What is an internet?
Norbert Wiener and the society of control

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April 2019

Submitted in partial fulfilment of the requirements of the
Centre for Research in Modern European Philosophy (CRMEP),
Kingston University, for the award of the degree
of Doctor of Philosophy in Philosophy

Typeset with LaTeX using the Cardo font in GNU Emacs.

It isn't June yet, but computer networks are bustin' out all over.
– J. C. R Licklider, 10 May 1967

Abstract

By means of a philosophical reading of Norbert Wiener, founder of cybernetics, this thesis attempts to derive anew the concepts of internet and control. It develops upon Wiener's position that every age is reflected by a certain machine, arguing that the internet is that which does so today. Grounded by a critical historiography of the relation between the Cold War and the internet's invention in 1969 by the 'network' of J. C. R. Licklider, it argues for an agonistic concept of internet derived from Wiener's disjunctive reading of figures including Claude Bernard, Walter Cannon, Benoît Mandelbrot, John von Neumann and above all, his Neo-Kantian inflected reading of Leibniz. It offers a counter-theory of the society of control to those grounded by Spinoza's ethology, notably that of Michael Hardt and Toni Negri, and attempts to establish a single conceptual vocabulary for depicting the possible modes of conflict through which an internet is determined.

Acknowledgements

My first acknowledgement must go to my teachers at the Centre for Research in Modern European Philosophy (CRMEP) – Professors Éric Alliez, Étienne Balibar, Howard Caygill, Peter Hallward, Catherine Malabou, Peter Osborne and Stella Sandford – each of whose classes, conversations and companionships have been far in excess of conventional pedagogical generosity. Whiling eight whole years (!) among such a crowd has been fundamentally transformational for me; my gratitude to you each will carry. This thesis implicitly presents a certain personal formation with respect to the Centre such that it could not, clichés aside, have been written elsewhere: *de facto*, it is 'of' CRMEP inasmuch as its ultimate interlocutors are 'of' a certain other research laboratory with a four letter acronym.

Howard, my 'principle supervisor', teacher and friend, you 'left the door open' for me in more ways than I can thank. Alongside countless iridescent insights you gifted me the question at the masthead of this thesis, you always encouraged me to trust and follow my intuition, to explore uncharted waters with a cunning I would not have otherwise owned.

This project was funded by the fortuitously-named Techne doctoral scholarship scheme of the Arts and Humanities Research Council, who I wish to thank, also for supporting my visit (a pilgrimage of sorts) to MIT, where this project began to come together. There I was greatly assisted by the diligent librarians of the MIT Archive and I met the generous Slava Gerovitch, a right of passage for any researcher of cybernetics; to them I extend my sincere gratitude.

For several years I have had the pleasure of editing and coding for the journal *Radical Philosophy*, an affiliation through which I learned innumerable skills that fed into the production of this thesis. In the editorial collective I learned the meaning of intellectual activism and camaraderie proper. Together with *RP*'s editors from CRMEP past and present – Stella, Peter and Peter – I would like to also especially thank David Cunningham and Matthew Charles for their encouragement and unremitting conviction that I would indeed complete this thesis, despite the untoward coincidence of my writing-up year with the relaunch of the journal.

For the care, dedication, for no small degree of patience, for the honour of their kinship, *emphatically thank you* to: Franziska Aigener, Irma Allen, Karin Bage,

Felicity Suvarna Bowden, Pauline van Mourik Broekman, Robert Buckman, Mercedes Bunz, Nick Cassin, Matthew Charles, Krystyna Colburn, Annabel Cohen, Florence Crawley, Joshua Dart, Eve Dickson, Alex Emanuel, Joseph Finlay, Alex Fletcher, Kristján Guðjónsson, Nanna Hlín Halldórsdóttir, Bjarki Halldórsson, Katie Hastings, Lara Howe, Tal Janner-Klausner, Mijael Jiménez, Charlotte Jobrack, Christopher Jones-Thompson, Niall Kennedy, Helga Kjartansdóttir, Masa Kosugi, Marie Louise Krogh, Janina Anja Lange, Mallika Leuzinger, Jessie Levene, Noa Levin, Edwin Mak, Lara, Susan and John Mancinelli, Jess McArdle, Navid Nouri, Albert Olafare, Simon Pickstone, Hemani Patel, Giorgio Salmistraro, Isy Schulz, Jenny Simm, Francesca Ter-Berg, Georgios Tsagdis, Sigríður Tulinius, Snorri Páll Jónsson Úlfhildarson, Willow Verkerk, Daniel Weizmann, Kim West, Alicia White and Sonia Zafer-Smith.

Thanks to the staff at Black Bird Bakery Peckham Rye and Dillons on Gower Street for allowing me to practically take up residency in your cafés during my writing-up period and for cheering me to the finishing line. Especially Laura, Gabriel, Prima, Theia, Sarah, Ella, Lettice, Vicky, Laurence, Sean and Christine.

And special thank yous must go to: Lucie Kim-Chi Mercier for the conversation that got this project underway and the many which followed. Isabell Dahms for the numerous times you stopped me giving up. Alex Sassmannshausen for introducing me to Free Software, for supporting my development in coding and for all those creative discussions. Daniel Kaldor for actually handing me a computer at the eleventh hour which no longer hissed at the fingers that fed it. Iain Campbell and Matthew Phull for reading over drafts of this thesis and providing generous feedback. And mum, dad, Adam, Georgina, Nigel, Philippe *and of course you too* Billy for all being there with your affection.

Finally, Caz, for proofreading, for being my rock, for breaking through those overcast days with your presence and your joy.

For my parents, Sally and Benyamin Nemenyi

Contents

Introduction

'I wish to turn my time over to William Burroughs, *who is here today* and I can never waste a minute talking while we could be hearing *Burroughs speak!*'[1] So stepped aside from his joint-panel Michel Foucault, star guest of Semiotext(e)'s Schizo-Culture colloquium at Columbia University in 1975, whose *Surveiller et punir* was already being rushed through translation. The audience included not only Jean-François Lyotard, Kathy Acker, R. D. Laing, John Rajchman, Arthur Danto and John Cage, but a specialist on Proust and Sacher-Masoch named Gilles Deleuze who would invoke the concept of a 'rhizome',[2] and Félix Guattari, an 'unknown quantity' to Americans but one whose encounter with the event's organiser Sylvère Lotringer proved the 'trigger' for its occasion – another Guattari *effect*.[3] I begin my thesis in the hall of this milestone event in the Anglophone reception – or rather *production* – of 'Post-'68 French Philosophy', and specifically at the moment when Foucault gave priority to an American contemporary's paper which, Deleuze says, construed his concept of a disciplinary *dispositif* to be of the *past*: succeeded by a *new* apparatus, a 'new monster' named 'control'.[4]

Reading his paper 'The Limits of Control', Burroughs announces: 'a cultural revolution of unprecedented dimensions has taken place in America during the last thirty years, and since America is now the model for the rest of the Western world, this revolution is worldwide.'[5] Three decades of Cold War. Three decades of American Empire. Three decades of cybernetics.

The guiding problematic of America's 'revolution', Burroughs says, has been how to exercise control by such covert means as to assure the continuity of power and its interests. 'Look at America. Who actually *controls* this country? It is very difficult to say. Certainly the very wealthy are one of the most powerful control groups. … However, it would not be to their advantage to set up or attempt to set up an overtly

1. Sylvère Lotringer and David Morris, eds., *Schizo-Culture: The Event, 1975* (Los Angeles: Semiotext(e), 2013), 23, 165.
2. Sylvère Lotringer, ed., *Schizo-Culture: The Book, 1978* (Los Angeles: Semiotext(e), 2013), 157.
3. Lotringer and Morris, *Schizo-Culture: The Event, 1975*, 11, 15.
4. Gilles Deleuze, 'What is a dispositif?,' in *Michel Foucault, Philosopher*, ed. François Ewald, trans. Tim Armstrong (London: Harveser Wheatsheaf, 1992), 164; Gilles Deleuze, *Negotiations*, trans. Martin Joughin (New York: Columbia University Press, 1997), 174, 178.
5. William Burroughs, 'The Limits of Control,' in Lotringer, *Schizo-Culture: The Book, 1978*, 42.

fascist government.'[6] Since today the use of overt force would trigger resistance or revolution, since overt force would 'soon encounter the *limits of control*' (as the paper's title suggests), the exercise of control principally occurs by covert *communication*. 'Words are still the principle instruments of control.'[7]

The figure through which Burroughs depicts this dynamic is pertinent. He portrays a lifeboat of ten persons, two of whom intend to murder their cohorts upon nearing land, their motivations unclear. They need the others to row, to exercise their labours, in order to reach their destination. So the pair must exercise caution. They must convince the others of their cooperative enterprise and mutual goals, since if their intentions were known they would be resisted and, being outnumbered, defeated. So they avoid direct confrontation by developing 'balance' in their techniques of 'psychological control', constantly improving and refining their method. Learning. And what role do the cunning pair perform on their vessel? 'They have the compass', Burroughs tells us, 'and they are contributing their navigational skills.'[8] In other words, they are they those the Greeks called *kybernetes*, the helmsmen who would govern the course of a ship. They are those who, after Norbert Wiener, one calls *cybernetician*s.[9]

Extending this analogy to the ship of State, Burroughs asks: who is in control of the States of the world? Who is quietly steering their course? To impose total control through overt fascism would be to beckon their demise, resistance; and anyway, fascism implies military expansion but today 'there is no longer anyplace to expand to – after hundreds of years, colonialism is a thing of the past.'[10] The cybernetic model of power-by-word, control-by-communication, has become global.

Through this thesis I will turn to Deleuze's famous 'reading' of Burroughs' argument occasionally, if at arms length, and not only for prioritising American writers. I am wary of his arguments from 'Postscript on Control Societies' (1990) and 'Control and Becoming' (1990)[11] because, like *What is Philosophy?* (1991), these texts engage

6. Burroughs, 'The Limits of Control,' 41.
7. Ibid., 38.
8. Ibid., 40.
9. In *Cybernetics* Wiener also accredits Walter Rosenblueth for coining the term from κυβερνήτης in the summer of 1947. In *The Human Use of Human Beings*, he takes the credit for himself while acknowledging that, unbeknown to him at the time, the transliteration had already been made by André-Marie Ampère and a 'Polish scientist', albeit with distinct significations. Norbert Wiener, *Cybernetics: or Control and Communication in the Animal and the Machine*, 2nd ed. (Cambridge, MA: MIT Press, 1961), 12–13; Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society*, 2nd ed. (London: Sphere Books, 1954), 17; André-Marie Ampère, *Essai sur la philosophie des sciences: Ou exposition analytique d'une classification naturelle de toutes les connaissances humaines*, vol. 2 (Paris: Bachelier, Libraire-Éditeur, 1843), 141–43.
10. Burroughs, 'The Limits of Control,' 41.
11. Both collected in *Negotiations*.

a nexus of problematics and critiques which extend far beyond their immediate arguments and deeply into Deleuze's *oeuvre*, especially his works with Guattari, such that to write anything of them which might escape superficiality would have been beyond the remit of my question. For now I shall just say that if, following Burroughs, Deleuze argues that power cannot extend through corralling new territory, if it operates by means of 'continuous control and instant communication', then there may be 'a generalised crisis in relation to all the environments of enclosure', a 'crisis of the institutions' which constitutes the heterogeneous spaces of the disciplinary society, for a new society of control.

Deleuze believed Foucault agreed with this, and perhaps evidence is to be found in a reflection Foucault made after Burroughs' paper. At the next morning's round-table discussion with R. D. Laing, Howie Harp and Judy Clark on prisons and psychiatry, Foucault raises having just encountered 'new techniques of torture' in the prisons of military-dictatorship Brazil – where, 'of course, arrested also means tortured'.[12] These techniques, Foucault says, have been 'developed and perfected to a considerable extent with the help of American technicians.' He proceeds to describe the administration of torture involving a computer network. A torturer receives questions for a prisoner on a computer terminal, sent, presumably, by a superior elsewhere. The torturer puts the questions before the prisoner and applies torture 'until the answer is obtained'. Any answer is then 'fed back into the computer to verify whether it is consistent with information already obtained.' Until the prisoner's answer is accepted by the computer terminal – which is not to say reflective of any truth – the feedback loop of questions, torture and answers continues. Not only is the ultimate source of power in this *new* networked technique hidden, but it could be anywhere on the planet.

Where does this leave the prison? Could this be a description of an end to the nineteenth century site of enclosure? Of the society of control?

I wish to show how control over an internet operates. The nature of the secrecy which Burroughs and Foucault depict with respect to power. Why these are essential to cybernetics and its age. Why the internet does not tend towards a harmony of humankind. Never did, never could. What the specific nature of strategy in this new network is. This thesis derives from my sense of confusion as to the extent of the surveillance that Edward Snowden revealed. Why does the State acquire and apparently need such intricate detail about people's lives today? What does it mean for the possibility of resistance that it does? It derives from a sense that the last major progressive movement to seriously challenge the state of things globally since the

12. R. D. Laing et al., 'Roundtable on Prisons and Psychiatry,' in Lotringer and Morris, *Schizo-Culture: The Event, 1975*, 172–173.

collapse of Communism, which I consider to be the Alter-globalisation movement, thought of itself in the image of the internet. That its major theorists, Michael Hardt and Toni Negri, who based their works on an interpretation of Deleuze's 'Postscript on Control Societies', were acutely mistaken in their understanding of the nature of power in networks. The movement faltered well over a decade ago and since then such fascist powers such as Trump and Brexit have become, on the whole, more adept at organising according to the logic of the internet. This is an attempt to understand what an internet is in order to think what it would mean to assert the control through which society is today formed. It attempts to present a new, fundamentally agonistic reading of the internet and its society, attempting to show that such agonism is essential to cybernetics.

Rhetorically, its framing follows the productive encounters of several American writers with (especially though not only) Francophones, while ceding priority, as Foucault did, to the former. It is to generally stress Burroughs' Schizo-Culture paper 'The Limits of Control' over Deleuze's 'Postscript on Control Societies', Walter Cannon's broadened theory of homeostasis over Claude Bernard's, von Neumann and Oskar Morgenstern's theory of games over Benoît Mandelbrot and Lévi-Strauss'. Most of all, Norbert Wiener's encounter with the 'intellectual ancestor' of cybernetics itself, G. W. Leibniz[13] (who wrote mostly in French). I hold that a theory of the society of control is best found in America because that is where it was invented and deployed, the hypocentre of the 'information bomb' which Einstein wrote of (from America) in the 1950s, and Paul Virilio after him.[14] The effects are now global, of course, but among American writers one finds its genealogy, nucleus and, as in Burroughs' paper, the most direct and immediate reports of its shocks. I wish to stick to the sources as far as I can.

What is with this strange formulation, 'What is *an* internet?' From Wiener's critical reading of Leibniz, I argue the need to distinguish *the* Internet from *an* internet. *The Internet* is taken to be the virtual medium of control, that which globally establishes the possibility of cybernetic power. Like Alexander Galloway and Eugene Thacker I argue that 'there is not one Internet but many internets',[15] but only in the sense that the Internet is an infinite virtuality, equivalent to the 'universe' in Leibniz's writings, whereas *an internet* is an actual instantiation of networks whose heterogeneity is not the result of different protocols, but networks with competing and conflicting purposes. It corresponds to Leibniz's 'world'. A *network* pertains to a unity of purpose, a monad. For example, the network of engineers, laboratories, military offices, corporations, Cold War concerns and cybernetic problematics whose unity of purpose established

13. Wiener, *HUHBb*, 18.
14. Paul Virilio, *The Information Bomb*, trans. Chris Turner (London & New York: Verso, 2000), 112.
15. Alexander R. Galloway and Eugene Thacker, 'Protocol, Control, and Networks,' *Grey Room*, 2004, 10.

the ARPANET. Networks overlap and transpose, they seek to determine one another's behaviour for their own strategic ends in a logic related to game theory, but they do so in one language, one protocol, which is diffracted not by the problems of translation but by cryptology and the active secreting of information, in the double sense of its release and its hiding. If a monad with a greater degree of self-conscious perception 'causes' another monad in Leibniz's system, according to Wiener control is exerted by the network which possesses a greater degree of information over its opponent than it does of them. A limited grammar of offensive and defensive tactics is afforded, each relating to the protection of one's own information and extraction of it from one's opponent. In this thesis I attempt to explicate this logic and prove it to be necessary in Wiener's writings.

Chapter outline

The first chapter is a short response to the question, 'Who invented the internet?' This is to concretely situate my object within its history, to reflect on and challenge the boundary-work that has taken place by internet historians, and to deploy from the outset the concepts of network and internet that shall be developed through the course of the thesis. I focus on Joseph Carl Robnett Licklider, who from the Sputnik debacle in 1957 on through the 1960s developed the idea of computer networking to the point of its realisation as the ARPANET, through the coordination of the Pentagon-based office he founded. I consider Licklider to name the corporate-military-academic network of institutions, ideologies, investments and problematics who produced the early internet. I describe how Wiener and cybernetics more generally had had a formative effect on Licklider in the 1940s, and how Licklider instantiated cybernetics in his project for a 'man-computer symbiosis',[16] whose fruit by the end of the 1960s was the interactive, graphical, internetworked digital computer we know today. I then continue to discuss the place in his thought of RAND researcher Paul Baran's problematic of a computer network that could survive nuclear war in order to launch a Second Strike. Although a popular point of reference amongst philosophers, I show how a succession of historical accounts have argued Baran's relevance to be a myth, and that, by implication, the internet was from its outset a civilian machine of peace. By reference to direct historical sources, I challenge this boundary work and show that Licklider was indeed concerned with such problematics. My intention is not to argue that the internet must be understood as martial rather than civil, but that this distinction between peace and war has never held ground with respect to the internet. I end by arguing that Baran's encrypted military network points to an alternative means of understanding the networking of networks based on conflicting

16. J. C. R. Licklider, *Man-Computer Symbiosis*, Cambridge: MIT Archive, MC499, box 6, November 20–21, 1958.

epistemologies rather than, as conventionally, interconnecting topologies.

The second chapter begins by discussing the parallelism that exists between Wiener and Deleuze's tripartite periodisation of modernity according to the three apparatuses: the clock, the steam engine, and the cybernetic machine. I argue that the internet is the specific machine appropriate to the third age, which is to say, the contemporary. I attempt to draw a parallel between the concepts which allow both Wiener and Deleuze to relate a society and a machine. Parallel to the *dispositif* for Deleuze, I argue, for Wiener is the theological notion of a divine image in which man is created, which he secularises into the concept of an 'operative image'. This concept provides Wiener with a means to argue that machines can be made according to the essence of nature, as it is understood in its age. I argue that two relevant but contradictory models of such operative images are to be found in the age of the clock – Hobbes and Leibniz – and that a kind of monstrous fusion of the two is depicted by Reinhardt Koselleck in the early Masons. Through developing a reading of Wiener's discourse on Karel Čapek's robots and his agreement with the idea of cybernetics constituting a 'prodigious Leviathan', I attempt to show that such a monster is what Wiener has in mind by the contemporary operative image. I conclude by proposing that Wiener puts forward an alternative test to the Turing Test in which life is construed to be what, because it has the capacity to learn, can play a game of strategy against its creator.

This leads onto the third chapter in which the concept of learning is addressed. This relates to the nineteenth century operative image, since, as I argue, the cybernetic concept of learning derives from the notion of self-regulation in an organism, and that this in turn is based on the image of the steam engine. I begin by showing that both Claude Bernard and Alfred Russel Wallace both consciously likened their respective theories of individual (ontogenetic) and species (phylogenetic) adaptation on the steam engine, although Bernard's doing so has been forgotten. I trace the genealogy of the term homeostasis, invented by Walter Cannon to name Bernard's theories, emphasising that Cannon personally played a formative role in the development of cybernetics. I argue that the term homeostasis carries implications which transgress Cannon's intention of it, but are pertinent and intimated by Bernard. Through Jean-Pierre Vernant, Nicole Loraux and Giorgio Agamben I argue that the *stasis* of the *homoioi*, the civil war of the equals, names the essential dynamism of the political in ancient Greek democracy. But I show that Cannon ignores this and instead reads homeostasis to imply a process of universal learning, or wisdom, which he then projects from the body of the individual organism to the body politic. I discuss Georges Canguilhem's critique of the wisdom of the social body, especially because it has been seen to be an implicit critique of Wiener. Before attempting to respond, I turn to the critique of the notion of homeostasis itself by Hans Jonas and the second-order cyberneticians, Humberto Maturana, Francisco Varela and N.

Katherine Hayles, and attempt a defence. Finally, I attempt to show that Wiener agrees with Canguilhem's critique of Cannon's universally benevolent homeostasis, and instead reads homeostasis in terms of conflict. This means that the homeostasis and learning that takes place on the internet is always partial, never for the wisdom of the whole social body, always for the benefit of the network concerned. This returns to the conclusion of the second chapter that the cybernetic operative image concerns a strategic plane, a game of strategy.

The short fourth chapter attempts to think through what Wiener means by a 'game'. I argue that he posed two concepts of game theory, one of which being represented by Benoît Mandelbrot's analogy of information theory and Ferdinand de Saussure's famous image of the chessboard. The other, a critical adoption of John von Neumann and Oskar Morgenstern's game theory. Both of these two theories of games are considered by Wiener to accord to a distinct type of opponent. Structuralist chess is the game of ideal science and of a passive 'Augustinian' opponent who stands for the natural encoding of truth, whose game is in the act of decoding. Von Neumann and Morgenstern's game stands for a 'Manichean' opponent who actively seeks to win through confusing their opponent, spying on them and concealing themselves. This is the game of war, politics, law, business and the reality of science today – in other words, the entire domain of human society as reflected by the internet. I argue that this distinction can be deepened and woven back through the discussion of the operative image through a reading of Leibniz's own game theory and, via Michel Serres, the problem of translation as distinct from the problem of conflict.

The fifth chapter is the longest. It is an attempt to formulate a detailed and productive reading of Wiener's relation to Leibniz, the 'patron saint for cybernetics'. It begins with Wiener's early education and publications on Leibniz, arguing that Wiener was formatively influenced by a Neo-Kantian account of the Leibnizian concept of apperception. I argue that this concept is to be found in Wiener and Arturo Rosenblueth's foundational papers of cybernetics, offering a reading of them which attempts to establish their correspondence to an important paper by Leibniz. I argue that in Wiener and Rosenblueth's papers the philosophical concept of 'information' is established, not by name but through the term 'determination', and that this aligns to the Leibnizian (or rather Neo-Kantian) concept of 'apperception'. This concept is more philosophically interesting than 'information' because it has a triple meaning which accounts for the purposivity, knowledge and power of a substance, and it does not imply Cartesian dualism. Wiener considers substances to *actually* intercommunicate, whereas Leibniz construed them to only do so by *analogy*. This difference changes the entire structure of the monadology from a hierarchy to a 'heterarchy', I argue, and this, a field of conflict over determination in its triple sense. I attempt to distinguish the various possible modalities of determination in a conflict, before moving on to RAND theorists John Arquilla and David Ronfeldt's

Chapter 1

'Who invented the internet?'

