figure XXX.

2.7 Nose types. From Lavater 1881, 304, Figure XXXVIII.

2.8 Physiognomic illustration of the four temperaments. From Lavater 1797, plate IV. Wellcome Images L0013239.

2.9 Silhouettes of Mendelsohn, Spalding, Rochow and Nicolai, from Lavater's *Essays on Physiognomy*. From Lavater 1797, Vol. II, 187, Plate: Silhouettes. Wellcome Images Ref. No. L0031526.

2.10 Frontispiece to Spurzheim's *The Physiognomical System of Drs. Gall and Spurzheim* (London, 1815). From van Wyhe 2002.

2.11 Frontispiece to Johann Casper Spurzheim's *Outlines of Phrenology; being also a manual of reference for the marked busts*, 1827. From van Wyhe 2002.

2.12 A servants' employment agency where prospective employees are having their heads phrenologically examined as to their suitabililty. Coloured etching by W. Taylor. Wellcome Images V0011121.

2.13 The phrenologist Gall examines the heads of two young society people. Coloured line engraving, published by Martinet, Paris. Wellcome Images V0011699.

Measuring Body Space: Anthropometrics and Bertillonage

2.14 The Grounds of the Royal Horticultural Society. From Elliott 2004.

2.15 Map of The International Health Exhibition, 1884. From International Health Exhibition 1884.

2.16 The (First) Anthropometric Laboratory at the International Health Exhibition. From Tredoux 2009.

2.17 The anthropometric form of William K. Russell from the Anthropometric Laboratory. From UCL Special Collections 1884.

2.18 A device to measure swiftness of blow, used in Galton's Anthropometric Laboratory, based on Exner's apparatus. From Galton 1885, plate XIII, Figure 5.

2.19 Professor Holmgreen's Test for Colour Blindness adapted to Galton's anthropometric purpose. From Galton 1885, plate XII, Figure 2.

2.20 A Hand Dynamometer, one of Galton's Anthropometric tools of the Anthropometric Laboratory. From UCL Galton Collection Image Ref.: 038.

2.21 Francis Galton's Second Anthropometric Laboratory, South Kensington Museum, 1891-95. From Pearson 1924 Plate LI.

2.22 Identification Card of Eugene Durand by Alphonse Bertillon, Card One: Front. From UCL Special Collections 1888.

2.23 Identification Card of Eugene Durand by Alphonse Bertillon, Card One: Back. From UCL Special Collections 1888.

2.24 Identification Card of Georges Desire Henri Pimpeterre by Alphonse Bertillon, Card Two: Front. From UCL Special Collections 1888.

2.25 Identification Card of Georges Desire Henri Pimpeterre by Alphonse Bertillon, Card Two: Back. From UCL Special Collections 1888.

2.26 Identification Card of Georges Desire Henri Pimpeterre by Alphonse Bertillon, Card Three: Front. From UCL Special Collections 1888..

2.27 Identification Card of Georges Desire Henri Pimpeterre by Alphonse Bertillon, Card Three: Back. From UCL Special Collections 1888.

2.28 Filing section card. From UCL Special Collections 1888.

2.29 Details of the filing cards. From UCL Special Collections 1888.

Photographic Ordering: Composites, Mugshots, and Graphs

2.30 Experiment to determine by electric and myographic methods simultaneously the frequency of the movements of the wing and the relative durection of its elevation and depression, 1869. From Marey 1901; reproduced from Braun 1992, 34.

2.31 Buzzard flying with double tambour used to signal movements described by the wing tip, 1869. From Marey 1901; reproduced from Braun 1992, 34.

2.32 Marey's harness to register the trajectory of the wing in free flight, 1870. From Marey 1901; reproduced from Braun 1992, 36.

2.33 The apparatus in use, 1870. From Marey 1901; reproduced from Braun 1992, 36.

2.34 Examples of chronography, from experiments on the flight of birds, 1870. From *Notice sur les titres et travaux scientifiques du Mr. Marey;* reproduced from Braun 1992, 37.

2.35 The sphygmograph, attached to the wrist. From Marey 1878; reproduced from Dagognet 1987, 49, Figure 11a.

2.36 The cardiograph, by Marey and Chauveau. From Marey 1895; reproduced from Dagognet 1987, 55, Figure 14.

2.37 Polygraph for registering various internal movements of the human body (heart, lungs and so on). From Marey 1895; reproduced from Dagognet 1987, 57, Figure 15.

2.38 Fusil Photographique, view of the interior, exterior and plate holder, 1882. *La Nature*, April 1882; reproduced from Braun 1992, 58.