Why bother asking the question, 'who invented the internet?', if not to perpetuate a mythology of geniuses and 'great men' (specifically, *men*) and to deny the countless others on the stage and off who participated in its development?

There is a certain temporality at stake, of speeds and the constitution of virtual futures. Wiener believed that the Royal Society's denial of Leibniz's role in inventing the calculus, and their jingoistic championing of Newton, retarded Anglophone sciences for centuries while they refused to consider Leibniz's superior, and now standard, notation system.[1] With respect to Alfred Russel Wallace's widely neglected invention of the theory of evolution in his 'Ternate Essay' read by Charles Darwin a good year prior to his publication of *On the Origin of Species* (1859), Gregory Bateson claimed it 'nonsense to say that it does not matter which individual man acted as the nucleus for the change': Wallace's paper presented at analogy between the mechanism of evolution and the self-regulating steam engine that, had it met adequate recognition, could have precipitated the beginnings of cybernetics a hundred years earlier.[2] '[Which] individual man acted as the nucleus for the change', Bateson stressed, '*is precisely [what] makes history unpredictable into the future*.'[3]

The question of who invented the internet matters because its answer establishes the bounds of legitimate discourse, and thereby furnishes certain problematics and concepts found within its grounds. It is to lift the veil of nature shrouding discursive boundaries and find the intentional labours beneath.[4] One could say that the

1. Norbert Wiener, *Prolegomena to Theology*, Cambridge: MIT Archives MC22, box 33B, folder 881, 1961; On the topic of the 'Leibniz-Newton calculus controversy' see, Alfred Rupert Hall, *Philosophers at War: The Quarrel Between Newton and Leibniz* (Cambridge: Cambridge University Press, 2012).

2. Gregory Bateson, *Mind and Nature: A Necessary Unity* (New York: E. P. Dutton, 1979), 43. Bateson seems to imply an untenable continuity of the thermodynamic and cybernetic age in this argument, but its principle still holds. See also, Wiener, *Cybernetics*, 36; George Beccaloni, *Alfred Russel Wallace and Natural Selection: the Real Story*, January 2013; Alfred Russel Wallace, 'On the Tendency of Varieties to Depart Indefinitely from the Original Type,' *Journal of the Proceedings of the Linnean Society: Zoology* 3, no. 9 (August 20, 1858): 53–62.

3. Bateson, *Mind and Nature*, 43.

4. I draw this from the sociological concept of 'boundary work', see Thomas F. Gieryn, 'Boundaries

legitimacy of a discourse is irrelevant. With respect to the internet, the otherwise penetrating Leibniz scholar Justin E. H. Smith has recently done just that, proposing a 'deep history of the Internet' composed of 'sympathetic snails', fungal networks and scrawls posted in the Wailing Wall to God.[5] But doing so he completely misses the specificity of the internet in our time, its dynamics, and moreover, as I shall argue, the fundamental importance of his very own Leibniz to it.

Questioning the boundaries of legitimate discourses through their inventors matter also because their boundaries have already been drawn, such that as Wiener and Bateson lamented, because (and perhaps especially) they already effect the diffusion of ideas whether noticed or not, and so it matters to assess whether these realities are fictitious or not.

By naming an inventor, it is not that I wish to specify an author for copyright purposes, but rather name *a network* of concepts, institutions, ideologies, theories, desires, interests, problematics and so on which weave through and connect a multiplicity of other networks. To take a negative example: a brilliant German engineer named Konrad Zuse single-handedly built what might be considered the first Turing-Complete digital computer in 1941, but I take him to be just a curiosity from the perspective of the history of the computing because, long unknown to the West, he does not name the network through which the digital computer was invented.[6] John von Neumann, on the other hand, links the first American computer through to Los Alamos and the hydrogen bomb, the Universities of Pennsylvania and Princeton, game theory, Wiener, cybernetics and the Macy Meetings, neurophysiology, artificial intelligence, cryptology, capitalism and anti-Communism, the State of Israel, the entire military-industrial-academic network through which the digital computer was invented. Hence the bitter controversy over whether it is right that the fundamental architecture of the digital computer should have ever been named the 'Von Neumann Architecture' is essentially a liberal one, concerned with the failure to accrue commodity value by certain individuals.[7] To refer to von Neumann as the 'inventor' of the computer is to name not him as an individual, but the entire network apparatus which his is the signifier.

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of Science,' in *Handbook of Science and Technology Studies* (London: Sage, 1999), 393–443 and Ronald R. Kline, *The Cybernetics Moment: Or Why We Call Our Age the Information Age* (Baltimore: John Hopkins University Press, 2015), 104.

5. Justin E. Smith, 'The Internet of Snails,' *Cabinet Magazine*, no. 58 (2015): 29–37; Smith is the author of, Justin E. Smith, *Divine Machines: Leibniz and the Sciences of Life* (Princeton: Princeton, 2011).

6. Marguerite Zientara, *The History of Computing* (Framingham, MA: Computerworld Communications, 1981), 35–48.

7. Namely, J. Presper Eckert and John W. Mauchly. See, Presper J. Eckert and Nancy Stern, *An Interview with J. Presper Eckert OH 13*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, October 28, 1977), 33–55; Bill Mauchly et al., 'Who Gets Credit for the Computer?: An Exchange,' *The New York Review of Books*, September 27, 2012, Alexander 5th Randall and J. Presper Eckert, 'Q & A: A lost interview with ENIAC co-inventor J. Presper Eckert (1989),' February 14, 2006, accessed, https://www.computerworld.com/article/2561813/computer-hardware/q-a--a-lost-interview-with-eniac-co-inventor-j--presper-eckert.html.

1.1 J. C. R. Licklider's artificial-homeostasis

On 29 October 1969 the Internet came to being, with a message sent from the University of California to the Augmentation Research Center at Stanford Research Institute. This ARPANET, named initially after the Pentagon-based (Defense) Advanced Research Project Agency (D/ARPA), established following the Sputnik debacle in 1957, was the 'invention' (according to the concept above) of J. C. R. Licklider.

It is pivotal for my argument to advance at the outset that Licklider was a cybernetician. He names the network through which the internet as the 'ultimate cybernetic machine', in the words of MIT historian Slava Gerovitch, could be realised.[8] Licklider was an MIT acoustics psychologist who relinquished Skinner's behaviourism for cybernetics after attending weekly 'circles' organised by Wiener in the 1940s, becoming, in his own words, 'a faithful adherent … who was always hanging onto [cybernetics]'.[9] He would participate in the 1950 Macy Meeting,[10] and in the first Annual Symposium of the American Society for Cybernetics (ASC) in October 1967, alongside cybernetic luminaries Margaret Mead, Warren McCulloch, Yehoshua Bar-Hillel and Heinz von Foerster, its organiser.[11] At the (CIA initiated)[12] ASC Symposium, Licklider presented on his hallmark topic, 'The Interaction of Men and Machines'. Today such a title may sound banal, but Licklider's vision of an 'interaction', 'symbiosis' or 'partnership' of humans and digital computers is not a mere preemption of the Human-computer interaction (HCI) research field; it concerns the creation of a *cybernetic* closed-loop feedback system: 'The inputs to the man are derived from the system, and his outputs are fed into the system. The man is thus "imbedded" in a system'.[13] Though the jargon 'cybernetically-extend organism' or 'cyborg' would be invented for such man-machine systems in the years to follow,[14] Licklider was following Wiener's cybernetic research into 'artificial homeostasis' such as automatic insulin dispensers, hearing gloves for the deaf and responsive prosthetic limbs.[15] Licklider's cybernetic concern was specifically on the artificial homeostasis of mental capacities a 'man-computer symbiosis' or, as his follower Douglas Engelbart would formulate it, 'augmenting

8. Slava Gerovitch, 'The Cybernetics Scare and the Origins of the Internet,' *Baltic Worlds* II, no. 1 (2009): 32-38.

9. J. C. R. Licklider, William Asprey, and Arthur Norberg, *An Interview with J. C. R. Licklider (OH 150)*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, October 28, 1988), 13.

10. Kline, *The Cybernetics Moment*, 48–49.

11. The American Society for Cybernetics, *Program For The First Annual Symposium*, Cambridge: MIT Archive, MC499, box 8, October 26, 1967.

12. Kline, *The Cybernetics Moment*, 185–90.

13. J. C. R. Licklider, *Notes on Psychology of Man-Machine Systems*, Cambridge: MIT Archive, MC499, box 4, October 10, 1957.

14. Kline, *The Cybernetics Moment*, 170–78.

15. Wiener uses the term 'artificial homeostasis' in Norbert Wiener, 'The Concept of Homeostasis in Medecine,' *Transactions and Studies of the College of Physicians of Philadelphia*, 20 1953, 87–93; For commentary see, Kline, *The Cybernetics Moment*, 170; On cybernetic and non-cybernetic prosthesis, see Wiener, *Cybernetics*, 25–26.

the human intellect'.[16] This would be the telos of the internet. How to improve the regulatory capacities of cognitive systems. Enthused by the prospect of realising this 'man-computer symbiosis', in 1962 ARPA created a department in the Pentagon for Licklider to pursue his cybernetic vision, the Information Processing Techniques Office (IPTO), directing its vast funds through corporate and academic research and development laboratories.[17]

From the outset of the 1960s under Licklider's directorship (and then others when he parted for a hiatus at IBM in 1964) the IPTO would transform the digital computer from the solitary monolithic calculator that it had been from von Neumann's invention into the graphical, interactive, windowed, mouse-driven, multi-purpose, hyperlinked and *internetworked* computer that we know today.[18] With ARPA's vast budget and Licklider's cybernetic vision of artificial homeostasis, the IPTO orchestrated the production of the ARPANET, the internet in its first instantiation. This was Licklider's concept. It was Licklider who proposed to create networks of 'thinking centers' connected by communication lines in 1960,[19] who addressed his colleagues as 'Members and Affiliates of the Intergalactic Computer Network' in 1963,[20] Licklider who conceived of a 'procognitive system' which would allow for 'man's interaction with the body of recorded knowledge' by means of an 'intermedium' of connected computers,[21] Licklider who started the IPTO's experiments in computer networking.[22] By 1967 his proselytising of networked computers was beginning to catch on, with various experiments at universities, banks, militaries and hospitals. In May he would note in a memorandum, 'It isn't June yet, but computer networks are bustin' out all over.'[23] But his vision was not of distinct networks, to each institution its own. He wanted to create an integrated network of networks, embedding the entire socius in a computer network system. As he wrote in what is effectively the manifesto of his internet (published in 1968 no less) with his successor at the IPTO, Robert Taylor, who directed the ARPANET's production until its launch:[24]

16. Doug Engelbart, *Augmenting Human Intellect: A Conceptual Framework*, technical report AFOSR-3223 (Stanford Research Institute, October 1962).

17. M. Mitchell Waldrop, *The Dream Machine: J. C. R. Licklider and the Revolution That Made Computing Personal* (New York: Penguin, 2002), 196–201.

18. The standard history of the IPTO is, Arthur L. Norberg and Judy E. O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: John Hopkins University Press, 1996); The related study on the IPTO's role in creating the internet is, Janet Abbate, *Inventing the Internet* (Cambridge, MA: MIT Press, 1999).

19. J. C. R. Licklider, 'Man-Computer Symbiosis (1960),' *IRE Transactions on Human Factors in Electronics* HFE-1 (March 1960): 7.

20. J. C. R Licklider, *Memorandum For Members and Affiliates of the Intergalactic Computer Network*, April 1963.

21. J. C. R. Licklider, *Libraries of the Future* (Cambridge, MA: The MIT Press, 1965), 1, 6, 93.

22. Norberg and O'Neill, *Transforming Computer Technology*, 159.

23. J. C. R. Licklider, *Memorandum: Burgeoning of Activity in the Field of Computer Networks*, Cambridge: MIT Archive, MC499, box 3, May 10, 1967; The same day he wrote, J. C. R. Licklider, *Memorandum: Classification of Computer Networks*, Cambridge: MIT Archive, MC499, box 3, May 10, 1967.

24. Katie Hafner and Matthew Lyon, *Where Wizards Stay Up Late: The Origins of the Internet* (New

> Today the on-line communities are separated from one another functionally as well as geographically. Each member can look only to the processing, storage and software capability of the facility upon which his community is centred. But now the move is on to interconnect the separate communities and thereby transform them into, let us call it, a supercommunity. The hope is that interconnection will make available to all the members of all the communities the programs and data resources of the entire supercommunity.[25]

Licklider envisaged an internet in which all domains of human life would be embedded. Taylor, who went on to continue 'Licklider's vision' at Xerox PARC, would later say of today's digital computer, '[Licklider] is really the father of it all.'[26]

Now, the major significance of Licklider's 'vision' in the invention of the internet is uncontroversial. As internet historians Christos J. P. Moschovitis *et al.* argue, 'Even a cursory look at the writings of Joseph C. R. "Lick" Licklider makes it clear: Licklider, a psychologist and a computer scientist, conceived the essential vision for the Internet.'[27] Neither is it especially controversial to assert the deep influence of cybernetics upon Licklider, although the implications of this have yet to be thought through as I hope to do here.[28]

What *has* been defined by successive historians as outside the bounds of legitimate discourse is to emphasise that military imperatives informed 'Licklider's' invention. For example, internet historian John Naughton considers Licklider to have been driven by a 'utopianism' which lead him to pursue a 'demilitarisation' of ARPA.[29] Such arguments deny the relevance of the profound influence that the North American Semi-Automatic Ground Environment (SAGE) missile defence network of the 1950s played on Licklider, and that he invented the concept of a 'man-computer system' while seeking to perfect the SAGE system;[30] that he considered military simulation

York: Simon & Schuster, 1996), 12.

25. J. C. R. Licklider and Robert W. Taylor, 'The Computer as a Communication Device,' *Science and Technology*, April 1968, 31–32.

26. 'I don't think that Ivan [Sutherland, Licklider's immediate successor at the IPTO], nor I, nor anyone who's been in that DARPA position since has had the vision that Licklider had. … I think most of the significant advances in computer technology, especially in the systems part of computer science over the years – including the work that my group did at Xerox PARC where we built the first distributed personal computer system – were simply extrapolations of Licklider's vision. They were not really new visions of their own. So he's really the father of it all.' Robert Taylor and William Asprey, *An Interview with Robert Taylor (OH 154)*, Oral history interviews (Minneapolis: Charles Babbage Institute, February 28, 1989), 9.

27. Christos J. P. Moschovitis et al., *History of the Internet: A Chrononology, 1843 to the Present* (Santa Barbara, CA: ABC-CLIO, 1999), 37; See also, Abbate, *Inventing the Internet*, 43; Vinton G. Cerf et al., 'A Brief History of the Internet,' The Internet Society, 2003, accessed April 13, 2015, http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet; Leonard Kleinrock, 'An Early History of the Internet,' *IEEE Communications Magazine* 48, no. 8 (August 2010): 29; M. Mitchell Waldrop, 'No, This Man Invented The Internet,' *Forbes*, November 2000, John Naughton, *A Brief History of the Future: The Origins of the Internet* (London: Phoenix, 2000), 81.

28. Thomas Rid, *Rise of the Machines: The Lost History of Cybernetics* (London: Scribe, 2016), 143; Naughton, *A Brief History of the Future*, 66-67; Gerovitch, 'The Cybernetics Scare and the Origins of the Internet.'

29. See, Naughton, *A Brief History of the Future*, 66-67.

30. J. C. R. Licklider, *The Truly SAGE System, or Toward a Man-Machine System For Thinking*, Cam-

systems necessary for the development of civilian ones;[31] that he continued research on military networks throughout the 1960s, for example in *Memorandum: An Air Force Role in Counter-Insurgency Warfare* (1962) when he poses the need to invent 'distributed' communications systems (expressively not 'centralised') that would be suitable for soldiers in Vietnam to autonomously call for airstrikes, reinforcements and aid drops, or a 1969 paper where he commands expertise over the contemporary state of missile defence systems;[32] and that his original realisation of a 'man-computer symbiosis' itself would be a 'man-computer thinking system' that would be 'centred upon a large-scale computer and *simulation* system'.[33] Alliez and Lazzarato characterise Licklider truly when they write, 'the Cold War led to experimentation on the planetary scale in a global epistemology of the soviet enemy based on *simulation*.'[34] But more than ignoring the extent to which military imperatives informed Licklider's worldview, historians have effectuated their boundary work separating the invention of the internet from the presses of war by resolutely denying that the internet was designed *to survive nuclear attack so that a 'second strike' could be ordered*.

Although numerous philosophers have taken this as given – for example Donna Haraway,[35] Paul Virilio,[36] Michael Hardt and Toni Negri,[37] Alexander Galloway and Eugene Thacker,[38] and Howard Caygill[39] – it has in fact been decisively written out of the official historical narrative of the internet by the most authoritative and popular histories of the internet, including and especially the Internet Society's own history which, given its authors, has claim to being almost autobiographical.[40] What

bridge: MIT Archive, MC499, box 6, August 20, 1957; Licklider, *Man-Computer Symbiosis*.

31. J. C. R. Licklider, *Theoretical Aspects of Research on Man-Machine Systems*, Cambridge: MIT Archive, MC499, box 6, 1957.

32. J. C. R. Licklider, *Memorandum: An Air Force Role in Counter-Insurgency Warfare*, Cambridge: MIT Archive, MC499, April 26, 1962; J. C. R. Licklider, 'Understimates and Overexpectations,' in *An Evaluation of the Decision to Deploy an Antiballistic Missile System*, with an introduction by Senator Edward M. Kennedy (New York, Evanston and London: Harper & Row, 1969), 118–129.

33. Licklider, *Man-Computer Symbiosis*, 6–7. Emphasis added. See also Licklider, 'Man-Computer Symbiosis (1960),' 7; The military need for simulation is repeated throughout Licklider's writings, making referring to them individually somewhat redundant, but we shall just mention the title of his little-known 1964 essay J. C. R. Licklider, 'Artificial Intelligence, Military Intelligence, and Command and Control,' in *Military Information Systems: The Design of Computer-Aided Systems for Command*, ed. Edward Bennett, James Degan, and Joseph Spiegel (New York: Frederick A. Praeger, 1964), 118–133.

34. Éric Alliez and Maurizio Lazzarato, *Wars and Capital*, trans. Ames Hodges (South Pasadena, CA: semiotext(e), 2016), 231–32.

35. Donna J. Haraway, *Modest_Witness@Second_Millennium.FemaleMan©_Meets_OncoMouse™: Feminism and Technoscience* (New York & London: Routledge, 1997), 4–5.

36. Virilio, *The Information Bomb*, 109.

37. Michael Hardt and Antonio Negri, *Empire* (Cambridge, MA: Harvard University Press, 2000), 299.

38. Galloway and Thacker, 'Protocol, Control, and Networks,' 19; Alexander R. Galloway and Eugene Thacker, *The Exploit: A Theory of Networks* (Minneapolis & London: University of Minnesota Press, 2007), 53.

39. Howard Caygill, *On Resistance: A Philosophy of Defiance* (London: Bloomsbury, 2013), 205.

40. The venerable list of co-authors attributed to the Internet Society's history include Lawrence G. Roberts, project manager of the ARPANET's initial development; Robert Kahn and Vinton G. Cerf, founders of the Internet Society itself and creators of the TCP/IP gateway protocol which allows

this boundary work has attempted to achieve has been to separate civil and martial domains from the history of the internet and depict it lily-white at birth, a machine which may have later been hijacked by extrinsic forces but was born for academic and industrial peace *not war*. Through Norbert Wiener's cybernetics I wish to argue that, on an ontological level, the boundary between war and peace makes no sense with respect to the internet. And though I would be in good company to simply ignore the official historians, I see it as unavoidable to first show this to be the case on a historical level too.

1.2 Paul Baran's Survivability

I write 'Licklider' to name the network through which the internet was invented. This network incorporates cybernetics, but a cybernetics which the official historians tell us has no connection to war aside from a certain one-way parasitical relation to military funding bodies. On a conceptual level the official historians attempt to divorce the necessity of the relation between cybernetics and warfare, *specifically by targeting the legitimacy of including Paul Baran within Licklider's invention*. I shall attempt to deny this through historical counter-argumentation in order to free this thesis up for conceptual discourse.

Perhaps Katie Hafner and Matthew Lyon played the first move in depicting the internet as born to simply '[embody] the most peaceful intentions – to link computers at scientific laboratories across the country so that researchers might share computer resources.'[41] The first to attack the 'grim myth' that 'ARPANET had been built to protect national security in the face of a nuclear attack.'[42] Certainly Naughton would rehearse the same argument.[43] But the Internet Society's own history is the most authoritative on the matter:

> It was from a RAND study that the false rumor started claiming that the ARPANET was somehow related to building a network resistant to nuclear war. This was never true of the ARPANET, only the unrelated RAND study on secure voice considered nuclear war. However, the later work on Internetting did emphasize robustness and survivability, including the capability to withstand losses of large portions of the underlying networks.[44]

These three sentences are all it takes the Internet Society to brush aside the 'false rumor' that Paul Baran and his concern to build a 'highly survivable' communications system capable of withstanding thermonuclear war are within Licklider's network.

different network architectures to interact with one another; David D. Clark who lead efforts to bring TCP/IP beyond mainframes to desktop computers; and Leonard Kleinrock, under whose instruction the ARPANET's first message was sent in October 1969. Cerf et al., 'A Brief History of the Internet.'

41. Hafner and Lyon, *Where Wizards Stay Up Late*, 10.
42. Ibid.
43. Naughton, *A Brief History of the Future*, xi, 83.
44. Cerf et al., 'A Brief History of the Internet.'

Although I shall be engaging with Baran at greater length later in this thesis, let us briefly recap what it is their boundary work seeks to exclude before attempting to contest it.

In *On Distributed Communications* (1964) Baran published through the RAND Corporation his designs for a 'highly survivable system' for transmitting communication that would be capable of withstanding thermonuclear war.[45] His concept proposed three major technical innovations which, in combination, decisively broke with the entire *analogue* communication orthodoxy of the day.