2.39 First single-shot photographic gun (Fusil a munition). Reproduced from Braun 1992, 60.

2.40 Physiological Station, 1883, at the Parc des Princes, Paris. From Braun 1992, 72.

2.41 Interior view of the main building at the Physioglogical Station. From Braun 1992, 72.

2.42 Man dressed in white, model for Marey's initial photographic experiments, 1883, From Braun 1992, 74.

2.43 Georges Demeny, Marey's assistant and model, dressed in black, 1884. From Braun 1992, 45.

2.44 Chronophotographic image of a black suited individual walking. From Braun 1992, 95.

2.45 Chronophotographic image of a black suited individual performing a jump from a height with knees bent to cushion the shock. From Braun 1992, 100.

2.46 Chronophotographic image of model Morin, in a black suit, running up an inclined plane. From Braun 1992, 106.

2.47 Photographs of criminals convicted of violent crimes and the composite images produced from them, showing features common among convicts. From Galton 1883.

2.48 Illustration of Galton's composite photography equipment. From Galton 1881, 141.

2.49 Two figures showing the diagrams by which Galton used to align faces for the creation of composite photographs. From Galton 1885, 243; and Galton 1878, 97.

2.50 Grid used by Galton to make composite photographs. From Galton 1878.

2.51 Composite portraits of the Jewish type. From Galton 1885.

2.52 Illustration showing the register mark technqiue used by Galton to make composite photographs. From Galton 1878.

2.53 The kaleidoscope of the body. Ellis 1894; reproduced from Green 1984, 11, Figure 6.

2.54 Composites and co-composite from Specimens of Composite Portraiture. From Galton 1883.

2.55 Positive image of Letter G by Galton. From Galton 1900.

2.56 Negative image of Letter G by Galton. From Galton 1900.

2.57 Positive image of Letter F by Galton. From Galton 1900.

2.58 Positive image of F and positive image of G by Galton. From Galton 1900.

2.59 Letter F changed into G by Galton. From Galton 1900.

2.60 Positive image of Letter G by Galton. From Galton 1900.

2.61 Photographic studio at Department of Judicial Identity. From ARTstor Collection: University of California, San Diego.

2.62 Tableau synoptic des traits physionomiques: pour servir a l'étude du "portrait parlé" [Summary Chart of Physical Traits for the Study of the "Portrait Parlé"] by Alphonse Bertillon. From Metropolitan Museum, Accession No. 2009.16.

2.63 "Types d'oreille, 1893" by Alphonse Bertillon. From Pheline's L'image Accusatrice, Cahiers de la photographie, Paris, ACCP, 1985.

2.64 Class on description at the Service de l'identite judiciaire in Paris, instituted by Bertillon in 1895. From ARTstor: University of California, San Diego.

Writing States: The Late Nineteenth Century Reconstruction of Babel

2.65 Bertillon's analysis of the handwriting from the Dreyfus Affair's bourdereau. From Rollet 2010.

2.66 Bertillon's analytical chart of the handwriting from the Dreyfus Affair's bourdereau. From Rollet 2010.

2.67 Dr Frazer's analysis of the handwriting of George Washington's signature using composite photography. From Galton 1900.

Chapter 3.0 Dexterous Fingers, Sinister Bodies

Constructing the female stereotype

3.1 Haeckel's illustration of the stem-tree of plants, protists and animals in *Generelle Morpholigie der Organismen*, 1866. From Richards 2008, 139.

3.2 Haeckel's drawing of the tree of life, showing the stem-tree of lineal progenitors of man, in *Anthropogenie*, 1874. From Richards 2008, 141.

3.3 Tree of Indo-German languages, in August Schleicher's *Die Darwinsche Theorie under die Sprachwissenschaft*, 1863. From Richards 2008, 245.

Superfluous women and their accomplishments

3.4 Oliver T. Eddy's Printing Machine, 1850. From Eddy 1850.

3.5 Dr Samuel Francis' Literary Piano, 1857. From Adler 1997, 27.

3.6 Dr Samuel Francis' Literary Piano, 1857, in the collection of the Smithsonian Institution, National Museum No. 180,600. From Adler 1997, 29.

Mechanised Women: Telegraphists and Typewriters 1832-1905

3.7 Royal E. House's Letter-Printing Telegraph Machine, 1846. From House n.d..

3.8 David Hughes' Letter-Printing Telegraph Machine, 1845. Built by Siemens and Halske in Saint Petersburg, Russian, ca. 1900. From Auction Team Breker 2011.