By means of analogue communication networks – a product of the nineteenth century – if a person wished to make a phone call, their telephony device would transduce their voice into a continuous analogue signal stretched all the way to the recipient's device, which would transduce the signal back into voice. The greater the distance of communication, the greater the noise in the call. This analogue signal said nothing of its destination, so in order to reach the receiver, the caller would need to dial into a central telephone exchange where either a switchboard operator, typically a woman, would manually program ('switch') a connection between sender and receiver through a tangle of plugs and sockets, or else this would happen by automatic machines. Because of the need for such industrially-organised switchboards, the analogue network was centralised like the spokes of a wheel to a hub. Baran realised that these central hubs constituted critical weaknesses to the national communication infrastructure, given that, after Sputnik, they had become vulnerable to intercontinental ballistic attack. This upended the rules of the game of Mutually Assured Destruction, whereby neither superpower would first attack the other with nuclear weapons since to do so would be to guarantee a counterattack. If only one well-chosen hub was brought down, the President would be unable to call the appropriate commander to launch a 'second strike'. Hence Baran was driven to design a 'survivable' communications network not by 'intellectual curiosity,' nor 'the desire to write papers,' nor in 'response to a work statement,' but by 'a most dangerous situation that existed' – that of 'the world's superpowers … stumbling into World War III.'[46]

Following Sputnik, Baran embarked on devising a network that could sustain mass destruction but still transmit the President's (and other military) communications. If all the 'intelligence' of the analogue network resided in the women who manually plugged the analogue switchboard, Baran's was a *digital* network where all this intelligence would reside in the network infrastructure itself. This would involve a series of related inventions. Instead of humans, computers would operate the

45. Paul Baran, *On Distributed Communications* (Sant Monica, CA: RAND Corporation, 1964), vol. I, 16.

46. Paul Baran and Judy O'Neill, *An Interview with Paul Baran OH 182* (University of Minnesota, Minneapolis: Charles Babbage Institute, March 1990), 13–14.

switchboard 'nodes' automatically. Instead of one massive message which would block the entire channel during their transmission by a modulator, messages would be broken into discreet, digitally-encoded, standard-sized 'blocks' 'like a fruit salad'[47] before transmission, each carrying the address of its desired recipient as well as its sender, so that the recipient could confirm reception of the block by their demodulator, and the sender could repeat their transmission of a block until being notified of their success.[48] The nodes would ideally be connected to one another as a 'distributed' grid or mesh rather than 'centralised' network (the third category of a 'decentralised' network represents a compromise between the two), with channels to several other nodes so that if one were attacked, or simply overwhelmed with traffic, the node would send the message automatically to a different intermediary node until it finally reached its destination, where it would be reconstructed with the other blocks of the same original message.[49] In this sense of it automatically 'switching' its paths depending on its state at any one moment, the network would 'learn' and 'adapt to the environment' as though it were intelligent.[50] Baran would give this system the clunky name of 'Distributed Adaptive Message Block Networking', or by way of a folksy American shortcut, 'Hot-Potato Routing', since 'rather than hold the "hot potato," the node tosses the message to its neighbor, who will now try to get rid of the message.'[51] With sufficient channels linking each node of this distributed network (Baran calculated three each) it would be extremely difficult to undermine the system as a whole through bombing it. It would hence be 'survivable' or, in more recent parlance, 'resilient'. Its resilience is determined by its capacity for learning.

Despite campaigning throughout the first half of the 1960s for the construction of his system, Baran decided in 1966 to '[pull] the plug on the whole baby', having failed to overcome the resistance of a deeply analogue-minded orthodoxy in the telephone and military establishment who could have implemented it, and being wary of half-baked implementations that would have undermined its reputation.[52] Yet almost precisely the same architecture would be employed two-years later in another American military-funded network, the ARPANET, which Baran did *not* work on. Referring to 'blocks' as 'packets' – the term used by the UK National Physics Laboratory's (NPL) Donald Davies' for an equivalent architecture – 'packet switching' remains the basis of the internet architecture today. The question has therefore since persisted: was the internet invented in order to withstand nuclear strike? Is it first and foremost a military network? Is the network of Baran, with RAND, nuclear weapons

47. Baran, *On Distributed Communications*, vol. IX, 8.
48. Ibid., vol. I, 20–23.
49. Ibid., vol. I, 1–3.
50. Ibid., vol. I, 31.
51. Ibid., vol. I, 25, 26–28.
52. Paul Baran and Stewart Brand, 'Founding Father,' *Wired* 9, no. 03 (March 2001); Baran and O'Neill, *An Interview with Paul Baran OH 182*, 34.

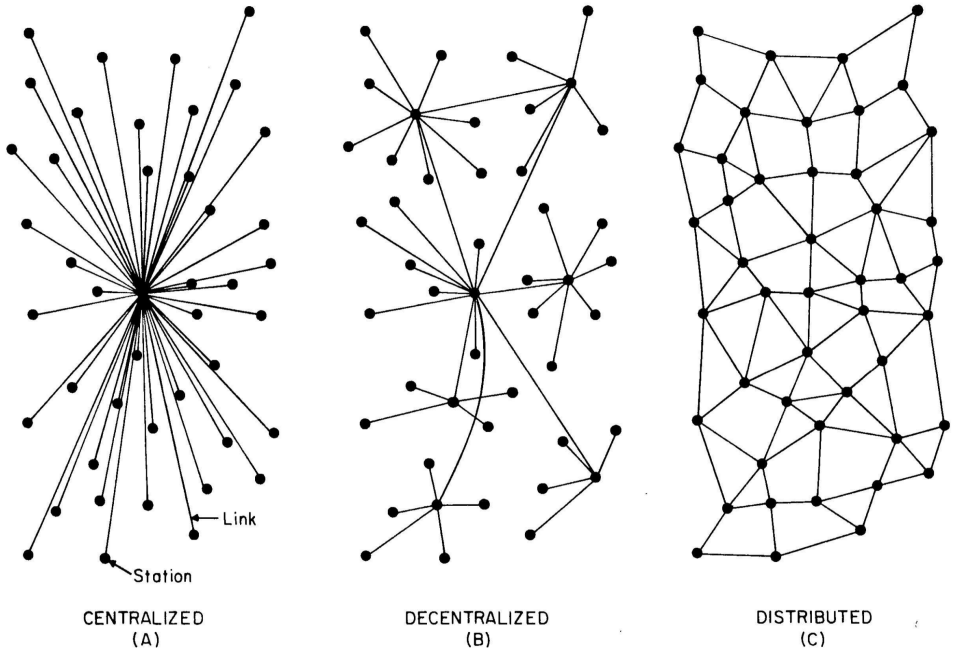

Figure 1.1: The three network topologies. Baran, *On Distributed Communications*, vol. I, 2.

and game theory, that which invented the internet?

This is precisely the narrative which the official historians sought to overturn, although in doing so, they introduced a counter-myth of their own: that the internet never was invented for military purposes. This is to say that Baran's problematic does *not* align with the network of Licklider.

In the acerbic sentences quoted above, the Internet Society presents four argument against Baran's being essential to the ARPANET, which I shall now contest.

The first concerns the pointed description of Baran's project as being merely 'a paper' – the Internet Society having written, 'The RAND group had written *a paper* on packet switching networks.'[53] 'Paper' seems a denigrating description for a work whose fourteen volumes filled well over eight-hundred pages, far more than any single study ever produced by the ARPANET team.[54] Perhaps they considered it theoretically slight compared to their own project? Yet they agree that it already envisaged

53. Cerf et al., 'A Brief History of the Internet,' emphasis added.

54. It is commonly said that *On Distributed Communications* totalled eleven volumes. This is a mistake. Baran has described how further volumes had been classified upon publication. This included a volume on the system's 'weak spots', another on the 'real world geographical layout of the network' (authored by a Rose Hirshfield), and the last on secure telephony. Paul Baran and David Hochfelder, *Paul Baran: An Interview Conducted by David Hochfelder, IEEE History Center*, October 1999.

its central conceptual innovations, including the concepts of packet switching and network distribution. I can think of only one plausible explanation for this description. That by referring to it as merely 'a paper' they regarded it as merely a written, theoretical proposition, in the sense that Baran was not able produce an actual network from it. That *On Distributed Communications* lacked the level of detail required for the actual hardware and software components to function. This was the view of Robert Kahn, co-creator of the TCP/IP gateway.[55]

If so, this seems a rather unfair charge to make given that Baran's having been prevented from realising his network because of military and industrial politics stopped him from confronting the technical details Kahn considers him to have neglected and that like Kahn he would have only realised it as part of a team. The argument that his work is as distinct from the ARPANET as a sketch is to a working machine seems more of an Aristophanic prejudice than a fair representation of events.

The second problem with the Internet Society's exclusion of Baran from the genealogy of the internet is that by depicting his study as concerning 'secure *voice*' communications, they portray it to be a network designed for just one specialised task, and a task that failed to transcend the existing communication network's purpose at that. Kahn argues this too, though in a slightly weaker vein.[56] By contrast the ARPANET/Internet was designed to be a multi-purpose system, with any transmittable application in mind.

Yet this position is contradicted already in the introductory volume of *On Distributed Communications* where there seems to be no major emphasis on voice communications at all. Baran writes that the network would 'handle *all* forms of digital data *including* "real-time" voice.'[57] In the non-classified volume dedicated to voice transmission, Baran describes his network as 'suitable for *both* digital voice and digital data applications.'[58] Baran described his network as a 'universal interface' by which 'signals from data, teletypewriters, facsimile would all be digitised.'[59] This proved, Baran recalled in interview, to be 'another hard concept for older telecommunications experts to swallow without audibly choking.'[60] So too apparently for the Internet Society, who misrepresents the scope of Baran's network, leaving the impression not

55. 'In some sense, it all started with the work that Paul Baran did at RAND. … Paul was and is a very brilliant fellow … But Paul was not a technologist at the time in terms of actually trying to build something. … I believe he had no detailed notion of how it might really be implemented, except somehow electronics might one day be cheap enough to do the task.' Robert E. Kahn and Judy O'Neill, *An Interview with Robert E. Kahn OH 192*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, April 1990), 17–18.

56. 'I think Paul [Baran] was focusing mainly on survivable voice communications, which was a big Air Force problem at the time. Not too much on computers, although he did understand you could link computers that way. … He didn't seem to be thinking about the computer and the computer communication problem as much as he was voice communications.' ibid., 18.

57. Baran, *On Distributed Communications*, vol. I, v. Emphasis added.

58. Ibid., vol. VIII, v. Emphasis added.

59. Baran and O'Neill, *An Interview with Paul Baran OH 182*, 18.

60. Ibid.

only that theirs was the first network intended to create a 'universal interface', but the equally false notion that Baran's network was distinguishable from theirs on the basis of its limited applicability.

Third, the Internet Society's *Brief History of the Internet*, published in 1997, claims that its coauthor Leonard Kleinrock's research pre-existed Baran's and that the invention of packet switching by Kleinrock, Baran and Donald Davies 'had all proceeded in parallel without any of the researchers knowing about the other work.'[61] Yet Janet Abbate has argued strongly that Baran's ideas were indeed widely disseminated amongst communication technology researchers at the time.[62] Were the inventors of the ARPANET truly ignorant of Baran's research? In a prior interview from 1990 Kleinrock contradicts this position by saying, 'I was well aware of [Baran's] results. In fact I quoted his results in my own [1962] dissertation [on network queuing].'[63] The co-inventors of the TCP/IP protocol, Vint Cerf and Bob Kahn, claim to have had no recollection of encountering Baran's work until well into the development of the ARPANET in 1968.[64] But Baran, with the evidence of diary entries, recalled 'many, many discussions with the folks at ARPA, starting in the very early '60s', and attested how 'People say they'd never heard of me at the time, yet I'd chaired a session with them in it.'[65] He added that by the time of the ARPANET's development, 'The information about packet switching was not a surprise, not new,' and that Lawrence Roberts, who lead the engineering of the ARPANET and co-authored the Internet Society's *Brief History*, had cited Baran's RAND reports as having 'either caused or [having been] a factor in specifying a fully distributed approach.'[66] It could be added that the designer of the ARPANET's topological infrastructure, Howard Frank, recalled that he saw his work as 'the follow-on to the work that Paul Baran did.'[67] And David Walden, who managed the team which built the ARPANET's nodes, recalled,

> [Baran] was in the community. [His work] was known. I can't remember the first day I heard Paul Baran's name. But I'd be surprised if I didn't know it in those days. Because some of the issues that came up were issues like: 'Do we have to do, [and] worry about some of the stuff Paul Baran is worrying about. What is the RFP [Request For Proposals] going to say? Are we really concerned about reliability in the face of nuclear attack?', and that kind of stuff.[68]

61. Cerf et al., 'A Brief History of the Internet.'
62. Abbate, *Inventing the Internet*, 21, 39–39.
63. Leonard Kleinrock and Judy O'Neill, *An Interview with Leonard Kleinrock OH 190*, Oral history interviews (Los Angeles, CA: Charles Babbage Institute, April 1990), 7.
64. Vinton G. Cerf and Judy O'Neill, *An Interview with Vinton Cerf OH 191*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, April 1990), p. 12; Kahn and O'Neill, *An Interview with Robert E. Kahn OH 192*, pp. 18-19.
65. Baran and Brand, 'Founding Father,' 1.
66. Baran and O'Neill, *An Interview with Paul Baran OH 182*, 39.
67. Howard Frank and Judy O'Neill, *An Interview with Howard Frank OH 188*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, March 1990), 10.
68. David Walden and Judy O'Neill, *An Interview with David Walden OH 181*, Oral history interviews (University of Minnesota, Minneapolis: Charles Babbage Institute, February 1990), 8–9.

Finally, one finds the concluding volume of *On Distributed Communications* in Licklider's archive at MIT.

The fourth problem with the Internet Society's boundary work concerns the emphasis on Baran's network being 'secure'. This holds truth to it in that unlike the ARPANET, cryptographic security was an essential dimension of Baran's network, which was designed to be a 'universal high-secrecy system, made up of a hierarchy of less-secure sub-systems.'[69] For the ARPANET, cryptological concerns would be an afterthought. By emphasising that Baran's work concerned *secure* communications, the Internet Society really imply that Baran's network is distinguished from theirs for being a military network, where secrecy was privileged, whereas theirs was an civilian one, in which no secrecy was needed.

This is an unfair criticism to make because until the revolution of public-key cryptography in the mid-1970s,[70] the possibility of secure communications over a network open to non-military networks would have vastly increased the difficulty and costs of implementing the ARPANET. Furthermore, the cryptographic ideals which Baran proposes match what much of the internet would become (though not their details, in lieu of public-key cryptography). It is not that the messages in his network were to be secret from the public and open to all the military, but that they would be doubly encrypted internally from sender-to-recipient (end-to-end) and node-to-node (link-by-link) such that messages could be transmitted on a need-to-know basis which would avert eavesdropping.[71] This is the kind of cryptographical system that the internet became, for everything from shopping websites to instant messaging apps. Baran was simply ahead of the curve. He had a complex notion of security which included, the Internet Society forgets, the open publication of *most* – not all – volumes of *On Distributed Communications*.

Hence, the Internet Society's four reasons for expelling Baran from the history of the internet – his lack of clarity, his specialised focus on voice transmission, that he was not known to the ARPANET community and that his was a secret network – are all untenable. What this means is that the claim that the internet never did have anything to do with 'with supporting or surviving war' and that it 'embodied the most peaceful intentions' is simply itself a myth.[72] As such Baran's survivable network thesis becomes a legitimate telos of the invention of the internet. When Licklider himself discusses 'survivability', 'dispersal to withstand localised damage', 'load levelling' and 'down-sensitivity' we should not imagine these to be distinct from those of Baran, the

69. Baran, *On Distributed Communications*, vol. IX, 7.

70. Arguably the greatest revolution in the history of cryptology was the publication of, Whitfield Diffie and Martin E. Hellman, 'New Directions in Cryptography,' *IEEE Transactions on Information Theory* 22, no. 6 (November 1976): 644–654.

71. Baran, *On Distributed Communications*, vol. IX, 10–18.

72. Hafner and Lyon, *Where Wizards Stay Up Late*, 10.

innocent concerns of science as distinct from war.[73] This is not to return to a notion that the internet *is* a military apparatus as *opposed* to civilian, but to argue that this distinction has lost its meaning.

It is often advanced that the ARPANET was only a *network* at birth and only became an *inter*network with the advent of the ARPANET's Transmission Control Protocol (TCP) in the 1970s, which allowed the various other computer networks in development, such as Louis Pouzin's CYCLADES in France and the UK's eventually realised NPL Network, to intercommunicate by means of a shared protocol.[74] An internet, by this account, is *a network of singularities with a harmonious commonality*.

Baran, whose system – according to this *topological* definition – would be an archetypal *network* rather than *internet* since it was designed without interconnection to non-military networks in mind, poses a competing *epistemological* way to understand this distinction. His secure network itself is bifurcated throughout with competing networks of transmission such that there is no one network but rather a myriad of overlaying, competing networks, each merging into one another, hiding and eavesdropping on communications not intended for them. This poses a different, *epistemological* rather than *topological* account of what an internet is: a *network* is defined by its members sharing their knowledge, purpose and control, whereas an *internet* is defined by such networks in competition. It is not their *commonality* that makes an internet according to this epistemological definition, but their *conflict*.

If Licklider names the network of institutions, socii and machines by means of which the internet was invented, then by implication it bears a certain correspondence to – a certain reproduction of – his network's form. This is why the investment in erasing Baran from its history exists, since doing so gives an altogether different picture of the internet and the society which produced it: both the internet and America come out looking, conveniently enough, like expressions of peace and the benevolent intentions of science and liberal democracy. At stake is not just the reputation of one man, but an entire society in the making.

73. Licklider, *Memorandum: Classification of Computer Networks*, 5–7.
74. Naughton, *A Brief History of the Future*, 157; Abbate, *Inventing the Internet*, 127–30.

Chapter 2

Clocks

'The thought of every age is reflected in its technique,' writes Wiener in *Cybernetics* (1948),[1] and Deleuze, in his 'Postscript on Control Societies' (1990) argues that certain machines 'express the social forms capable of producing them and making use of them.'[2] There are strong grounds for reading together these two arguments that certain machines 'reflect' or 'express' their 'age' or 'society'.

Both Wiener and Deleuze divide modernity into three epochs. Wiener writes in 1948:

> If the seventeenth and early eighteenth centuries are the age of clocks, and the later eighteenth and the nineteenth centuries constitute the age of steam engines, the present time is the age of communication and control.[3]

In 1990 Deleuze argues:

> One can of course see how each kind of society corresponds to a particular kind of machine – with simple mechanical machines corresponding to sovereign societies, thermodynamic machines to disciplinary societies, cybernetic machines and computers to control societies.[4]

Both Wiener and Deleuze agree on which machines represent the first two epochs: the clock and the thermodynamic engine. With respect to the third, contemporary, moment, both agree that it is defined by cybernetics and its machines. Wiener, writing when the von Neumann network had just invented the first digital computer, describes the *age of communication and control* as no longer primarily concerned with the 'economy of energy', but 'the accurate reproduction of a signal', which is to say, information as opposed to noise or entropy.[5] Deleuze, writing on the eve of the internet's widespread adoption, writes that our *control societies* correspond to 'information technology and computers' whose 'passive danger is noise, and the

1. Wiener, *Cybernetics*, 38.
2. Deleuze, *Negotiations*, 180.
3. Wiener, *Cybernetics*, 38.
4. Deleuze, *Negotiations*, 175.
5. Wiener, *Cybernetics*, 37–38.

active, piracy and viral contamination.'[6] By these depictions alone both agree that some form of cybernetic communication network corresponds to the age: Wiener refers to communication engineering, Deleuze's invocation of noise, piracy and viral contamination only making sense in the context of networks of computers. That is, it is not the digital computer that corresponds to our society's age, but some kind of network. I read both as simply too early to write: *Ours is the historical moment which corresponds to the Internet.*

Wiener is always quoted for saying: '*Information is information, not matter or energy.* No materialism which does not admit this can survive at the present day.'[7] But what is a reader to really make of these words? I wish to experiment with reading them in terms of the three ages: *Matter* being the 'materialism' of the age of clocks, *energy* being the 'materialism' of the age of engines, *information* being the 'materialism' of the age of the Internet. The 'present day' – our *contemporary* – is that which must take into account its disjunctive historical specificity with respect to these two earlier moments.

Expanding on this sentence Wiener writes that 'the mechanical brain does not secrete thought "as the liver does bile," as the earlier materialists claimed, nor does it put it out in the form of energy, as the muscle puts out its activity.'[8] My reading of 'information is information not matter or energy' as concerning the break of the age of the Internet from that of the 'older materialists' in the age of steam engine and clock is perhaps complicated by tracking down Wiener's un-referenced quotation ('as the liver does bile') to a pre-cybernetic source: a critique of phrenology by a *nineteenth century* American physiologist named Thomas Sewall, in which both the mechanical and energetic materialisms are rendered explicit.

In *An Examination of Phrenology* (1839) Sewall argues that phrenologists hold a larger brain to 'possess more power than a small one' by analogy to a large liver which 'will secrete more bile than a small one', their analogy implying that 'the brain … elaborates thought *as the liver does bile* from the blood'.[9] Phrenologists, he continues, regard the brain to be 'a galvanic battery, and thought the fluid eliminated by its action.' Wiener's reproduction of this argument implies that his most famous claim rests on a paraphrased old critique of phrenology! Nevertheless, while Wiener must have had Sewall's book at hand when writing this passage, his argument cannot be reduced to it; I stand by my reading that information's distinction from matter refers to a break with the age of the clock, and its distinction from energy being a break with that of the thermodynamic engine.

In this chapter I shall begin to emphasise the cybernetic determinations of Lick-

6. Deleuze, *Negotiations*, 180.
7. Wiener, *Cybernetics*, 132. Emphasis added.
8. Ibid., 132.
9. Thomas Sewall, *An Examination of Phrenology: In Two Lectures*, 2nd ed. (Boston: D. S. King, 1839), 59. I have emphasised the passage which Wiener quotes.

lider's network. I turn to Wiener, who profoundly influenced Licklider in the 1940s, to address the nature of the reflection of a historical moment in its technique. This would be to determine the parallel concept of Wiener's to that employed by Deleuze in the 'Postscript' to depict the fact of machines as expressions of the sociohistorical forms. That is, parallel to Foucault's *dispositif*, the network through which the heterogeneous elements of a society are strategically connected and whose contemporary instantiation Deleuze names 'control'.[10] As Bernard Dionysus Geoghegan has emphasised, in its English translation as 'apparatus', *dispositif* merges ambiguously with *appareil*, instruments becoming epistemological figures which 'coordinate, suspend, or rationalize difference.'[11] My approach perhaps differs from Geoghegan's in that his emphasises the plurality of technical apparatuses, whereas I shall argue of one. This relates to the distinction between the *dispositifs* of discipline and control instituted by Deleuze. For Foucault there are various machines – prisons, schools, hospitals, sanatoriums, etc. – and while each corresponds to the *dispositif* and speaks of it, they form a *heterogeneous* vocabulary. Each are heterogeneously associated by means of the language of the disciplinary *dispositif* through which they analogically translate. Different machines each constitute elements of a single univocal language, the *dispositif*, or at least a partial language of, in Deleuze's words, 'paralinguistic signs, breaths and screams'.[12] If Geoghegan insists on the productive ambiguity of the *dispositif* as *appareils*, then I shall insist on the ambiguity of one *appareil* with the *dispositif* (which many *appareils* reflect). A single machine of machines. Perhaps this is implied in Deleuze's distinction of the *dispositif* of control as continuous, unbounded, and, as Alexander Galloway has argued, *homogeneous*.[13] And why Hardt and Negri have construed this affirmatively, reconstruing the equivocal *dispositif* with the univocal Spinozan category of 'common form' that everything expresses.[14] Nevertheless, my reading of Wiener calls for a return, against Deleuze (at least according to Galloway's presentation of his 'digitality') and especially Hardt and Negri, to an *equivocal heterogeneity*, albeit one which insists on heterogeneity as taking place within a single apparatus, the internet: not through Spinozan commonalities, but the post-Leibnizian

10. Foucault's sole discussion of the meaning of *dispositif* is to be found in the interview 'The Confession of the Flesh', *Power/Knowledge*, 194–228. The opening sequence of the discussion was omitted from translation; Stuart Elden has published it on his blog, https://progressivegeographies.com/2013/12/30/the-missing-question-from-foucaults-confession-of-the-flesh-interview-a-translation/.

11. Bernard Dionysius Geoghegan, 'From Information Theory to French Theory: Jakobson, Lévi-Strauss, and the Cybernetic Apparatus,' *Critical Inquiry*, 2011, 99; On the general difficulties of translating *dispositif* see, Jeffrey Bussolini, 'What is a Dispositive?,' *Foucault Studies*, no. 10 (November 2010): 85–107.

12. This is said, following Alexander Galloway's lead, through hooking up Deleuze's 'Postscript' to his distinction of analogue and digital in his book on Francis Bacon. Gilles Deleuze, *Francis Bacon: The Logic of Sensation*, trans. Daniel W. Smith (London & New York: Continuum, 2003), 113, 121; Allexander R. Galloway, 'Computers and the Superfold,' Postscript on Control Societies, *Deleuze Studies* 6, no. 4 (2012): 513–28.

13. Galloway, 'Computers and the Superfold'; Deleuze, *Francis Bacon*, 116.

14. Hardt and Negri, *Empire*, On the 329–331.

conflicts of networks against networks.

This is to get ahead of myself. To begin with we might say that the concept which shares the role for Wiener as the *dispositif* is neatly characterised by François Ewald's characterisation of the *dispositif* itself, it 'presents to modern society its true picture of itself.'[15] And further, that this new picture is a 'new monster', as Deleuze says, of control, but so because it is, as Wiener affirmed in Père Dubarle's review of *Cybernetics*, a 'prodigious Leviathan' which presents a new mode of power, a '*machine à gouverner*', with *gouverner* doubly signifying the traditional political governor and the new cybernetician.[16] The monstrosity of the new Leviathan, which portrays our society's true picture, is implicit on the level of Wiener's equivalent to the *dispositif* – the '*operative image*' – since it is characterised by a fusion of Leibniz and Hobbes; a bastard offspring which neither early modern philosophers would have ever desired. Power decided by arbitrary might instead of necessary wisdom, a State without any sense of contract. The internet, as the 'ultimate cybernetic machine' (Gerovitch),[17] is the image to which our cybernetic society corresponds. But what does 'image' in such a context mean?

Wiener's approach to the correlation between machine and society, or machine and organism, is determined by a post-theological imaginary specifically founded upon the nature of the 'image' of God in which man is created. This theological imaginary is expressed all the way from *Cybernetics* to his final work *God and Golem,* Inc. (1964) in which it is most directly thematised. This final book has perplexed some of Wiener's closest readers, who consider it an '[extension of] the reach of cybernetics beyond science, engineering, politics, labor and other social concerns into the realm of religion'.[18] What renders his notion ultimately a secular one, or rather *secularised*, is that his concept of image is not ontological but historical, presenting every age with the image of the human's historical being by means of 'the machine made in his own image'.[19] In every age, humans discover a new image of what it means to be a creative being and they create a singular machine which represents this.

By image, Wiener means a dynamic rather than static one: it is not about resemblance but about a simulacrum of a logic of operation. He writes that,

15. François Ewald, 'A power without an exterior,' in Ewald, *Michel Foucault, Philosopher*, 170.

16. Dubarle's review of *Cybernetics* (1948) was swiftly published in *Le Monde* on 28 December 1948, Wiener having had the book published, in English, simultaneously in France as well as the USA. Wiener considered Dubarle's review to be 'very penetrating' and quoted a large section of it in *The Human Use of Human Beings*, its translation likely his own. Wiener, *HUHBb*, 157; The French reception of *Cybernetics* would have mattered acutely to Wiener, since, as Geoghegan catalogues, he was persuaded to formalise his ideas into a book initially by its Paris publisher, *Hermann et Cie*, whereas MIT Press and Wiley & Co. had to bully and splurge their way to a simultaneous US release. Bernard Dionysius Geoghegan, 'The Cybernetic Apparatus: Media, Liberalism, and the Reform of the Human Sciences' (PhD thesis, Northwestern University and Bauhaus-Universität Weimar, 2012), 166.

17. Gerovitch, 'The Cybernetics Scare and the Origins of the Internet,' 38.

18. Kline, *The Cybernetics Moment*, 152.

19. Wiener, *HUHBb*, 160.

> In order to discuss intelligently the problem of a machine constructing another after its own image, we must make the notion of image more precise. Here we must be aware that there are images and images. …[Besides] pictorial images, we may have operative images, which perform the functions of their original, may or may not bear a pictorial likeness to it. Whether they do or not, they may replace the original in its action, and this is a much deeper similarity. It is from the standpoint of operative similarity that we shall study the possible reproduction of machines.[20]

The picture of the self which the operative image reflects is not the static being of its aesthetic presentation but the becoming of its productive organisation. Such an emphasis on the dynamism of the image rather than its appearance is fundamental to the cybernetic 'theory of machines'. As Ross Ashby says in 1956, 'cybernetics … treats not things but ways of behaving. It does not ask "what *is* this thing?" but "*what does it do?*" … The materiality is irrelevant'.[21] Such an argument is founded on Wiener's 'philosophical' analogy of machines and organisms. In *Cybernetics* Wiener poses that an engineer's servomechanism and the function of a gene are not 'philosophically very different', and argues, 'I do not in the least claim that the details of these processes are the same, but I do claim that they are philosophically very similar phenomena.'[22] The operative image is a specific artifice: it crosses the threshold from utility into life, and as living it is that which can itself reproduce life. It is a human-created, or 'invented', representation not of what life looks like and is but of how it functions. What the living *do*. Wiener declares, 'It will not do to state categorically that the processes of reproduction in the machine and in the living being have nothing in common.'[23]

The formulation 'operative image' is a late one, introduced only in Wiener's final texts, but he refers to the same concept as a 'working simulacrum' in this passage from *Cybernetics*:

> At every stage of technique since Daedalus or Hero of Alexandria, the ability of the artificer to produce a *working simulacrum* of a living organism has always intrigued people. This desire to produce and to study automata has always been expressed in terms of the living technique of the age.[24]

As 'working simulacrum of a living organism', or an 'expression' of the 'living technique of the age', the operative image refers to the operative mechanism of the being which betrays the characteristics of the living and could, if realised with sufficient perfection, create another living being. Why? Because it has been manufactured according to the laws which govern the very occasion of life itself.

20. Norbert Wiener, *God and Golem,* Inc. (London: Chapman & Hall, 1964), 37–38.
21. W. Ross Ashby, *An Introduction to Cybernetics* (London: Chapman & Hall, 1957), 1–2.
22. Wiener, *Cybernetics*, 180.
23. Wiener, *God and Golem,* Inc., 52.
24. Wiener, *Cybernetics*, 40.

If Wiener's writings have been taken seriously in France whilst being derided as 'mainly philosophical' (especially in contrast to Shannon) at home in America,[25] one reason surely stems from his flat refusal to conform to the Anglo-Saxon boundary work of the nineteenth century by which 'science' and 'philosophy' were divorced from one another – in the UK by the likes of William Whewell of Cambridge.[26] Like Whewell's obstinate student James Clerk Maxwell – whose 'On Governors' Wiener considered to be the 'first significant paper on feedback mechanisms'[27] – ontological concerns of 'natural sciences' cannot be separated from Wiener's writings. Wiener scorned those with 'brilliant ideas' but 'a distressing inability to place [them] in any philosophical structure', as he recalled of Claude Bernard's English translator J. B. Henderson,[28] he held disdain for the 'peculiar sense of power, and worship of power, to be found among the less philosophical and more administrative technical men.'[29] He wrote *Cybernetics* to 'display some of the ideas and philosophical reflections which led [him] in the beginning to enter upon this field, and which have continued to interest [him] in its development.'[30] The reason Wiener is 'too philosophical' for those who expect a separation of powers between 'philosophy' and 'science' is simple: his work is 'philosophical' according to the tradition of Descartes, Leibniz, Newton, Maxwell and so on: that is, within the tradition of natural science. This said, he recognises the contiguous historicity of the natural science, and even, in his final book, alludes to his own axiom's future redundancy.[31]

25. Kline, *The Cybernetics Moment*, 36.

26. On Whewell's 1833 coining of 'scientist' in distinction to 'philosopher', and his student James Clerk Maxwell's rejection of the distinction and his commitment to the tradition of natural philosophy that Whewell's move was intended to make redundant, see P. M. Harman, *The Natural Philosophy of James Clerk Maxwell* (Cambridge: Cambridge University Press, 1998), 11.

27. Referring to his coining of 'cybernetics', Wiener reflects: 'In choosing this term, we wish to recognize that the first significant paper on feedback mechanisms is an article on governors, which was published by Clerk Maxwell in 1868.' Wiener, *Cybernetics*, 13; See, J. C. Maxwell, 'On Governors,' *Proceedings of the Royal Society*, no. 100 (1868).

28. Norbert Wiener, *Ex-Prodigy: My Childhood and Youth* (Cambridge, MA: MIT Press, 1953), 165–66; Wiener encountered Henderson during his publication of *The Fitness of the Environment* in the 1911–1913 seminar on scientific method organised by Josiah Royce, who receives special thanks in the book's preface. Did Wiener encounter Bernard's concepts of '*milieu intérieur*' at this point, and the concept that would come to be called 'homeostasis'? Although Bernard does feature in Henderson's early book, he does so only with respect to his positive experimental methodology and its opposition to vitalism, in line with the conventional reception of Bernard at the time. (This situation would begin to change only in the 1920s, Henderson contributing the translation of *Introduction à l'étude de la médecine expérimental* (1865) in 1927.) What the young Wiener would have certainly encountered in Henderson, not-insignificantly given the focus of his first cybernetic works with Rosenblueth, was an attempt to read Darwinian evolutionary biology with respect to the categories of *purposivity, teleology and order*. But this only with respect to an organism's relation to its *outer* environment, rather than the Bernardian conflict between an *inner environment* and outer. Lawrence J. Henderson, *The Fitness of the Environment: An Inquiry into the Biological Significance of the Properties of Matter* (1913: Macmillan, 1913), x, 286–88.

29. Wiener, *Prolegomena to Theology*, 89. Emphasis added.

30. Wiener, *Cybernetics*, xv. Emphasis added.

31. 'Homeostasis, whether for the individual or the race, is something of which the very basis must sooner or later be reconsidered.' Such a fundamental reconsideration ambiguously begs whether the

Wiener's concept of an 'operative image', whose contemporary manifestation is the internet, has roots within the tradition of natural science, and I wish to argue that it translates a concept in Leibniz's *Monadology*.[32] But perhaps the most immediate notion of creating a 'working simulacrum of nature', in Wiener's words given the notion of cybernetics producing a 'prodigious Leviathan', is that of Thomas Hobbes' introductory argument of the *Leviathan*: 'NATURE, the art whereby God hath made and governs the world, is by the *art* of man, as in many other things, so in this also imitated, that it can make an artificial animal.'[33]

That is, we begin with the distinction of the age of information from that of 'matter', whose operative image is the *clock*.

2.1 Big gods, little gods: Hobbes contra Leibniz

Does Wiener's 'operative image', which stands in place of the *dispositif* and whose manifestation is the internet, accord to the model of the image of creation as conceived by Hobbes or Leibniz? Does it accord to both?

A typical early modern, Hobbes followed Robert Boyle's view that the primary mechanism of a corpuscle must bear explanation of the mechanical kind that could equally explain the structure and inner workings of a clock,[34] he followed the Cartesian view that, 'when swallows come in spring, they operate like clocks. The actions of honeybees are of the same nature.'[35] He considered the organic body to operate in the image of the clock and the clock itself to be of the image of nature. In the introduction to the *Leviathan* Hobbes famously depicts nature as clockwork machine designed by an original clockmaker God, writing, 'For what is the *Heart*, but a *Spring*; and the

very foundation of cybernetics would remain tenable, or whether cybernetics itself constitutes this critique of homeostasis. Wiener, *God and Golem,* Inc., 86.

32. Following standard convention, throughout this thesis I shall refer to *Mondadology* and 'monadology' distinctly. *Monadology* refers to the text which Leibniz authored in 1714, whose title was given posthumously by its German publisher in 1720. As 'monadology', I refer to Leibniz's general 'system' of thought expressed in the *Monadology* and other especially late texts. G. W. Leibniz, *Leibniz's* Monadology*: A New Translation and Guide*, ed. and trans. Lloyd Strickland (Edinburgh: Edinburgh University Press, 2014), 5–12

There is some debate over whether Leibniz can be considered a 'systematic philosopher'. Margaret Wilson, for example, argues against this because his output spans so many disciplines, evolves over decades and lacks a central *opus* like Spinoza's *Ethics*. Reading Michel Serres, Lucie Mercier has argued persuasively of Leibniz's systematicity as a 'methodological pluralism', its multilinearity and multivalence. Respectively, I read Leibniz as indeed a systematic thinker, one whose methodology is like the monadology itself: a myriadic, sprawling, integrated network where each position grants a different degree of clarity as to its relation to its universe of ideas. Margaret Wilson, *Ideas and Mechanism: Essays on Early Modern Philosophy* (Princeton: Princeton University Press, 1999), 372–88; Lucie Kim-Chi Mercier, 'The Inside Passage: Translation as Method and Relation In Serres and Benjamin' (PhD, CRMEP, Kingston University, 2015), 99–103; Also, Nicholas Jolley, *Leibniz* (New York: Routledge, 2005), 9-11.

33. Thomas Hobbes, *Leviathan* (Cambridge: Cambridge University Press, 1996), ix.

34. Peter R. Anstey, *The Philosophy of Robert Boyle* (London: Routledge, 2000), 55, 60.

35. Descartes, 'Letter to the Marquess of Newcastle' (23 November 1646), *The Philosophical Writings of Descartes*, vol. III, 304.

Nerves, but so many *Strings*; and the *Joynts*, but so many *Wheeles*, giving motion to the whole Body, such as was intended by the Artificer?'[36] Therefore, Hobbes poses, given that humans can create clockwork automata, why should they not strive to create the paragon such automata through 'imitating that Rationall and most excellent worke of Nature, *Man*.'

Wiener says of the early modern clockmakers, 'As in ancient times the craftsmen made their tools in the *image* of the heavens. A watch is nothing but a pocket orrery, moving by necessity as do the celestial spheres'.[37] To Descartes the human-made clock is merely an infinitely coarse image of God's clockwork universe.[38] Otto Mayr argues that, especially until Huygens invented the pendulum in 1657, clocks primarily provided a 'conceptual image' of the universe rather than, as one might expect, the utility of timekeeping: 'Their objective, it seems, was universality; they attempted to mirror the whole human experience'.[39] Similarly, Derek J. de Solla Price argues that for the ancients the sundial and water-clock were also not primarily timekeeping devices, but rather means to 'simulate the heavens', and that the flying machines of that master of Renaissance clockwork automata, Leonardo da Vinci, were less to enable humans to fly than for the 'perfection of a simulacrum for the mechanism of a bird'.[40] Hobbes would raise the stakes of this tradition, claiming that the human can imitate themselves, in body and soul. '*Art* goes yet further, imitating that Rationall and most excellent work of Nature, *Man*.'[41] In this claim Hobbes surpasses Descartes for whom only God could create the entire human, since he held a monopoly over the production of souls. For Hobbes the entire human is imitatable because he construes the soul to be, in Carl Schmitt's words, no more than 'a mere component of a machine artificially manufactured by men'.[42]

The mechanical clock is a machine whose laws of operation are pre-established by its clockmaker and cannot be adjusted but by an external intervention. Its authority derives from a single central source, the toothed escapement, whose original fourteenth century form even looked like a crown and was named the '*virge* escapement', after the 'virge' (or 'mace') which represents the authority, force and capacity for violence of a divine or earthly sovereign (virges were initially weapons and instruments of corporal punishment). One finds the mechanical clock figured as such almost from the outset of its invention, divinely in Dante's *Inferno* (1320),[43] and secularly in Chaucer's

36. Hobbes, *Leviathan*, ix.
37. Wiener, *Cybernetics*, 38. Emphasis added.
38. Descartes, *Treatise on Man* (1664), *The Philosophical Writings of Descartes*, vol. I, 99.
39. Otto Mayr, *Authority, Liberty & Automatic Machinery in Early Modern Europe* (London: John Hopkins University Press, 1986), 10.
40. Derek J. de Solla Price, 'Automata and the Origins of Mechanism and Mechanistic Philosophy,' *Technology and Culture*, 1964, 13–14, 21.
41. Hobbes, *Leviathan*, ix.
42. Carl Schmitt, *The Leviathan in the State Theory of Thomas Hobbes: Meaning and Failure of a Political Symbol*, trans. Georgre Schwab and Erna Hilfstein (London: Greenwood Press, 1996), 34, 37.
43. *Par.* XXIV.13–5. Also *Par.* XXIV:13–18 and XXXII:143–45, and, according to Francesco

Book of the Duchess (1368–1372).[44] But, argues Mayr, it is in the seventeenth century that the image comes into its own, and with the Leviathan at the pinnacle of the 'mechanical universe'.[45] Mayr argues that the image of the clock is authoritarian by nature: 'order, peace, equilibrium were to be achieved through central planning, steering, decision-making. All the members of the system outside the sole central authority remained mere little wheels in a great train, and they possessed neither freedom nor individuality.'[46]

Wiener may have enthused about the claim that cybernetics threatens to engender 'the rise of a prodigious Leviathan' which would render that of Hobbes 'nothing but a pleasant joke';[47] yet there is an important distinction between the kind of imitation conceived of by Hobbes and Wiener. As Schmitt writes, the relation for Hobbes between humans and their '*homo artificialis*' ('a huge machine, a gigantic mechanism in the service of ensuring the physical protection of those governed') is not merely that of maker and engineer, but also of material and machine.[48] The human is both the material and maker of the Leviathan, subjected *to* its power and author *of* its power. This is crucial to ensure that the 'huge man' takes its life and power from the covenant of those it rules over and to render the state 'impersonal' and distinct from its prince. Whilst it is not the case that the personality of the state for Hobbes is derivative only of the sum of its human parts – Mark Neocleous has shown that it also has a distinct personality of its own[49] – it would be inconceivable to think of Hobbes' machine without its human elements. Out of the operational image of a material, clockwork nature, Humans create a 'mortal god', as Hobbes refers to his machine, who reciprocally transforms them from wolves into the citizens who constitute his inner mechanism. But what Hobbes attempted, even if he ultimately fails, is to ensure a *contract* between the machine and its creator, such that it is the people who are ruled by the machine who hold ultimate authority over it. What ensues from cybernetics is a machine which rules over its creator without any such notion of contract. It does this by beginning with Leibniz.

Ciabattoni's reading, XXIII.97–102. Francesco Ciabattoni, *Dante's Journey to Polyphony* (Toronto, Buffalo & London: University of Toronto Press, 2010), 186–87.

44. See, Guillemette Bolens and Paul Beckman Taylor, 'Chess, Clocks, and Counsellors in Chaucer's Book of The Duchess,' *The Chaucer Review* 35, no. 3 (2001): 281–293.

45. Otto Mayr, 'A Mechanical Symbol for an Authoritarian World: German Clocks and Automata 1550-1650,' in *The Clockwork Universe*, ed. Klaus Maurice and Otto Mayr (New York: Neale Watson Academic Publications, 1980), 1–8.

46. Klaus Maurice and Otto Mayr, 'Introduction,' in *The Clockwork Universe: German Clocks and Automata 1550-1650*, ed. Klaus Maurice and Otto Mayr (New York: Neale Watson Academic Publications, 1980), vii–ix.

47. Wiener, *HUHBb*, 157.

48. Schmitt, *The Leviathan in the State Theory of Thomas Hobbes*, 34–35.

49. Mark Neocleous, *Imagining the State* (Maidenhead: Open University Press, 2003).

Leibniz distinguishes the 'minds' of humans from the 'souls' (or 'bare monads') of animals and vegetable life on the basis of a mind's capacity to have a certain degree of clear self-reflective perceptions, or *apperception*, whereas souls are capable only of confused *perceptions*. This apperception allows minds to discover within themselves innate ideas such as 'I', cause, being and God, or the truths of mathematics and geometry.[50] This mind's capacity for insight into *a priori* concepts is the same which gives it the capacity to understand the natural organisation and mechanism of nature, and therefore to create living mechanisms in its image. In the *Monadology* (M83) he writes,

> that souls in general are *living mirrors or images of the universe of created things*, whereas minds are also *images of the divinity* itself, or of the very author of nature, capable of knowing the system of the universe, and of imitating something of it through their own smaller scale constructions [*échantillons architectoniques*], each mind being like a little divinity of its own sphere [*chaque esprit étant comme une petite divinité dans son département*].[51]

With this, as with many verses in the *Monadology*, Leibniz directs the reader to a passage in the *Theodicy* (1710), notably T147, which we shall return to.