Chapter 4.0 Spirit (Writing) Media

An Explosion of Machines

4.1 The Caligraph, 1881. From Polt 1996.

4.2 Front cover of Mrs Longley's Remington TypeWriter Guide and Mrs Longley's Caligraph Guide. From Longley 1882 and Longley 1882.

4.3 The Hall Type Writer (New York), 1881. From Robert 2001.

4.4 Hammonia, 1882. From Ditts and Cincotta 1998.
4.5 The Columbia Index, 1885. From Pedrali 2011.
4.6 The Sun Linear Indexer, 1885-1890. From Auction Team Breker 2009.
4.7 The Morris, 1885. From Howard 2008.
4.8 The People's Typewriter, 1885. From Auction Team Breker 2008.
4.9 The Herrington, 1886. From Messenger 2011.
4.10 The World, 1886. From Pedrali 2011.
4.11 The Ingersoll, 1886. From Casillo 2003.
4.12 Advert for the Ingersoll, 1891. From Curator 2011.
4.13 The Odell Typewriter, 1889-1907. From Howard 2008.
4.14 The Velograph, 1887. From Robert 2001.
4.15 The Crown, 1888. From Auction House Breker, 2009.
4.16 The Victor, 1889. From Ditts and Cincotta 1998.
4.17 The Merritt, 1889. From Pedrali 2011.
4.18 The American Index Writer, 1889. From Pedrali 2011.
4.19 The Simplex, 1891. From Howard 2008.
4.20 The Wilson One Dollar, 1891. From Robert 2001.
4.21 Advert for the Wilson One Dollar. From Project Gutenberg.
4.22 The Edland, 1892. From Howard 2008.
4.23 The Graphic, 1895. From Auction Team Breker 2011.
4.24 The Champion, 1895. From Curator 2011.
4.25 The Pocket Typewriter Polyglotte, 1897. From Auction Team Breker 2011.
4.26 The Pocket Typewriter Polyglotte, 1897. From Messenger 2011.
4.27 The Hammond Typewriter, 1884. From Howard 2008.
4.28 John Pratt's Ptereotype, 1868. From Adler 1973, 108.
4.29 Wooden Ouija Board. From Orlando 1996.
4.30 The Planchette. From Webmaster 2011.
4.31 Bond's Ouija or Egyptian luck-board, from US Patent No. 446,054. From Bond 1891.
4.32 The Boston Planchette. From Braude 1989.
4.33 Isaac T. Pease's 'Ghost Telegraph Dial'. From Hare 1855, Plate 1.
4.34 Robert Hare's Spiritoscope. From Hare 1855, Plate 1.
4.35 Robert Hare's Second Spiritoscope. From Hare 1855, Plate 2.
4.36 Hudson Tuttle's Dial Planchette or The Psychograph, 1880s. From Orlando 1996.

An Explosion of Spirit(ualism) and the Evident Ghost

4.37 A Poster for Robertson's Phantasmagoria, staged in the Couvent des Capucines, c.1799. From Warner 2006, 146.
4.38 Table Tipping. From Braude 1989.

Investigative Practices and Legitimate Knowledges

4.39 Illustration of the Davenport Brothers and their spirit cabinet. From Taylor 2008.

4.40 Photograph of the Davenport Brothers and their spirit cabinet. From Blackmore 2010.

4.41 '1879 Programme for the Egyptian Hall, England's Home of Mystery, showing illustrations of all four Maskelyne automata, as well as illustrations of their anti-spiritualism tricks including levitation of both body and objects, and decapitation. From British Library Ephemera Collection.

4.42 Advertisement for the Egyptian Hall, showing an illustration of Maskelyne's Levitation Illusion. From Jenness 1967.

4.43 Maskelyne with his whist-playing automaton, Psycho. From Egyptian Hall 1877.

4.44 Maskelyne with his drawing automaton, Zoe. From Hoggett 2011.

4.45 Zoe Showcard, showing sketches drawn by the automation. From Jenness 1967.

4.46 1882 Programme for the Egptian Hall, England's Home of Mystery, carrying advertisements on the back page for Maskelyne's Mechanical Cashier and for The Maskelyne Typewriter. From Jenness 1967.

The Magical, The Spiritual, The Fantastical and The Typewriter

4.47 Maskelyne Typewriter No.3, 1893. From Auction House Breker, 2009.

4.48 Thomas Edison Electric Pen, 1875. From Burns 2010.

Chapter 5.0 Write Me, Read Me

5.1 Demeny pronoucing 'Je vous aime", with images placed in the disc to be run through his phonoscope, 1891. From Braun 1992, 178.

5.2 Crary's Writing Glove. From Adler 1973, 38.

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