A mind's distinct capacity for self-reflection and thereby the discovery of necessary truths casts it in the image of God. *Every mind is an image of God.* This is one of the *Monadology*'s rare theological motifs and it subtly embraces a certain branch of a Judaeo-Christian mysticism. A consequence of the capacity to innately discover necessary truths is the capacity to know the essence of creation, nature and being itself. Hence minds are reflections of the 'very author of nature' and can come to know 'the system of the universe' itself. Such a capacity would be limited by the degree of perfection of a mind's conscious perceptions (apperceptions), which for any embodied being entails a certain degree of confusion such that a human would never near anything like equivalence with the infinite degree of clarity of God himself; but they can raise their degree of understanding of the necessary truth of being, indeed they *should* since this would allow them to appreciate the necessity of its wisdom, the 'pre-established harmony' of God's creation that ensures our world is the 'best of possible worlds' (M53, 55).[52] Such truth is not deducible exogenously from the empirical senses to their causes (*a posteriori*) but only endogenously through reasoning

50. M26–30. See also, G. W. Leibniz, *Philosophical Essays*, trans. Roger Ariew and Daniel Garber (Indianapolis: Hackett, 1989), 292–294, 368.

51. M83. Lloyd Strickland trans., Leibniz, *Monadology*, 149–151. Emphasis added.

52. As argued in the *Theodicy*, §196: 'For in this case the determination would spring from the nature of the thing, the line would be perpendicular, and the angle would be right, since that is all that is determined and distinguishable. It is thus one must think of the creation of the best of all possible universes, all the more since God not only decrees to create a universe, but decrees also to create the best of all.'

over the foundations of things to their effects (*a priori*).[53]

The operative image which Leibniz employs is, as for Hobbes, the clock. Leibniz liked to ask his readers to 'imagine two clocks or watches which are in perfect agreement'. Ruling out miracles or external influences, such a feat could only occur if a perfectly skilled and accurate clock maker had made them agree at the beginning of time, as though he were 'always putting forth his hand', but without doing so since the clocks themselves unfold their original instructions.[54] Wiener took this to be the model of the clockwork image, depicting it as 'passively dancing figures on top of a music box. They have no real influence on the outside world, nor are they effectively influenced by it.'[55]

Now, whilst it would for Leibniz contradict reason to countenance that any being but God could create *new* beings, a mind with sufficient clarity as to the system of the universe could plausibly imitate 'something of it' in the world of composite reality through what Leibniz calls their '*échantillons architectoniques*': and it is by doing so become 'a little divinity of its own sphere.'

It is this untranslatable *échantillons architectoniques* that I wish to suggest finds a translation in Wiener's 'operative image'.

The phrase has been translated variously, with varying connotations, by Leibniz scholars. As 'architectonic ensamples' (Robert Latta)[56] or 'architectonic samples' (Leroy E. Loemker),[57] which is literal and obscure; 'schematic representations' (Roger Ariew and Daniel Garber),[58] which emphasises that minds imitate God by devising mathematical or physical accounts of the universe, although given that Leibniz says as much in our 'knowing the system of the universe' this reading would be an unnecessary repetition in a text which does not mince words; as 'constructive exemplars' (Anthony Savile)[59] or 'constructive samples' (Nicholas Rescher)[60] with an emphasis on imitating God through political organisations, scientific knowledge and the construction of

53. Strickland argues that the pre-Kantian meaning of *a priori* and *a posteriori* which Leibniz employed derives from his great interlocutor Antoine Arnauld's *Port-Royal Logic* (*La logique, ou l'art de penser*; 1662–1683), which Foucault considers to have been a basis of the classical *episteme*. The distinction between *a priori* and *a posteriori* is there made not primarily in terms of the status of sensibility but rather in terms of the direction of illumination, with the former relating to 'proving effects through their causes' and the latter 'causes their through effects'. Part IV, ch. 1, p. 104, Pierre Nicole and Antonoine Arnauld, *Logic, Or the Art of Thinking: Being the Port Royal Logic*, trans. Thomas Spencer Baynes (Edinburgh: Sutherland & Knox, 1850); Leibniz, *Monadology*, 302.

54. 'A New System of the Nature and the Communication of Substances' G. W. Leibniz, *Philosophical Papers and Letters*, 2nd ed., ed. and trans. Leroy E. Loemker (Dordrechy, Boston & London: Kluwer Academic Publishers, 1969), 460.

55. Wiener, *Cybernetics*, 41; Wiener, *HUHBb*, 22-23.

56. G. W. Leibniz, *The Monadology, and Other Philosophical Writings*, trans., with an introduction by Robert Latta (Oxford: Clarendon Press, 1898), 266.

57. Leibniz, *Philosophical Papers and Letters*, 651.

58. Leibniz, *Philosophical Essays*, 223.

59. Anthony Savile, *Routledge Philosophy GuideBook to Leibniz and the* Monadology (London: Routledge, 2000), 238.

60. Nicholas Rescher, *G. W. Leibniz's* Monadology*: An Edition for Students* (Abingdon & New York: Routledge, 1991), 275.

artefacts, but given that *architectonique* refers to an architectural sense of construction, this seems too broad; and 'smaller scale constructions' (Strickland),[61] which emphasises the imitation of Leibniz's *machina mundi* through the construction of little machines or models composed by its same principles. It is along the lines of Strickland's translation of imitation in the image of the machine of the world that I believe 'operative image' functions.[62]

In passage T147, to which the interested reader of M83 is referred, Leibniz's emphasis is somewhat different. The *Theodicy*'s passage relates not to the imitation of the mechanism of the *machina mundi*, but to a mind's *political governance* of their little world being an imperfect imitation of *divine governance*. Imperfection here means above all the occurrence of evil: the problem of theodicy itself. In the *Theodicy*'s passage Leibniz writes that the 'collision' of one mind's world with another's – i.e., war – occurs inevitably because of a falling to passions – that innate limitation of all monads but God – but that these privations of the good (Leibniz's concept of evil is fundamentally Augustinian), when given the correct framing, must be recognised as part and parcel of the 'greater adornment of [God's] world.' Profane governance is guided not by the contingent path towards peace, but by the discovery and imitation of the necessary laws through which the Divine Kingdom has been ordered. Against Hobbes, for whom every disagreement – theological ones first and foremost – ultimately fall to the contingent will of the sovereign to resolve, Leibniz's somewhat-medieval politics buck the spirit of his age by continuing to hold the Catholic Church to universally 'bind the whole human race together.'[63] Hence the imitation of divinity pressed upon in the *Theodicy* concerns less the mechanism of nature as the logic of its necessary moral order.

Without denying a gap with respect to the *échantillons architectoniques* in the *Monadology* and the associated passage in the *Theodicy*, I wish to insist that this gap can be read as expressive of a complementary metaphysical and moral account, especially if both passages are qualified via Deleuze's reading of Leibniz's 'world' as being 'a compossible architectonic totality' [*un ensemble architectonique compossible*].[64] 'Architectonic' here signifies a system of monads who, lacking windows, are themselves architectural structures – *cells*[65] – whose Baroque architecture is 'compossible' in so far as it is that total system of non-contradictory relations which has been chosen by God from all other possible alternatives because it is – despite every privation, every limitation, every 'evil' – the best of them all.[66] According to Deleuze's reading,

61. Leibniz, *Monadology*, 150.
62. This comparison of translations of *échantillons architectoniques* follows that of from ibid., although it corrects a.
63. Leibniz, 'On Natural Law' (date unknown), *Political Writings*, 79.
64. Gilles Deleuze, *The Fold: Leibniz and the Baroque*, trans. Tom Conley (London: Athalone Press, 1993), 66.
65. Ibid., 28.
66. See M53

architecture signifies both the *metaphysical* relationality of the *universe* and its specific *moral* instantiation as the best of possible *worlds*. Hence, there is indeed a distinction between the metaphysical account of the *Monadology* and the moral one of the *Theodicy*; yet there is no contradiction. As Leibniz says: 'God has no less the quality of the best monarch than that of the greatest architect; … he has attained the utmost good possible, provided one reckon the metaphysical, physical and moral goods together.' (*Theodicy*, §247) The *échantillons architectoniques* through which humans imitate God's nature are irreducibly both mechanical (concerning machines made in the image of God's nature) and moral (concerning the necessary good). A clock, a telescope, a magnifying glass, a government: The machine which functions best would be that which best imitates the rational and ordered – which is to say clockwork – nature of things, and, morally speaking, this would be the most universally beneficent and good organ.

The difference between Leibniz and Hobbes on the matter of imitating the image of God's nature is therefore a stark one. To Leibniz, everyone can become a god who rules over their created machines; to Hobbes, everyone creates a machine who rules over them as a god. Nowhere is the difference between the two philosophers more obvious than in the ultimate manifestation of this difference politically. Let us mention how: To Hobbes, the state is conceived as a single person who rules over all irresistibly, but to Leibniz the state should be bound by international law [*codex iuris gentium*] to a confederation in the tradition of the federated Church;[67] to Hobbes, a sovereign who must jealously guard its secrets from its enemies and thereby reprimand its citizens to each 'mind his own private, than the public business',[68] whereas to Leibniz secrets should be those of the cloister of the mind and its perceptions into which God whispers,[69] while the sovereign must be bound by the public acts of constitutional law and international peace treaties;[70] for Hobbes, a state of nature where the equal sovereign right of everyone to everything destines civil war, for Leibniz, a natural distribution of little sovereign gods who even in encroaching upon one another express naturally the greatest good; for Hobbes a sovereign whose exceptional right to everything trumps all facts and whose *contingent* laws can be unjust and even evil, for Leibniz a justice founded on the *necessary* laws of wisdom, which is to say, knowledge of the good.[71] All this flows from the question of whether

67. See the 'Codex Iuris Gentium' (1693) and 'Caesarinus Fürstenerius' (1677), both in *Political Writings*.

68. Thomas Hobbes, *De Cive: English Version*, ed. Howard Warrender (Oxford: Clarendon, 1983), 138–140.

69. '[God] leaves [man] to himself, in a sense, in a small department, *ut spartam quam nactus est ornet*. He enters there only in a secret way, for he supplies being, force, life, reason, without showing himself.' *Theodicy*, T147.

70. Leibniz, 'Codex Iuris Gentium', *Political Writings*, 165–176.

71. At least this represents something of the argument of Leibniz's critique of Hobbes' political thought in his 'Meditation on the Common Concept of Justice' (1703), *Political Writings*. In effect it would have also been potent against Spinoza, who, in Reinhart Koselleck's words, too 'deemed it perfectly reasonable to look on every good deed as sinful if it harmed the State just as conversely, sins became

we must create a mortal god in God's image (Hobbes) or else in the image of God make ourselves little gods (Leibniz), since in the former the machine ultimately rules over its creators, and in the latter, the creator ultimately rules over their machines.

2.2 A monster, the Masons

Can Wiener's concept of the operative image be said to be closer to Hobbes' or Leibniz'? In truth he seems to fear that in the age of communication and control, the society of control, one sets out from the *échantillons architectonique* but is compelled towards a sort of Leviathan. This would be a monstrous fusion for the reason that Leibniz, who devoured Hobbes' writings and claimed in his youth to have 'profited from them as much as from few others in our century',[72] construed his entire political philosophy to be opposed to Hobbes' on the basis that it attributes God (divine and earthly) the 'right to do everything, because he is all powerful.'[73] Leibniz' system is to ensure the necessary wisdom in every aspect of God's creation and in the political architecture of the wise sovereign who imitates God.

Such a monstrous fusion is anticipated by Reinhart Koselleck in *Critique and Crisis* (1959). Koselleck suggests that in the decade following Leibniz's death in 1716 his political theory found a certain actualisation – by the secret society of Masons.[74] The early Masons, Koselleck argues, construed in Leibniz's theodicy the 'historico-philosophical legitimation of [their] moral art.' They rose to his system of secret beneficence, wisdom, and success of planning, to the notion of a best of possible worlds which they would ensure by opaquely '[steering] it from the secret backroom of the moral inner space.' But in construing themselves to be 'the true initiates', they deviated from Leibniz's system by replacing his God with themselves. They construed themselves as the necessary sovereign of the profane. Koselleck writes,

> Leibniz's theological, rational theodicy becomes the rational, historico-philosophical justification of the new man, the 'earth god' who wants to control history. The Masonic order has become the guardian of the rule of harmony in the universe.[75]

Such an argument would have likely pleased Wiener, for whom the threat posed by cybernetics of engendering a 'World State' was nothing short of a problem worth

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pious works if they served the common wealth.' *Critique and Crisis*, 20–21.

72. *Letter to Thomas Hobbes* (13/22 July 1670), Leibniz, *Philosophical Papers and Letters*, 106; Maria Rosa Antognazza argues that Leibniz comprehensively read Hobbes before doing so even for Descartes, Maria Rosa Antognazza, *Leibniz: An Intellectual Biography* (Cambridge: Cambridge University Press, 2011), 52; There would be a 'lasting impression of Hobbes on Leibniz', argues Catherine Wilson, who notes that as late as 1684, five years after Hobbes' death, Leibniz had compiled a complete catalogue of his work. Catherine Wilson, 'Motion, Sensation, and the Infinite: The Lasting Impression of Hobbes on Leibniz,' *British Journal for the History of Philosophy* 5, no. 2 (September 1997): 341.

73. Leibniz, 'Meditation on the Common Concept of Justice', *Political Writings*, 47.

74. Reinhart Koselleck, *Critique and Crisis: Enlightenment and the Pathogenesis of Modern Society* (Oxford: Berg, 1988), 131.

75. Ibid.

dedicating especially the first edition of the *Human Use of Human Beings* to.[76]

How did the Masons, according to Koselleck's argument, turn Leibniz into a global and contractless-Hobbes so easily? By creating their 'earth god'-'mortal-god'-'huge man' in the image of God dethroned by themselves. By turning the Masonic order into the God who sits *not* on the Leviathan's throne – which despite its exceptionality and secrecy is inconceivable without the public contract through which men voluntarily surrender to the sovereign their status as gods in their own right – but that of Leibniz's God dethroned. Through casting initiated man in the image of dead God, which is to say, himself, but no longer himself since that which his image is a reflection of no longer exists. Both mirror and mirrored images are struck through: ~~*Man*~~ *is created in the image of* ~~*God*~~. In such a system, which can certainly not be attributed to Leibniz himself since the positive being of God provides for him the theodical 'virgin spring' upon which to build the monadology, the necessary truth which God had assured becomes, as for Hobbes, the contingent truth of men. So too the global territory of divine ministry which for Leibniz needed no contract, which if formerly premised on the treasure of a wisdom secret to reason becomes established through the historical successes of a secret society with imperial ambitions. In their reflection as the image of ~~God~~, the ~~men~~ of the Masons transcend from being gods of a *microcosm* among *microcosms* to creating a secret Leviathan, an artificial anterior God with ambitions for the whole *cosmos* composed of Mason bodies. But whereas for Leibniz the reign of God and the moral wisdom of the world is assured by necessary truth, for the Masons, its assurance rests on the mere fact of their success, a facticity alike (but not akin) to that of Hobbes' merely mortal God who can only secure the good of peace through the artificial *fiat* of its composition, the social contract. And whereas for Leibniz, God is (given the principle of non-contradiction) one, in that the Masons have nothing other than a belief in their own 'true initiation' to justify their sovereignty, what is to stop other such self-assured secret societies from engaging against them in a backroom struggle, a crypto-politic or crypto-war, for the same secret crown? The 'earth god' of the Masons is a special kind of monster which would have appalled both Leibniz and Hobbes alike, precisely because it takes leave from the fusion of their conflicting concepts of image.

76. 'With the airplane and the radio the word of the rulers extends to the ends of the earth, and very many of the factors which previously precluded a World State have been abrogated. It is even possible to maintain that modern communication, which forces us to adjudicate the international claims of different broadcasting systems and different aeroplane nets, has made the World State inevitable.' In the 1950 edition these words conclude their chapter, whereas in the second edition Wiener follows on with a section that somewhat dampens them. Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society*, 1st ed. (London: Eyre / Spottiswoode, 1950), 102; Wiener, *HUHBb*, 82.

2.3 A prodigious robot

I shall attempt to show that such a monstrous fusion of Leibniz and Hobbes' notions of the image of creation is implicit in Wiener's own notion. Wiener frames the theological notion of the 'image' around the following rhetorical question,

> God is supposed to have made man in His own image, and the propagation of the [human] race may also be interpreted as a function in which one living being makes another in its own image. In our desire to glorify God with respect to man and Man with respect to matter, it is thus natural to assume that machines cannot make other machines in their own image; that this is something associated with a sharp dichotomy of systems into living and non-living; and that it is moreover associated with the other dichotomy between creator and creature.
>
> Is this, however, so?[77]

which later continues,

> Man makes man in his own image. This seems to be the echo or the prototype of the act of creation, by which God is supposed to have made man in His image. Can something similar occur in the less complicated (and perhaps more understandable) case of the non-living systems that we call machines?
>
> What is the image of a machine? Can this image as embodied in one machine, bring a machine of a general sort, not yet committed to a particular specific identity, to reproduce the original machine, either absolutely or under some change that may be construed as variation? Can the new and varied machine itself act as an archetype, even as to its own departures from its own archetypal pattern?
>
> It is the purpose of the present section to answer these questions, and to answer them by 'yes.'[78]

Wiener's framing is not of Hobbes' image of humans collectivised into a transcendent 'mortal God', but the Leibnizian one of imitating God by means of creating a *creature* to whom one's relationship is that of *creator*; of imitating God's image through constructing an *échantillon architectonique* and of thereby becoming in regards to it a patriarchal little God. In so doing 'man' the creature becomes 'Man' the creator. But it is not the capacity for humans to be creators of machines ('to glorify … Man with respect to matter') that Wiener sees problematic – this is taken for granted – but rather the capacity for matter to become creator, machines to reproduce, to become creator Machines. For the machine itself to transcend its own status as a mere 'archetypal pattern', an *échantillon architectonique*. But this poses an immediate dilemma: if the Machine possesses the divine power of creation, then what becomes of Man, no longer master of machines, but the machine's *competitor*?

Writings on the danger of competition between humans and cybernetic machines have tended to fixate on the threat of automated machines to human labour, or

77. Wiener, *God and Golem,* Inc., 20.
78. Ibid., 36.

the persistence of human civilisation as such. Indeed these were certainly major concerns for Wiener, who, prior to even the publication of *The Human Use of Human Beings* made efforts to forewarn that the 'automatic automobile assembly line' could provoke disastrous mass-unemployment.[79] This echoes Marx's writings of the 'automatic factory' governed not by humans but a self-regulating automaton who subordinates human workers to its autocratic subjectivity and tends towards their elimination.[80] It preempts the warnings of Donald N. Michael and the Ad Hoc Committee on the Triple Revolution who would in the early 1960s formalise the notion of mass unemployment (or 'disruption' as Michael puts it) of labour by computers and cybernetic machines into the term *cybernation*.[81] Evidence suggests Wiener encountered such a socialist tradition at an early age via his father's translation of the great Yiddish labour poet Morris Rosenfeld.[82] It also speaks from the related tradition of science fiction works such as Samuel Butler's *Erewhon* (1872), Wiener's reading of which emphasising the reduction to slavery of human labour through its competition with mechanical 'slaves'.[83] Similarly from Karel Čapek's play *R.U.R.* ('Rossum's Universal Robots') which, as Jessica Riskin argues, was more about 'clones' in a relation of *slavery* to their creator than about metallic men.[84] Following Riskin, Čapek's play, in which robots liberate themselves from human bondage – they win the competition – was more an indictment against industrial capitalism, and this is certainly reflected in Wiener's prologue to its May 1950 performance in Boston, which, alas, is documented only by a short report published in the *New York Times*.[85] Thomas Reid's discussion of this event emphasises how Wiener focused on machines

79. 'Letter to Walter Reuther', as reproduced in David F. Noble, *Progress Without People: New Technology, Unemployment and the Message of Resistance* (Toronto: Between the Lines, August 13, 1995), 161–63; For Noble's commentary, see pp. 63-64. See also, Norbert Wiener, 'The Machine Age,' *The New York Times* (New York), May 2013, 7.

80. Karl Marx, *Capital*, trans. Ben Fowkes, with an introduction by Ernest Mandel, vol. One (1976), I.XV.4, 544–53.

81. The Ad Hoc Committee on the Triple Revolution, *The Triple Revolution* (April 6, 1964), 5; Donald N. Michael, *Cybernation: The Silent Conquest* (Santa Barbara, CA: Center for the Study of Democratic Institutions, 1962); Donald N. Michael, 'Automation,' *The New York Review of Books*, November 25, 1965, Kline, *The Cybernetics Moment*, 214–16; Rid, *Rise of the Machines*, 100–12.

82. Norbert Wiener's father Leo Wiener, who commanded 'some forty' languages, was the pioneering founder in 1896 of Slavic Studies at Harvard University. Among his translations done while Norbert was a child, was the first translation of Morris Rosenfeld, published as *Songs from the Ghetto* (1898). The motif of its opening poem 'The Sweat Shop' is the transformation of man into the slave of the machine, featuring such withering verses as: 'In its sound I hear only the angry words of the boss; In the two hands I see his gloomy looks. The clock, I shudder, – it seems to me it drives me and calls me "Machine," and cries out to me: "Sew!" '. Morris Rosenfeld, *Songs from the Ghetto*, trans., with an introduction by Leo Wiener (Boston: Copeland / Day, 1898), 3; Wiener recounts his father's translation of Rosenfeld in, Wiener, *Ex-Prodigy*, 55, 146, 235–36; and Norbert Wiener, *I Am a Mathematician: The Later Life of a Prodigy* (Cambridge, MA: MIT Press, 1956), 18, 48.

83. Wiener, *Cybernetics*, 27; Wiener, *HUHBb*, 159.

84. Jessica Riskin, *The Restless Clock: A History of the Centuries-Long Argument over What Makes Living Things Tick* (Chicago & London: University of Chicago Press, 2016), 296–300.

85. W. K., 'Revival of R. U. R. With New Prologue: Presenting Palomilla As Plato Said,' *The New York Times* (New York), May 7, 1950,

undermining taking 'the bread from the mouths of our workers.'[86] One could invert this fear, as Louis Chude-Sokei does, into the 'late imperial anxieties' of white masters fearing that their racialized *and therefore mechanised* colonised subjects would revolt against them.[87] But whereas Rid portrays Wiener's prologue to *R.U.R.* as being resolutely within a conventional labour tradition, he neglects to mention its closing remarks.

Wiener opened the Boston performance of *R. U. R* by reference to the *Republic*'s argument that the ship of state should be steered by philosopher kings, calling for 'poet engineers' or 'engineer poets' to prevent the condition whereby 'humanity as a whole can be ruled by nothing less than men who span the whole of humanity'; how they would be necessary to ensure that cybernetics is not employed 'for vain ostentation or to satisfy the lust for power, [which] can lead only to damnation', but rather 'to some purpose which we recognize as righteous and which transcends all petty private ambitions.' This is not an argument reducible to the threat of automation upon labour; nor is it an existential 'facile humanism' of the sort that Gilbert Simondon critiques.[88] It repeats Wiener's call in *The Human Use of Human Human Beings* for philosophers and anthropologists to steer humanity away from the 'manifold dangers' of the 'mechanization of the world as a great super-human apparatus working on cybernetic principles.'[89] Whilst refusing to be oblivious to the very real threat of machine automation to human labour, Wiener's claim in his introduction to *R. U. R.* is that the real threat of the automaton, the machine made in the image of nature, is the nature of its human element: economically, that of the owners of new automatic factories, but moreover politically, those who would exploit the evils of machines for their own 'lust for power' that could globally 'span the whole of humanity.' What Čapek's play reveals via Wiener's prologue is comparable to Čapek's Prague contemporary Franz Kafka's 'photo' of his father as depicted by Deleuze and Guattari: an image which is 'expanded beyond all bounds … a political *map* of the world.'[90] But whereas Deleuze and Guattari's Kafka concerns a psychoanalytically pathological

86. Rid, *Rise of the Machines*, 83–85.

87. Louis Chude-Sokei, *The Sound of Culture: Diaspora and Black Technopoetics* (Middletown, Conncticut: Wesleyan University Press, 2016), 16; Louis Chude-Sokei, 'At the Borders of Flesh: A Secret History of Race and Technology,' October 2016, accessed September 12, 2017, https://backdoorbroadcasting.net/2016/10/louis-chude-sokei-at-the-borders-of-flesh-a-secret-history-of-race-and-technology/.

88. Simondon's *Modes of Existence of Technical Objects* is aimed against the 'primitive xenophobia' of a 'facile humanism' whereby the technical object is construed as a 'stranger' of a foreign reality to man. Whereas Wiener regards automation as a secondary problem consequent of cybernetics, Simondon altogether denounces the fear of autonomous 'robots' as myth and stereotype. Real servitude for Simondon is not of man to robot, but of alienation from the technical reality which constitutes human reality. Wiener would be less concerned with such an existential dilemma than the material relations of domination amongst humans by means of their techniques, as well as their making their habitat uninhabitable. Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cécile Malaspina and John Rogove (Minneapolis, MN: Univocal, 2017), 15–21

89. Wiener, *HUHBb*, 158–59.

90. Gilles Deleuze and Félix Guattari, *Kafka: Toward a Minor Literature*, trans. Dana Polan (Minneapolis, MN: University of Minnesota, 1986), 9–15.

'Oedipalisation of the universe' which symbolically concerns the author's father, the globalisation of the image of a new 'earth god' which Wiener's Čapek depicts is very real. The image of *this* machine of damnation is not intended to be an 'exaggeration'. It is exactly what is at stake in the Manichean terrain of the cybernetic age, the age reflected by the image of the internet, which institutes a clamour for power whose ultimate prize is that of Leibniz's God, the secret governance of all men. By referring to Platonic poet engineers, Wiener's analogy to the *ship* of state is prescient, since it is the *kybernetes* who steers the ship, the cybernetician.

This is the threat of a World State and 'prodigious Leviathan' to which the *Human Use of Human Beings* is intended to be a warning, as depicted most starkly by Dubarle's *Le Monde* review of *Cybernetics* of which Wiener was so fond:

> The *machines à gouverner* will define the State as the best-informed player at each particular level; and the State is the only supreme co-ordinator of all partial decisions. These are enormous privileges; if they are acquitted scientifically, they will permit the State under all circumstances to beat every player of a human game other than itself by offering this immediate dilemma: either immediate ruin, or planned co-operation. This will be the consequences of the game itself without violence. The lovers of the best of worlds have something indeed to dream of![91]

What Wiener finds so compelling in Dubarle's review, which alludes to both Hobbes and Leibniz by referring to a 'prodigious Leviathan' and 'The lovers of the *best of worlds* have something indeed to dream of!', is his appreciation of Wiener's argument concerning the new cybernetic strategic game of power and knowledge, his emphasis on the 'human processes which may be assimilated to games'.[92] What is the State but the player who has acquired the most information? Who has imitated the being of nature, via Leibniz, and has come out a new Hobbes?

Preempting Simondon,[93] Wiener argues that Dubarle's *machine à gouverner* is 'not frightening because of any danger that it may achieve autonomous control over humanity', since learning machines are 'helpless by themselves', but rather because they,

> may be used by a human being or a block of human beings to increase their control over the rest of the human race or that political leaders may attempt to control their populations by means not of machines themselves but through political techniques as narrow and indifferent to human possibility as if they had, in fact, been conceived mechanically.[94]

This is a competition of control. How does one compete against a human or block of humans in the game of control when they have such a vastly superior apparatus

91. *HUHBa*, 206–09, *HUHBb*, 155–57.
92. Wiener, *HUHBb*, 156. Emphasis added.
93. Simondon, *On the Mode of Existence of Technical Objects*, 15–21.
94. Wiener, *HUHBb*, 158–59.

of communication and control at their disposal? When they have the resources to combat the 'information deluge'[95] so much more proficiently than you?

It is the 'symbiosis' of man and machine that Wiener was fearful of, precisely the symbiosis which Licklider set out to, and succeeded in, realising. Who opened Pandora's box. By inventing the internet, Licklider's network generalised the plane of cybernetic conflict across the globe.

Hence the problem of competition with cybernetic machines for Wiener, of the creator *no longer* being the master of the machine, as *Leibniz* intended, but of a machine having become the master of its creator, as for *Hobbes*, but without any sense of contractual legitimacy, is not a competition between human and mechanical labour but of a generalised competition whose structure and machines are defined by cybernetics. It is this global and strategic field of competition that I claim orders the relations *between* networks, that constitutes an internet. It is *this* network of networks which allows a single age or society of control to be spoken of.

2.4 Wiener's theodicy

Wiener conceives of the operative image through the game of strategy. Today society is a set of games: the game of the market, politics, diplomacy, war,[96] law,[97] communication,[98] everywhere 'the game of power and money'.[99] That is, they are relations according to which a *theory of strategic games* applies. Wiener critically adopts the operative image of game theory, and axiomatic to his critique is the concept which we shall discuss in our next chapter, *homeostasis*.

Wiener frequently invoked the game theory of fellow cybernetician John von Neumann in his writings with Oskar Morgenstern: 'an arrangement of players or coalitions of players each of whom is bent on developing a strategy for accomplishing its purposes, assuming that its antagonists, as well as itself, are each engaging in the

95. J. C. R. Licklider, 'The Information Deluge,' *The John Hopkins Magazine* (Cambridge: MIT Archive, MC499, box 8), 1967,

96. 'The market is a game, which has indeed received a simulacrum in the family game of Monopoly. … Even in the case of two players, the theory is complicated, although it often leads to the choice of a definite line of play. In many cases, however, where there are three players, and in the overwhelming majority of cases, when the number of players is large, the result is one of extreme indeterminacy and instability. The individual players are compelled by their own cupidity to form coalitions; but these coalitions do not generally establish themselves in any single, determinate way, and usually terminate in a welter of betrayal, turncoatism, and deception, which is only too true a picture of the higher business life, or the closely related lives of politics, diplomacy, and war.' Wiener, *Cybernetics*, 159, 171.

97. '[A] game in which the litigants try by methods which are limited by the code of law to obtain the judge and the jury as their partners' Wiener, *HUHBb*, 98.

98. '[Benoît Mandelbrot and Roman Jakobson] consider communication to be a game played in partnership by the speaker and the listener against the forces of confusion, represented by the ordinary difficulties of communication and by some supposed individuals attempting to jam the communication.' ibid., 162.

99. Wiener, *Cybernetics*, 162; See also, Norbert Wiener, 'Some Moral and Technical Consequences of Automation,' *Science* 131 (3410 1960): 1355–1358.

best policy for victory.'[100] These *strategies* include the employment of confusion, bluff and other 'jamming forces'. With reference to the terrain envisaged by Dubarle, Wiener adds, 'This great game is already being carried on mechanistically, and on a colossal scale.'[101] The state of a society is the state of this game, which is to say, its *strategic arrangement*. There are clear Foucaultian intimations in Wiener's description of society as a 'strategic arrangement' and 'apparatus' whereby power and knowledge converge.

Wiener continues, game theory employs a flawed operative image: 'von Neumann's picture of the player as a completely intelligent, completely ruthless person is an abstraction and a perversion of the facts.'[102] 'Not even the best human brain approximates to this.'[103] This is to say, the game does not function like a 'single machine' whereby each side has unlimited capabilities and deals with its cards in the best possible way.[104] A game is not a network. It has no perfect theory since, *a priori*, 'Games with a perfect theory are not interesting'.[105] Ticktacktoe is one such example.[106] Who bothers with a game which they know from the outset precisely how to already win? The game of control is dependent on a certain degree of resistance, where control is not total, where power is not omnipotent. Burroughs' paper 'The Limits of Control' also makes this point: 'You don't control a tape recorder – you use it … When there is no more opposition, control becomes a meaningless proposition.'[107] The competitive society with players that are *not* omnipotent, is essentially not a system of 'use', of a 'single machine', or single network controlling itself, but a game of control among networks. An internet.

What does this have to do with our topic of the operative image? Wiener admits that his readers might find his emphasis on games 'remote', but insists that it raises an important *theological* problem: 'the problem of the game between the Creator and a creature.'[108] A theory of strategic games is implicit in the operative image, but once again from a theodical paradigm that returns to the problematics of Leibniz and Hobbes.

Wiener turns to the Book of Job and Milton's *Paradise Lost*, their mutual thread being the struggle between God and evil, the problem of theodicy: specifically an evil personified as the Devil. Wiener emphasises that the Devil is 'one of God's creatures', a reading especially pronounced in Milton's *Paradise Lost*, whereby Lucifer is cast as a

100. Wiener, *HUHBb*, 162–63.
101. Ibid., 158.
102. Ibid., 159.
103. Wiener, *Cybernetics*, 164.
104. Ibid., 158.
105. Wiener, *God and Golem,* Inc., 22.
106. Wiener, *Cybernetics*, 171; Wiener, 'Some Moral and Technical Consequences of Automation,' 1355–56.
107. Burroughs, 'The Limits of Control,' 38.
108. Wiener, *God and Golem,* Inc., 23.

fallen angel who leads a revolt against the rule of God and his Son. Now, even though the Devil is 'a master of subtlety', 'to play a game with an omnipotent, omniscient God is the act of a fool', so how can they play against each other? How can God and Beelzebub compete over Job's soul or for the liberty of the fallen angels if 'any uprising of the rebel angels is foredoomed to failure'? Wiener's answer is that 'God is something less than absolutely omnipotent'. God's conflict with his creation is very real, which is to say, the Devil (his creature) has a degree of power and liberty, he does not 'derive all its possibility of action from God himself.'[109]

Theodicy, says Wiener, teaches that in the act of playing a game with one's creation, with one's constructed machine, the 'inventor has arrogated to himself the function of a limited creator.'[110] To construct a machine with which one can play against is essentially to diminish one's potency. Let us phrase this in the (cybernetic) language employed by Burroughs: to be engaged in a struggle of *control* (to modify another's behaviour) is to admit that you cannot simply *use* them and that, moreover, whilst they can neither simply use you, they have the capacity to *control* you. Control is an essentially finite, imperfect means of exerting power, with an infinite, endless potential. The power of a *machine à gouverner* will never be total, since 'total control' is a contradiction in terms. But it can be vastly in excess of one's own control.

2.5 The Wiener Test

Why is Wiener drawn to the problem of theodicy? Because he has conceived of a machine which reflects a new universal image of creation which *learns*, a '*learning machine*', and it threatens to make the 'little god' of man the creator of a living evil. The internet itself is a learning machine, which automatically learns the best routes for its traffic. A network itself, as a microcosm of the entire internet, is also a machine which learns, doing so for its own gain.

Wiener argues that if one can play a game against another, then they have a life of their own. This is because they have the capacity to develop a strategy of resistance against you, however feeble. This is say, they *learn*.

Wiener is intimating Alan Turing's famous test, whereby the intelligence of a machine and its capacity to 'think' is accredited through an 'imitation *game*' whereby the machine must trick a human into believing it to be a fellow human, by means of formulating an adequately 'natural' language conversation over a computer network.[111] What might be called the *Wiener Test* differs from this on a number of accounts.

Turing's game takes a binary answer. 'Can the machine think?' Yes or No. Either

109. Wiener, *God and Golem,* Inc., 23–24; See also, Wiener, *HUHBb*, 165-66.
110. Wiener, *God and Golem,* Inc., 25.
111. Alan M. Turing, 'Computing Machinery and Intelligence,' *Mind* 59 (236 1950): 433–460.

the machine can think because it has fooled the human, or it has not so it cannot. It is anthropocentric. Human intelligence is construed to be the gold standard of intelligence. And this human intelligence is that of a universal human subject who, as Hayles argues, has no embodied and historical situation:[112] are we talking about Alan Turing being the judge of intelligence or a fifteenth century serf who would have considered a clockwork goose to be alive?

The 'Wiener Test', as it might perhaps be called, asks whether a game can be played against a machine at all, which is to say, whether a mutual contest to alter one another's behaviour, to control each other, can be engaged. In this sense it has vastly lower expectations than the Turing Test, but this is because it refers to an infinity of degrees of intelligence rather than a binary two. In *The Human Use of Human Beings* Wiener plays his game with a kitten. He calls to it and it looks up, registering his message, changing its behaviour, and thereby being controlled. Then the kitten 'lets out a pitiful wail' and it is Wiener who, alerted to its hunger, is controlled, since it is his behaviour which has been changed.[113] This simple sequence exemplifies to Wiener that the kitten is 'moderately intelligent'. This is a game that can be played by humans with their inventions, or God with his. The question of whether a being can pass for a human in its communication, can 'speak human', critical for Turing, is irrelevant for Wiener. What is at stake for him is rather the *degree* of intelligence, which is the same as to say its degree of learning, adaptability and 'life'. This is to say, *homeostasis*.

A being is 'alive' if it is an 'organised system' which 'learns'. An organised system is that system (call it a human, computer, network, organism, kitten or just a 'box') which transforms an incoming message into an outgoing message based on its internal principle of transformation. Wiener tells us that if, to this principle of transformation, a criterion of performance or a telos is attributed, and if the principle of transformation is adjusted so as to tend to generally improve its performance, then it can be said to 'learn'. To learn is to adjust the principle by which an input is transformed into an output in such a way that the output can be said to be better than it had been formerly.[114]

Wiener's first example of this was the coupling of his WWII anti-aircraft predictor (AA predictor) and the self-regulating organism in 'Behavior, Purpose, Teleology' (1943) with Arturo Rosenblueth and Julian Bigelow.[115] The AA predictor neatly materialises this schema: its incoming signal or *input* is the light from an aeroplane hitting its photoreceptors over a period of time, recorded as a temporal series in its

112. N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago & London: University of Chicago Press, 1999), xi–xiv.
113. Wiener, *HUHBb*, 23.
114. Wiener, *God and Golem,* Inc., 21.
115. Norbert Wiener, Arturo Rosenblueth, and Julian Bigelow, 'Behavior, Purpose, Teleology,' *Philosophy of Science*, no. 10 (1943): 18–24.

memory; its outgoing message, or *output*, is a missile; its *principle of transformation* which calculates where to fire the missile has as its *telos* the interception of the enemy aeroplane. Through successive images received by its photo-receptors, the AA predictor *adapts* its principle of transformation so that it chooses the most likely coordinates of the enemy plane in the time taken for a surface-to-air missile to reach its altitude; and then it sends an output, so to speak, of its own to the aeroplane, with the hope of successful delivery.

In the same founding paper this learning machine is depicted as a cat who induces from observation the 'extrapolated future position' of its prey,[116] and Wiener would later write of the 'very complicated' outgoing and incoming messages at play when the kitten swipes at a swinging spool with one paw and then catches it with the other.[117] The capacity for any being, whether human, missile, cat or computer, to achieve ends by means of learning with respect to their environment or opponent is the signifier, for Wiener, of its being alive. This is because, following from the nineteenth century traditions of *homeostasis* and natural selection, the concept of life itself is defined as that which is capable of adaptation.

With this chapter I have claimed this to be distinct from two philosophers cast as representative of the age of clocks, Hobbes and Leibniz, arguing that let loose is a monstrous fusion of the two akin to Koselleck's depiction of the early Masons: an opaque machine through which domination occurs without contract. I have attempted to show that the 'operative image' of cybernetics is the internet, and every internet is a site of strategic conflict among learning networks which aim towards the control of other networks. The question now becomes, is society as a whole a learning machine? Can we speak of *homeostasis* on the level of the internet itself?

116. Wiener, Rosenblueth, and Bigelow, 'Behavior, Purpose, Teleology,' 3.
117. Wiener, *HUHBb*, 23.

Chapter 3

Engines

'Information is information, not matter *or energy*.'[1] If the former chapter attempted to distinguish the operative image of the internet from that of the clock, taking Hobbes and Leibniz as its representatives, this attempts to do so by means of the steam engine, which in Canguilhem's words constitutes the 'paradigmatic machine' of the nineteenth century.[2] What distinguishes the engine from the clock in the cybernetic schema is not its capacity for superior strengths or speeds, but its capacity to 'take cognizance of what has already been said',[3] the principle of feedback. In the 1780s James Watt, inspired by developments in British windmills,[4] added a mechanism to his steam engine to automatically regulate its behaviour such that it would automatically maintain a steady dynamism, increasing and decreasing its inputs of energy in order to maintain a regular output. This was the 'flyball *governor*' after which Wiener, Hellenising, named 'cybernetics', and on which James Clerk Maxwell wrote in 1868, in Wiener's words, 'the first significant paper on feedback mechanisms'.[5] Whereas according to Wiener the behaviour of the clock is pre-established by the clock maker and can only be corrected by an external hand, the steam engine can, so to speak, keep itself alive. The self-regulation of a cybernetic machine is absolutely fundamental to cybernetics, which reformulates it as the *negative feedback loop*, the capacity for a mechanism to oppose or restrain its behavioural output and maintain stability. This is distinguished from *positive feedback loop* wherein an output is amplified into instability. The chapter asks how the thermodynamic and cybernetic operative images differently interpret self-regulation.

In order to distinguish the concept of self-regulation in the Age of Clocks and Internet, I shall focus my reading of the operative image of the self-regulating steam

1. Wiener, *Cybernetics*, 132. Emphasis added.
2. Georges Canguilhem, *A Vital Rationalist*, ed. François Delaporte, trans. Arthur Goldhammer, with an introduction by Paul Rabinow (New York: Zone Books, 1994), 85.
3. Wiener, *HUHBb*, 132.
4. Otto Mayr, *The Origins of Feedback Control* (Cambridge, MA: MIT Press, 1970), 90–108.
5. Wiener, *Cybernetics*, 11; Wiener, *HUHBb*, 132; Maxwell, 'On Governors.'

engine around the 'discovery' of the self-regulating organism by Claude Bernard, the great French experimental physiologist, and his American follower in the century to follow, Walter Cannon. The latter would formalise Bernard's theory into the prescient term 'homeostasis', extend the concept into the social realm, and in the last months of his life persuade Wiener and Arturo Rosenblueth, with whom he had coauthored a late work on the automatic regulation of the nervous system,[6] to pursue the 'line of work' that would lead to *Cybernetics*.[7] Therein lies a direct genealogy from Bernard to Cannon to Rosenblueth and Wiener, to each a certain homeostasis of concepts, but between Cannon and the cyberneticists a fundamental *discontinuity*.

Homeostasis is not a concept without its adversaries. Significant critiques have been launched at Wiener's cybernetics on behalf of those who consider self-regulation to obscure the self-*organising* principle of organisms, or who condemn its analogy with machines, notably N. Katherine Hayles, Francisco J. Varela and Hans Jonas (a former student of Heidegger). Canguilhem's critique of the employment of homeostasis in the social realm is also assessed. I argue that the ambition of every network is to maintain homeostasis, or 'negative feedback', for itself despite the costs to others.

Although Hippocrates taught that the body has a natural propensity to compensate for illness and heal itself,[8] the foundation of the *modern* concept of self-regulation is perhaps the invention of the thermometer in 1592, supposedly by Galileo.[9] It allowed Italian physician Sanctorio Sanctorius to note in his *De Statica Medicina* (1614) the body's remarkable capacity to maintain a constant temperature despite illness. As the instrument's precision grew with the replacement of water for wine and, by 1670, mercury, it became possible to accurately measure the temperature of bodies. In 1714 German physicist Gabriel Fahrenheit afforded this temperature to be quantified through setting the thermometer's zero-degree to be the temperature of sal ammoniac in his hometown at winter(!), establishing the body's constant temperature to be 96 degrees. Swedish astronomer Anders Celcius, having constructed a thermometer of his own, simultaneously conceived of a less arbitrary measurement schema. The realisation that the temperature of the body not only remained constant but held the 'power' to 'destroy heat' and 'generate cold' when the 'atmosphere exceeded the proper temperature', and vice versa, heat in the cold, was the discovery of two

6. Walter B. Cannon and Arturo Rosenblueth, *Autonomic Neuro-Effector Systems* (New York: The Macmillan Company, 1937).

7. This is why it should not be surprising that Rosenblueth and Cannon are the first names mentioned in the introduction to *Cybernetics*. See, Wiener, *Cybernetics*, 1, 16–17.

8. Georges Canguilhem, *Writings on Medicine*, trans. Stefanos Geroulanos and Todd Meyers (New York: Fordham University Press, 2012), 72.

9. This paragraph reads from, L. L. Langley, ed., *Homeostasis: Origins of the Concept* (Stroudsburg, PA: Dowden, Hutchinson & Ross, 1973), 1–4; And, L. L. Langley, *Homeostasis* (London: Chapman & Hall, 1965), 1–10.

eighteenth century Royal Society members, Charles Blagden (1714–1820) and John Hunter (1728–1793). The trajectory of these early discoveries was to culminate in the work of the French experimental physician Claude Bernard.

Bernard would discover the tendency towards a certain 'fixity' not only in an organism's temperature, but its gastric juices, liver function and nerve dilation.[10] By no later than 1859 had he established his principle, '*La fixité du milieu intérieur est la condition de la vie libre*.'[11] That a 'higher organism', a warm blooded animal, possesses a certain freedom in not being 'chained' to the conditions of its environment, because of its capacity to 'regulate the harmony' of its internal environment by means of a 'compensatory mechanism' innate to the nervous system: 'It is the nervous system, we have said, that provides the mechanism for compensation between intake and output.'[12] We find already here in Bernard's writings the notion of a self-regulating mechanism with input and outputs, so fundamental to cybernetics, and this is so because the organism is conceived being the *inner* environment [*milieu intérieur*] with respect to an *outer* environment, and the 'intakes' and 'outputs' function as principles of traversal. The self-regulating organism is that which is able to compensate for adjustments for the intake of its outer environment through adjusting the output of the mechanisms constitutive of its inner environment.

Now, even Canguilhem criticises Bernard for seeming to have 'forgotten' that the 'paradigmatic machine of his era was the steam engine', after Bernard distinguishes 'mechanical machines' from 'organic machines' on the basis of the former being 'fixed' and 'immutable' and the other being 'flexible' and 'elastic'.[13] And Hayles argues that Bernard's thesis was extended to machines only in the 1940s, presumably meaning by cyberneticians.[14] It seems as though this passage from Bernard's *Introduction to Experimental Medicine* (1865) is what has been forgotten:

> A living machine keeps up its movement because the inner mechanism of the organism, by acts and forces ceaselessly renewed, repairs the losses involved in the exercise of its functions. Machines created by the intelligence of man, though infinitely coarser, are built in just this fashion. A *steam engine*'s activity is independent of outer physico-chemical conditions, since the machine goes on working through cold heat, dryness and moisture.[15]

Exactly as do Hobbes and Leibniz with respect to their operative image, Bernard construes life to be not even analogous with that of his age, but continuous to a

10. Charles G. Gross, 'Claude Bernard and the Constancy of the Internal Environment,' *The Neuroscientist*, September 1998, 380.

11. Langley, *Homeostasis*, 4.

12. Claude Bernard, 'Lessons on the Phenomena of Life Common to Animals and Vegetables. Second Lecture: The Three Forms of Life,' in Langley, *Homeostasis*, 129–150, especially 146–47.

13. Canguilhem, *A Vital Rationalist*, 85–86.

14. Hayles, *How We Became Posthuman*, 8.

15. Claude Bernard, *Introduction to Experimental Medicine*, trans. Henrey Copley Greene, with an introduction by Lawrence J. Henderson (Henry Schuman, 1949), 121. Emphasis added.

'coarser' degree. It is not only that, following François Madendie and the *Ideologues* (A. L. C. Destutt de Tracy and Pierre Cabanis), Bernard was adamant that biology should contend on the same experimental materialist plane as chemistry and physics, denying vitalist principles or substantive dualism, although he allowed for emergent properties from the complexity of matter.[16] Or only that the notion of a *milieu* in biology stems from the French translation of Newton's 'fluid' (in particular, ether) which Lamarck and Hippolyte Taine had imported from mechanics into biology.[17] It is that the continuity between organism and self-regulating machine is already there in Bernard's writings. Wiener did not have to invent this continuity between homeostatic organism and machine to depict the organic body in terms of an inorganic 'inner economy', whose elements consist in 'an assembly of thermostats, automatic hydrogen-ion-concentration controls, governors, and the like, which would be adequate for a great chemical plant.'[18] He was continuing its tradition from Bernard.

It should be added that it was not only on the level of an individual organism with respect to its environment that the nineteenth century saw this operational image expressed, the *ontogenetic* level, but also on level of a collective species adapting itself with respect to other collectivities, the *phylogenetic* level. As Wiener knew,[19] in the first paper of the theory of evolution by natural selection, Alfred Russel Wallace's 'On the Tendency of Varieties to Depart Indefinitely from the Original Type' (1858) – which was well known to Charles Darwin[20] – the operative image of the steam engine is also at stake:

> The action of this principle is exactly like that of the *centrifugal governor of the steam engine*, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow.[21]

Gregory Bateson, apparently also unaware of the passage of Bernard's above, argues that were Wallace's passage to have been adequately noted, 'The whole cybernetics movement might have occurred 100 years earlier'.[22] This seems to reveal a conflation of the operative image of the steam engine and that of the internet, which I reject. Bateson would not be alone in this however, as we shall see.

16. Gross, 'Claude Bernard and the Constancy of the Internal Environment,' 380–81.
17. Georges Canguilhem, 'The Living and Its Milieu', in *Knowledge of Life*, 99–100.
18. Wiener, *Cybernetics*, 115.
19. Ibid., 36.
20. The claim over authorship of the concept of natural selection between Wallace and Darwin could well have degenerated into a rancour comparable to that of Leibniz and Newton over the discovery of calculus, were it not for Wallace's magnanimous reticence to contest it for himself. Both Wallace and Darwin received awards for what was frequently referred to as the Darwin-Wallace Theory until into the twentieth century. Beccaloni, *Alfred Russel Wallace and Natural Selection: the Real Story*.
21. Wallace, 'On the Tendency of Varieties to Depart Indefinitely from the Original Type,' 32. Emphasis added.
22. Bateson, *Mind and Nature*, 43.

3.1 Homeo-stasis/Homo-statics

Walter Bradford Cannon was born in Wisconsin in 1871, seven years after Bernard's death in Paris. In the French translation of his major work *The Wisdom of the Body* (1932) (though not in the original English edition) he leaves an appropriate accreditation to Bernard's influence, writing: 'The central idea of this book, "the stability of the inner medium of the organism in higher vertebrates," is directly inspired by the precise views and deep understanding of the eminent French physiologist Claude Bernard.'[23]

While Bernard may describe the organism in terms of the operative image of the day, opening up the possibility for its broader application, he does not push his concept further than the individual organism. *Cannon does*, applying it as a model for understanding human behaviour behaviour as such, on an individual and social level. It is this expansion – albeit one rooted firmly in experimental biology – which opens the way for cybernetics to project the model of the self-regulating machine onto all beings, albeit, with a twist. It is Cannon who first describes the self-righting mechanism as one of '*learning*', and who in 1926 invents the rich neologism for this, *homeostasis*.[24] Bernard invents the concept, Cannon invents and extends the term.

What's in the word, 'homeostasis'? Cannon explains how he conceived of this neologism carefully.[25] *Homeo*, from Greek *homoio* to indicate 'likeness' or 'similarity', with their connotations of degrees of variation rather than the 'fixed' and 'rigid constancy' of *homo*, 'sameness'. This is consistent with Jean-Pierre Vernant and Nicole Loraux's translations, wherein *homoio* stands for 'equality', 'alikeness' and 'interchangeability'.[26] And it is consistent with Bernard's depiction of the organism as 'elastic' and 'flexible' rather than 'fixed' and 'immutable'.[27] *Stasis* – whose political sense is unmentioned though is, as we shall see, implicit – to indicate a condition of immobility and stagnation that is 'so peculiarly physiological' as to warrant distinction from the 'relatively simple' division of mechanics known as *statics*, which is concerned with physical systems whose 'action of forces' totals a certain balanced rest.[28] Homeostasis names the telos of every organism, the criterion of performance of its principle of transformation. In Bernard's words: 'all the vital mechanisms, however varied they

23. Translated by, Langley, *Homeostasis*, 2. Cannon does, though accredit Bernard within the body of *The Wisdom of the Body*, though only on p. 37, and within his essays, notably, 'Organization for Physiological Homeostasis' (1929), pp. 399–400.

24. Walter B. Cannon, 'Physiological Regulation of Normal States: Some Tentative Postulates Concerning Biological,' in *Selected Readings in the History of Physiology*, ed. John Farquhar Fulton (1926), 329–332.

25. Walter B. Cannon, 'Organization for Physiological Homeostasis,' in Langley, *Homeostasis*, 251.

26. Jean-Pierre Vernant, *The Origins of Greek Thought* (London: Methuen, 1982), 61; Nicole Loraux, *The Divided City: On Memory and Forgetting in Ancient Athens*, trans. Corinne Pache and Jeff Fort (New York: Zone Books, 2006), 54.

27. Canguilhem, *A Vital Rationalist*, 85–86.

28. Cannon, 'Organization for Physiological Homeostasis,' 251.

may be, have only one object, that of preserving constant the conditions of life in the internal environment.'[29] Wiener refers to this as 'our homeostatic mechanism'.[30]

Cannon's careful definition of homeostasis leaves a second concept implicit. If the living organism is characterised by homeostasis, then the non-living could be said to be characterised by what might be formulated as '*homostatics*', with an adjective form of '*homostatic*', inverting Cannon's neologism.[31] Such a rigid, unchanging thing – with the sense of moralism intentional – which returns to precisely the same position (should it have the energy) might be an appropriate description of the clock. Hence implicit in the concept by which the operative image of the steam engine is distinguished, is that which repudiates the operative image of the former age. That which is hom*eo*static has an internal source of activity, that which is hom*o*static relies on another for its source of dynamism. Is this a difference of degrees or kind? Certainly for Wiener, the difference between something that has hom*eo*stasis and that which might be attributed with hom*o*statics is one of degrees. The differential of theses degrees between two things, two networks, is the differential of control of one over another.

Cannon never seems to appreciate that the very term 'homeostasis' implies conflict, in a fundamentally martial and political sense, although this is anticipated in Bernard's writings:

> We have said that life cannot be explained, as it has been believed, by the existence of an internal principle of action acting independently of physico-chemical forces, and, above all, contrary to them. *Life is conflict*.[32]

How is this *conflict* essential to life to be understood? Scholars of the Greek world, Vernant and Loraux, have both written on the condition of *stasis* – civil war – in Greek society. *Homoioi*, Vernant writes, designates the equality of 'men who were alike' (emphasis on *men*) such that they could be interchanged for one another.[33] This equality was such that the Greeks could employ machines to allot jurors by the fall of black and white marbles.[34] *Homoioi* would become *isio*, 'equals', and the Polis, the city State, would be structured by *isonomia*, equal participation of all citizens in the exercise of power, when Solon, the 'man of the middle', would declare debt slavery void, thereby ending the *stasis* (civil war) and distributing *cratos* (sovereignty, power)

29. 'No more pregnant sentence was ever framed by a physiologist,' said J. S. Haldane of this in 1922. Haldane identified the self-regulatory function of breathing and was the father of Wiener's friend, J. B. S. Haldane. Bernard, 'Lessons on the Phenomena of Life Common to Animals and Vegetables. Second Lecture: The Three Forms of Life,' 149; Cannon, 'Organization for Physiological Homeostasis,' 251.

30. Wiener, *Cybernetics*, 114–15; Wiener, *HUHBb*, 85–86.

31. I recognise that the adjective might be easily confused with the unfortunate adjectival form of 'homeostasis' that Cannon employs, 'homeostatic', but I have not been able to find a better term.

32. Bernard, 'Lessons on the Phenomena of Life Common to Animals and Vegetables. Second Lecture: The Three Forms of Life,' 129. Emphasis added.

33. Vernant, *The Origins of Greek Thought*, 61; Loraux, *The Divided City*, 54–55.

34. On the *kleroteria* see, http://agathe.gr/democracy/the_jury.html.

to the *demos* (the people). The universal *isonomia* would be equal with respect to the democratic, public and depersonalised *meson* (centre) of power, the Agora, which Vernant's description of Greece in Anaximander's map befits: a 'common mediator … through which all elements are related'.[35] Peace, as annulment of *stasis*, was not at the centre of the Polis. 'The Agora and the battlefield are indissoluble', says Loraux, at the centre of the Agora is the *agōn*.[36] Democracy is constituted by citizens taking sides and standing (*histēmi*) against one another, for only in doing so can a city divided by civil war (*stasis*, whose roots are in *histēmi*) come back together. The apathetic citizen will have their rights stripped, 'he will be politically dead – as if *stasis* had taken on the role of civic duty.'[37] *Stasis* is the occasion for the political life of the Polis.[38] The middle around which all are equal, *homoioi*, is the place where two conflicts, *stasis*, two standings, become the single life of the Polis.

But this is a certain kind of conflict that is also the reason for its harmony. Whether Cannon knew it or not, 'homeostasis' as the *stasis* of the *homoioi* refers to the conflict governing the threshold between inside and outside that the living being at any one moment *is*. It not only names the life of the organism after Bernard, but the occasion of the democratic organisation after Solon. In this sense homeostasis names a tense ambivalence of conflict and harmony, war and accord, inside and out. Bernard would express this ambivalence when he says:

> For us, in a word, life results from a conflict, from a close and harmonious relation between the external conditions and the pre-established constitution of the organism. … It is not by warfare against the cosmic conditions that the organism develops and maintains itself, but on the contrary, by an adaption, an accord with them.[39]

I read this ambivalence to reflect the depiction of *stasis*, civil war, portrayed by Giorgio Agamben. Rebutting the definition of *stasis* as meaning a 'war within the family', Agamben argues that it marks a 'threshold of indifference' between inside and outside, home and city, intimate and foreign, and between 'blood kinship and citizenship'.[40] What could be a better way of describing the relation of *milieu intérieur* to the environment outside given that Bernard at first identified the former wholly with blood,[41] so much so that Cannon translates *milieu intérieur* as 'fluid matrix'?[42] Agamben's hypothesis is that 'in the system of Greek politics civil war functions as a

35. Jean-Pierre Vernant, *Myth and Thought among the Greeks*, trans. Janet Lloyd and Jeff Fort (London: Routledge & Kegan Paul, 1983), 190–208.
36. Loraux, *The Divided City*, 99.
37. Ibid., 103. See in general, 98–104.
38. Caygill, *On Resistance*, 9.
39. Bernard, 'Lessons on the Phenomena of Life Common to Animals and Vegetables. Second Lecture: The Three Forms of Life,' 129.
40. Giorgio Agamben, *Stasis: Civil War as a Political Paradigm*, trans. Nicholas Heron (Stanford, CA: Stanford University Press, 2015), 14–15.
41. Gross, 'Claude Bernard and the Constancy of the Internal Environment.'
42. Cannon, 'Physiological Regulation of Normal States,' 399–400.

threshold of politicization and depoliticization, through which the house is exceeded in the city and the city is depoliticised in the family.'[43] *Stasis* is a function which doubly displaces, politicising the household and 'economising' (from *oikos*, house) the city, interiorising the outside as the inside is exteriorised. It ensures that there is no isolated 'substance' but rather a 'field incessantly traversed by tensional currents of politicization and depoliticization, the family and the city'.[44] Whereas the hom*o*static clock represents peace through acquiescence to another's control, hom*eo*stasis names the conflict of the constitution of a threshold of interiority and exteriority through which harmony is expressed. Where life is for Hobbes the result of acquiescence to the sovereign machine-god, and for Leibniz an acquiescence to the divine wisdom within, according to the operative image of the steam engine it is the conflict itself. This will provide the basis for the kind of conflict of network through which an internet is defined.

Though I wish to construe the *stasis* of homeostasis and Bernard's claim that 'life is conflict' along the lines of Vernant, Loraux and Agamben, it should be noted that although Bernard wrote of the 'social life of cells' he refused to enlarge his system of the constancy of the *milieu intérieur* beyond the level of the experimentally-observable organism itself, and he even shirked, for the same reason, from applying it to the organism on a phylogenetic level, as regards the evolution of species. This is why he writes of fixed and inflexible 'pre-established laws', analogous to the laws of matter, which determine the ideal type, the universality, of vital phenomena in respect of their real instantiation given the conditions of their environment.[45] These pre-established laws are vestiges of clockwork mechanism, for Bernard the *milieu* still contains the Newtonian laws of matter. Perhaps this position was over-determined by his efforts to refute Bichat's vitalist argument that the organism contrasts to physical phenomena through its anarchic irregularity.[46] Nevertheless, despite the singular prestige Bernard met in his lifetime for his work founding experimental biology, comparable within France to Einstein's around the world in the century to follow, it was only when the profound collective *phylogenetic* significance of his ideas caught on fifty years after his death that the ontogenetic thesis which is today considered synonymous with his name came to any significant attention at all.[47] Bernard provided not only a concept but the origins of a programme, a homeostasis of concepts, which would draw into

43. Agamben, *Stasis*, 16. Agamben's emphasis removed.
44. Ibid., 23.
45. Bernard, 'Lessons on the Phenomena of Life Common to Animals and Vegetables. Second Lecture: The Three Forms of Life,' 129.
46. Georges Canguilhem, *Knowledge of Life*, trans. Stefanos Geroulanos and Daniela Ginsberg (New York: Fordham University Press, 2008), 122–25.
47. Gross, 'Claude Bernard and the Constancy of the Internal Environment,' 383–84.

its interior concepts first from an evolutionary biological register and then from a social one. The collective, phylogenetic, significance of homeostasis as an evolution of organisms would lead to the idea of a collective homeostasis in the social lives of humans.

The process by which the age of the engine's image of the ontogenetic and phylogenetically hom*eo*static organism came to supplant the hom*o*static clockwork organism (or 'divine machine') that commanded over the age of the clocks occurred through a succession of evolutionary biological writings in the first decades of the twentieth century. Through their studies of the salt content of marine life, Léon Fredericq, René Quinton and Archibald Macallum would begin the process of depicting phylogenetic evolution as the increasing sophistication of the *milieu intérieur*'s regulatory capacity with respect to its environment.[48] Arguments continuous with their thesis but in regards to mammals would be made by William Bayliss and Ernest Starling, discoverers of the first hormone, Joseph Barcroft and J. S. Haldane, pioneers of the regulatory functions of breathing, and Charles Scott Sherrington, a founder of modern neurophysiology.[49] These writers would supple the eternal laws Bernard believed legislated the constitution of every organism, vestiges of the clock, into an elastic phylogenetic homeostatic mechanism, whereby the very life of a species would depend on the relentless redrafting of its laws to meet new circumstances. They would unite the entire life of the organism in its individual and collective instantiation as homeostatic. This would allow Canguilhem to write of Darwin:

> [To] live is to submit an individual difference to the judgement of the ensemble of living beings. This judgement has only two possible outcomes: either death or becoming oneself part of the jury for a while. So long as one lives, one is always judge and judged.[50]

Is not the kind of law produced by this *stasis* of the *homoio*, when the jury decrees either assimilation or death, not the peace treaty where there is no sovereign contract? This puts to rest the operative image of the clock in the sense of Hobbes' pre-established contract with the sovereign, and Leibniz's pre-established harmony of monads.

If homeostasis in the ontogenetic sense implies the conflict through which every living thing is permeated by its environment, then on a phylogenetic level it means the defined status of the collective itself is at stake. What is at stake is the very consistency of the organism in its molecular and molar state, which both become elastic.

Even so, still an organism is of a single, if shifting species. Still it is an 'individual'. When this becomes a homeostasis of networks according to the third operative image, not only will every network conflict in homeostatic 'harmony' with every other, but their allegiances become myriadic, no longer bound to a single species, but rather in

48. Ibid., 384.
49. Ibid.
50. Georges Canguilhem, 'The Living and its Milieu', *Knowledge of Life*, 105.

overlapping, shifting, paradoxical internets. Let us see how the operative image of the homeostatic engine is seen to play out in the realm of human society.

3.2 Cannon's social homeostasis

The move from the homeostasis of the organism to the homeostasis of the social organism, from the body organic to the *body politic*, was especially pronounced in the concept's American reception. In his 1935 'physiologist's interpretation' of Vilfredo Pareto's *Trattato di sociologia generale* (1916), J. B. Henderson, the American translator of Bernard's *Introduction*, argues that the theory of regulation and homeostasis in an organism agree with Pareto's argument that after small disturbances (short wars, minor epidemics and other lesser catastrophes) a social system 'will tend to restore the original state, very slightly modified by the experience.'[51] This was an argument premised on the epilogue to Cannon's *Wisdom of the Body* (1932), entitled 'Relations of Biological and Social Homeostasis'. In Cannon's book homeostasis is posed not as conflict, but a collective *emancipation from conflict itself*. Cannon not only wrote of the conventional homeostatic mechanisms of an organism (regulation of body temperature, acidity, etc.) but of homeostatic behaviours such as shivering, seeking shelter and wearing coats. Ultimately these develop Bernard's description of the self-regulating organism as 'free' with respect to its external environment into the liberty of the individual human with respect to their society, doing so through positing a harmony of body and body politic: 'steady states in society as a whole and steady states in its members are closely linked.'[52]

Cannon is able to expand from the life of the individual organism to that of the social human because he construes homeostasis in the anthropomorphic sense of a process of '*learning*' – 'the use of the word "learned" is not unwarranted', he emphasises[53] – specifically the learning of 'self-righting mechanisms'.[54] There is a *wisdom* to the body. According to Cannon, life, liberty, learning, wisdom and rightness (or, to say the same, truth) are all bound to one another in the concept of homeostasis. The concept therefore does not, for him, entail a conflict of all against all, but the prospect of a collectively beneficent liberation, a phototropism in which a society advances towards a collective self-rightness by means of its phylogenetic learning. As the most evolved organism, that with the greatest capacity for learning and self-righting, humans hold the capacity for improving such mechanisms. They can engender a universal social homeostasis.

'The main service of social homeostasis', Cannon writes, 'would be to support

51. Lawrence J. Henderson, *Pareto's General Sociology: A Physiologist's Interpretation* (Cambridge, MA: Harvard University Press, 1935), 46.
52. Walter B. Cannon, *The Wisdom of the Body* (London & NY: W. W. Norton, 1939), 323.
53. Ibid., 22–23.
54. Ibid., 25.

bodily homeostasis.'[55] If Bernard shows homeostasis to liberate the individual organism from a 'constant danger of disaster' and the 'management of the details of *bare existence*' through its automatic 'correction' of itself, then social homeostasis should liberate the individual from the 'slavery' of their own constant attention to disaster so as to become, says Cannon, 'free to enter into agreeable relations with our fellows, free to enjoy beautiful things, to explore and understand the wonders of the world about us, to develop new ideas and interests, and to work and play, untrammelled by anxieties concerning our bodily affairs.'[56] Social homeostasis releases 'the highest activities of the nervous system' from the bare existence of fending for themselves as individuals, and onto instead 'adventure and achievement'. From 'essential needs' to 'priceless inessentials'.[57]

I read this as Cannon arguing: it is *social homeostasis* which relieves the individual from Hobbes' state of nature and *stasis* of all against all, wherein there is no industry, culture, arts, letters, society, where there is 'continual fear and danger of violent death; and the life of man solitary, poor, nasty, brutish, and short.'[58] That is, the operative image of the hom*eo*static steam engine provides a challenge for the need for a Leviathan. Where Hobbes prescribes a hom*o*static clockwork body politic whose logic is pre-established, to which all must submit as cogs in order to live free from the slavery of averting the constant threat of death, Cannon suggests that the body politic automatically regulates itself due to an innate wisdom, albeit one which will be improved through the natural 'learning' of humankind, like a species of fish that evolves more effective gills.

Perhaps this automatic regulation is akin to Leibniz's pre-established harmony. Instead of the perfect clockmaster God's having established every event in advance by means of his divine wisdom, wisdom is innately within the body politic itself. Not in a prescribed hom*o*static sense, but in its automatic hom*eo*static self-adjustment. Ours – yes, even in the year of *The Wisdom of the Body*'s publication, 1932 – would be the 'best of possible worlds', because it is the expression of human society's innate wisdom. As Bernard retained an element of Newton's mechanism through his holding to the pre-established laws governing a species, Cannon could be said to cling on to the moral wisdom which the clockmaster God has pre-established in the world itself. Perhaps this is why he does not consider conflict to be implicit and essential to homeostasis. As we shall see, Wiener will eradicate any sense of an innate wisdom in the social world, and networks shall strive for their own homeostasis.

Now, the wisdom which individual and social homeostasis aspires to ensure is *stability*: 'The organism suggests that *stability is of prime importance*.'[59] Stability is more

55. Ibid., 323.
56. Ibid.
57. Ibid.
58. Hobbes, *Leviathan*, I.13, 113.
59. Cannon, *The Wisdom of the Body*, 315–17.

important than private property or economy. There is in this a justification for a certain state of exception, again, pulling us back to Hobbes for whom the Leviathan ultimately demands obedience at all cost, rather than Leibniz for whom the state should reflect divine wisdom in its judgement. *Stability at all costs.*

What does this mean? Cannon argues that whereas the *milieu intérieur* of the body is carried by blood and lymph, that of the body politic consists in rivers, roads, trains and boats.[60] He echoes Harold A. Innis who simultaneously argued such a principle in his classic study *The Fur Trade in Canada* (1930) to show that the frontiers of Canada had been constituted by the riverine routes of the beaver trade.[61] The ventricles of the body politic are the principles of its order. For Cannon the life of the social body derives from the humans who flow through its veins. They are its water, salts and sugar. Hence, just as 'The organism throws away not only water and salts, but also sugar, if they are present in excess in the fluid matrix',[62] individual humans should be prepared to sacrifice themselves for the greater benefit of the homeostatic stability of society.

Certainly Cannon describes a number of unexceptional means for stabilising the body politic in the face of crises, the storage of foodstuffs, etc.[63] But he also insists on the control of its population and borders. He writes, '[Any] wisdom which the human organism has to offer to the social organism would be based on the provision of a population which is adjusted to reasonably assured means of subsistence and which is undisturbed by large increases from either local or foreign sources.'[64] This, in 1932. Further, like the natural turnover of cells after they have served their course, 'Death means ridding society of old members in order to yield places for the new. A State or a nation does not need to contemplate its own end, because its units are ceaselessly refreshed.'[65] Cannon's homeostatic body politic supposedly ends the instability of the war of all against all; but it does so at the cost of the Malthusian self-sacrifice of its constituent members.[66]

60. Cannon, *The Wisdom of the Body*, 313–315.

61. Beginning with ancient Egypt's Nile and ending with the rivers of Canada, Innis writes of rivers as principles of centralised order which have provided the conditions of possibility for the creation of society and state: its labour, institutions, solidarity. The centralisation which the river imposes is contested by the decentralisation imposed by other kinds of communication networks, notably today, mass media. For Innis, rivers, railways and roads are essential networks through which a society is produced; but, unlike Cannon, he would insist on the different orders each would impose. On the basis of this paradigm, Marshall McLuhan would formulate his famous dictum 'The medium is the message' (or 'mass-age'), writing in *The Gutenberg Galaxy*, 'Harold Innis was the first person to hit upon the *process* of change as implicit in the *forms* of media technology. The present book is a footnote of explanation to his work.' Harold A. Innis, *Empire & Civilization*, ed. David Godfrey (Victoria & Toronto: Press Porcépic, 1986), 12, 176; Marshall McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (Toronto: University of Toronto Press, 1962), 50.

62. Cannon, *The Wisdom of the Body*, 317.

63. Ibid.

64. Ibid., 319.

65. Ibid., 320.

66. If the reputation of Malthusianism on the Continent during and after the rise of Nazism needs

3.3 Canguilhem's critique of social homeostasis

I will now turn to Canguilhem's critique of Cannon's social homeostasis. His translators Stefanos Geroulanos and Todd Meyers argue that 'a quiet target' of this critique is Wiener's cybernetics.[67] This is a reasonable assessment to make given that Cannon pushed Wiener to pursue his research on cybernetics, given that the final chapter of *Cybernetics* (first ed.) concerns homeostasis in society, given that the *Human Use of Human Beings: Cybernetics and Society* is an extended treatment on the theme, and given that in 1951 Wiener wrote a paper 'Homeostasis in the Individual and Society', where he argues, 'The body politic is not without homeostasis, or at least the intention of having homeostasis'.[68] But it seems to me that construing Cannon's notion of social homeostasis to be continuous with Wiener's is to fail to notice the fundamental break that occurs between them, that is, between the homeostasis of the steam engine and that of a network. It mixes operative images. It neglects to notice how for Wiener the body politic is expressively *anti*-homeostatic.

In 1955, before an audience one presumes would have been sympathetically weary of the depiction of the State as an organic body (*L'alliance Israélite Universelle*[69]), Canguilhem presented 'The Problem of Regulation in the Organism and Society'.[70] This is a critique of the final chapter of Cannon's *The Wisdom of the Body* which despite being described by Canguilhem as 'the weakest part of his book' and having resulted from 'the temptation that the scientist shares with the common man, which is to import into sociology this magnificent concept of regulation and homeostasis',[71] it nevertheless provokes from him an impassioned and productive argument which has been read by his translators as a veiled attack on Wiener's cybernetics.[72] Canguilhem's argument draws on Bergson's *The Two Sources of Morality and Religion* (1932), published the

illustration: Wiener's own eight-page meditation on Malthus in the *Human Use of Human Beings* would be silently redacted from its 1942 German translation, despite the section containing the book's entire discussion of Lamarckian and Darwinian evolution. Everything from 'This entire question of balance of population…' (p. 48) to 'What shall we do?' (p. 56) is absent from the influential German translation of the first edition of *HUHB* (1950), published as *Mensch und Menschmaschine: Kybernetik und Gesellschaft* (1952). Given that the same section reappears in Wiener's second edition of *HUHB* (1954), it is doubtful that Wiener would have intended for this to be the case. And given that his German translator Gertrud Walther, who also translated cyberneticist W. Grey Walter's *The Living Brain* (1953), was judicious enough to list her translations of Wiener's cybernetic vocabulary in her introduction, it seems unlikely that this was an innocent omission.

67. Canguilhem, *Writings on Medicine*, 20.

68. Norbert Wiener, 'Homeostasis in the individual and society,' *Journal of the Franklin Institute* 251, no. 1 (January 1951): 65–68.

69. The philosopher and Hellenist Pierre-Maxime Schuhl had furnished his invitation, Canguilhem says. (p. 67) One wonders whether Emmanuel Levinas may have been in attendance, since he administered and taught at the *Alliance* from the 1930s on.

70. Canguilhem, *Writings on Medicine*, 67–78. As Pasquinelli argues, Canguilhem's critical reading must be understood 'against the background of the German *Lebensphilosophie* and the catastrophe of Nazi *Staatsbiologie*. Matteo Pasquinelli, 'What an Apparatus is Not: On the Archeology of the Norm in Foucault, Canguilhem, and Goldstein,' *Parrhesia*, no. 22 (May 2015): 86.

71. Canguilhem, *Writings on Medicine*, 75.

72. Ibid., 18–21.

same year as *The Wisdom of the Body* and written at the same time in the same city, Paris.[73]

The essence of Canguilhem's argument is encapsulated by a claim which directly targets the title of Cannon's book: 'There is no social wisdom in the way there is a wisdom of the body.'[74] Perhaps alluding to such ominous Malthusian implications as above, Canguilhem pleads to be 'vigilant toward all these comparisons [between organism and society] whose consequences you can guess.'[75] Society is not an organism, it is a machine or tool. Canguilhem uses his paper to insist on this argument repeatedly. The difference concerns purposivity:

> What defines the organism is precisely that purpose [*finalité*], in the form of its totality, is present to it and to all its parts. I apologise – I will perhaps scandalise you but society has no proper purpose; a society is a means; a society is more on the order of a machine or of a tool than on the order of an organism.[76]

The purposive quality inherent in an organism, which an organism *is* and which a society and a machine are said to lack, is precisely its capacity to self-regulate. Homeostasis shows that an organism is capable of resolving – 'on its own' – a contradiction between stability and modification because the entire organism is directed towards what is an obvious stable state, its health. 'We all know and agree what a sick organism is; the ideal of a sick organism is a healthy organism of the same species.'[77] The ideal of the organism, that which is defined by the tendency to self-regulate, is to be itself, which is to say, homeostasis.[78]

Yet there is no agreement, Canguilhem insists, as to the ideal of a 'social organism'. It is true that a society may bear resemblance to an organism, as 'organicists' emphasise.[79] But it can neither be an individual, since it does not express in its totality its purposive self-regulation, nor can it be a species, since 'it is, as Bergson says, closed'. Bergson distinguishes the closed society 'in which we live' from the open society of 'humanity' which society differs from in kind, but towards which it seeks to overcome itself.[80] This lets Canguilhem categorically discern, 'Human societies are not the human species'. Being neither individual nor species a society is 'a being of an ambiguous genus, is as much a machine as it is a living thing'. Not being an

73. Canguilhem, *Writings on Medicine*, 74.
74. Ibid., 77.
75. Ibid., 78.
76. Ibid., 76.
77. Ibid., 70.
78. Cannon's own definition of health agrees with Canguilhem's: 'Perhaps as good a concept of health as any is that of the condition of the body in which, when the body is at rest, the various organs continue their functions at a moderate rate, and in which disturbance or stress is met promptly and is followed fairly promptly by a return of the organs to their former moderate activity.' Walter B. Cannon, *Digestion and Health* (London: Martin Secker & Warburg, 1937), 90.
79. All Canguilhem references and quotes in this paragraph and the next come from 'The Problem of Regulation in the Organism and in Society', *Writings on Medicine*, 76–78.
80. Henri Bergson, *The Two Sources of Morality and Religion*, trans. R. Ashley Audra, Cloudesley Brereton, and W. Horsfall Carter (New York: Henry Holt / Company, 1935), 24.

organism it has no self-regulation and its existence and organisation is dependent on human design. 'It simply represents a means, *a tool*', a 'type of *apparatus* that is not inherent in social life as such; it is a historical acquisition, a tool that a certain society gave itself.' Regulation is 'added on' to it rather than being its essence. One is not spontaneously wise simply because one sees with the eyes and 'one is not wise in the way that one sees with one's eyes'. Wisdom and justice, the justice of 'the supreme regulation of social life' and the wisdom to pursue it, are innate to the organism as organism. To the social organisation they must be attained. 'One must *become* wise, one must *become* just.'[81] Society will not return to a wise and just state of its own accord since it is a tool for which such ideals and mechanisms are not innate.

What then is the 'normal state' of a society according to Canguilhem, if that of the organism is inborn equilibrium, moderation and control, the balance of health? 'Disorder and crisis.' This is why society imposes on itself 'historical inventions' such as the 'parliamentary apparatus' whose end is to 'channel discontent'. 'Justice has to come from elsewhere'.[82]

Now, before I make a defence of Wiener's critical notion of social homeostasis against Canguilhem – if Wiener is indeed his target – I wish to take a pause. The reason is that the very notion of homeostasis itself – irrespective of it being a social concept or not – has come under attack by the Second Order (or Wave) Cybernetics movement and I see it necessary to take their criticism into consideration before continuing with Wiener's concept. I ask for the readers patience in this movement, as now, after raising Canguilhem's critique of social homeostasis, seems to me the least awkward moment to engage their criticisms. I shall also take an avowedly unconventional reading of the Second Order critique, starting with the under-recognised critique of Hans Jonas, a former student of Heidegger. His 'Critique of Cybernetics' (1953) is not only forceful from a philosophical perspective, but productive of his concept of *metabolism*, which preempts the major Second Order Cybernetic concept of *autopoiesis* by Humberto R. Maturana and Francisco J. Varela, who I read alongside N. Katherine Hayles. Both metabolism and autopoiesis operate as critiques of homeostasis, standing in its place so to speak. So I shall cast out first to Jonas' critique of cybernetics, then Maturana, Varela and Hayles' critique, then, making an 'about turn' I shall offer a defence against their critiques, arguing that Hayles takes her important argument from a flawed one by Mayr, before finally returning to Canguilhem's critique of social homeostasis.

81. Canguilhem, *Writings on Medicine*, 78.
82. Ibid., 76–78.

3.4 Second order critiques of homeostasis

Hans Jonas: metabolism

If, as Canguilhem says, at the turn of the 1930s Cannon and Bergson 'encounter the same problem' from divergent backgrounds in biology and philosophy,[83] then in the 'cybernetic moment' in the years following the publication of *The Human Use of Human Beings* the same can be said for Canguilhem and Hans Jonas.[84] And if Canguilhem takes aim at the final argument of cybernetics in which the self-regulative purposivity of the organism is enlarged onto a society, through denying that machines have essential purposes and depicting society as a machine, then Jonas tries to sink cybernetics on launch through the analogy of the Anti Aircraft Predictor and the organism by similarly arguing that whereas the organism is concerned with self-preservation, the tool's only intrinsic end is its own death.[85]

There is an aggression to Jonas' 'A Critique of Cybernetics' (1953) which he almost apologises for, an urgency to an intervention against a literature 'which fortunately is not yet too bulky.'[86] Why? On the one hand he considers its own end to be the capture of philosophy: '[Cybernetics] is not the innocent special science which seduces susceptible philosophy by its passive beauty: from its inception it has been out to capture her.'[87] This not unlike his (repudiated) master Heidegger, who would in exactly the same year write of modern technics as a violent 'enframing' (*Gestell*) of being.[88] On the other hand, like Canguilhem, his ultimate concern is the society constituted in the image of cybernetics. For the cyberneticians, Jonas writes, 'society is a communication network for the transmitting, exchanging, and pooling of information, and it is this that holds it together.'[89] This image implies a mass denial of ethical responsibility: 'the cybernetician looks at his objects in a theoretical situation somewhat like the practical situation in which our commander

83. Georges Canguilhem, 'The Problem of Regulation in the Organism and in Society', *Writings on Medicine*, 74.

84. A Jewish former student of Husserl, Heidegger and Rudolf Bultmann who voluntarily fought for the British in WWII, Jonas had composed the standard philosophical works on Gnosticism for much of the twentieth century prior to the War (later compiled into *The Gnostic Religion* (1958)) before making a fundamental reattunement whilst fighting towards the philosophy of the organism, his major work being *The Phenomenon of Life: Toward a Philosophical Biology* (1966). What drove this transformation was the tension between the crisis of human society – the radically dualistic struggle of Gnosticism having been 'the classic case of a human crisis on a large historical scale' – and the organism – an 'insoluble fusion of inwardness and outwardness' which provides the paradigm for a reintegration of 'fragmented ontology into a uniform theory of being.' See, Hans Jonas, *Philosophical Essays: From Ancient Creed to Technological Man* (New Jersey: Prentice-Hall, 1974), Introduction.

85. Hans Jonas, 'Critique of Cybernetics,' *Social Research* 20, nos. 2/4 (1953): 172–192.

86. Ibid., 190, 174.

87. Ibid., 190.

88. Martin Heidegger, 'The Question Concerning Technology,' in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (Harper Perennial, 1977).

89. Jonas, 'Critique of Cybernetics,' 191.

looks at his subordinate.'[90] That is, as an extension of his own command, a 'tool' or a 'robot', tools and robots being synonymous for Jonas since each *depends for its* telos *on being used by another*. The cyberneticians imagine a society where everyone receives orders as inputs and mindlessly performs them as outputs, with none outside of this society of total control, and no ultimate controller.

The philosophical novelty of cybernetics, argues Jonas, is its attempt to present a 'unified theory of mechanism' which would resolve the Cartesian bifurcation of substances into matter and soul, a 'unified conceptual scheme, for the representation of reality.'[91] It does this through purporting that the servo-mechanism is a new kind of mechanism which, unlike the 'slaving giant' of the steam engine, is 'perceptive, responsive, adaptive, purposive, retentive, learning, decision-making, intelligent, and sometimes even emotional.'[92] The fundamental concepts of this schema are purpose and teleology. The cyberneticians argue that their anti-aircraft predictor functions by the same teleological function, namely 'negative feedback', as a hand lifting a glass, and when it oscillates too far and misses they depict it as akin to a sufferer of purpose tremors, a 'positive feedback' which does fail to regulate its behaviour.[93]

Now what is meant by 'purposeful behaviour' hinges on the meaning of 'final condition', the *telos* towards which a purpose is directed. The cyberneticians write, 'the term purposeful is meant to denote that the act or behavior may be interpreted as directed to the attainment of a goal – i.e. to a final condition in which the behaving object reaches a definite correlation in time or in space with respect to another object or event.'[94] What do the cyberneticians mean by 'final' if the cybernetic feedback loop means a constant readjustment of its behaviour such that no point is ever final? A circle has no end. Therefore by 'final' one can only understand 'the condition in which the *action* ends'.[95] If this is the case then the end of an organism, its innate purpose, would be maximum entropy and death, like a watch whose spring has wound down. The only way to break the feedback loop with a *causa finalis*, which is really what is at stake, is for the supposedly self-regulating machine to be controlled from elsewhere, like a hand that winds up its timepiece. But if this hand itself needs a hand, if every cybernetic machine recursively needs an external input, like an endless bureaucratic machine, like Kafka's *Castle*, then 'Cybernetics is an attempt to account for purposive behavior without purpose.'[96]

Jonas' argument against cybernetic teleology clearly incorporates that of a young analytic philosopher named Richard Taylor, published in 1950 and discussed by

90. Ibid., 188.
91. Ibid., 175.
92. Ibid., 174–75.
93. Jonas, 'Critique of Cybernetics,' 176; Jonas is reading from, Wiener, Rosenblueth, and Bigelow, 'Behavior, Purpose, Teleology,' , with this example being from pp. 2–3.
94. Wiener, Rosenblueth, and Bigelow, 'Behavior, Purpose, Teleology,' 1.
95. Jonas, 'Critique of Cybernetics,' 177.
96. Ibid., 185.

Galison and Hayles.[97] Taylor argues that purposivity for Wiener, Rosenblueth and Bigelow ignores the *causa efficiens* and means merely the culmination of an empirically observable sequence of events. Taylor likens their concept of teleology to the end point of a roulette wheel. Jonas incorporates Taylor's argument but what makes his paper more significant and interesting is that beyond posing a mere critique, Jonas produces a far-reaching concept in the process. In actuality, says Jonas, the living organism, far from tending towards death, is alive and is free in respect of others because it cannot but *metabolise*. This elemental urge to renew itself, to constitute, preserve and reproduce its life is essential to the organism.[98]

A machine may be attributed by negative feedback (homeostasis), but it does not *care* if it is and so it will not strive to do so. This care to live, this *conatus*, is metabolism and is unique to organisms.[99] An organism has no choice but to live and to be independent, since to live is to metabolise, to produce energy, to generate and to regenerate every part of itself. 'Metabolism can very well be considered as the defining quality of life: every living being has it, no nonliving being has it.'[100] 'There is no analogue in the machine to the instinct of self-preservation – only to the latter's antithesis, the final entropy of death.'[101] In metabolisation 'the liberty of life is itself its peculiar necessity.'[102] It enjoys a freedom 'with respect to its own substance', with the substance it has come to possess, in not sharing an identity with the total sum of its parts; an independence from a substance which it nevertheless wholly and essentially consists in, which it has no freedom to speak of. This is all to say that the concept of *metabolism* distinguishes organism and machine, and therefore breaks the cybernetic analogy (Jonas too does not know about Bernard's analogy with the engine). It identifies *that which is most essential to the organism to be metabolism*, and this is a wholly internal quality which pays no reference to an outside.

Metabolism, we could add, constitutes a *positive* freedom which contrasts with the *negative* freedom of homeostasis. Metabolism is not concerned with being free *from* environmental changes, as per homeostasis, but free *for* the production of the self. This is an attribute which distinguishes the organism from the machine, and it anticipates by two decades the concept of autopoiesis.

97. Richard Taylor, 'Comments on a Mechanistic Conception of Purposefulness,' critique of cybernetics, galison and hayles write about, *Philosophy of Science*, 17 1950, 310–17; Richard Taylor, 'Purposeful and Non-Purposeful Behavior: A Rejoinder,' *Philosophy of Science*, 1950, 327–32; Peter Galison, 'The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision,' *Critical Inquiry* 21 (1994): 249-52; Hayles, *How We Became Posthuman*, 95–97.

98. Jonas, 'Critique of Cybernetics,' 190–91.

99. Jonas develops the notion of metabolism with respect to Spinoza and *conatus* in, Hans Jonas, 'Spinoza and the Theory of Organism,' *Journal of the History of Philosophy*, April 1965,

100. Jonas, *Organismus und Freiheit. Ansätze zu einer philosophischen Biologie*, 1973, p. 83; as translated in Francisco J. Varela and Andreas Weber, 'Life after Kant: Natural Purposes and the Autopoietic Foundations of Biological Individuality,' *Phenomenology and the Cognitive Sciences* 1 (2002): 112

101. Ibid., 191.

102. On metabolism see also Jonas' essays 'Biological Foundations of Individuality,' 194–195, and 'Spinoza and the Theory of Organism,' 47.

Varela, Hayles: Autopoiesis

The metabolic and necessarily free concept of the organism advanced by Jonas' critique of cybernetics 'already in the early 1950s and in an astonishing way precedes and philosophically extends the findings of autopoiesis', writes the co-author of the latter concept, Francisco J. Varela in 2002.[103] This is no minor point. *Autopoiesis* is the concept which Humberto R. Maturana would coin and jointly publish with his student Varela in the extended essay, 'Autopoiesis: The Organization of the Living' (1972), concisely formalising into a single word the advance to a 'mature phase' (as Hayles puts it) of the institution known as 'second order cybernetics'.[104] Jonas' metabolic critique of cybernetics implies the autopoietic organism, defined by Maturana and Varela as that which 'generates and specifies its own organization through its operation as a system of production of its own components, and does this in an endless turnover of components under conditions of continuous perturbations and compensation of perturbations.'[105]

Autopoietic machines are *autonomous*. Everything they change and produce is internal to themselves, whereas their other, the *allopoietic* machine (from Gk. *állos*, other), produce things external to themselves. Autopoietic machines are *individual* since they produce nothing but themselves. Their identity is not effected from the outside by an external observer, since to observe an autopoietic machine is to enter its network of productions, to produce and be produced. Allopoietic machines, which produce external things, lack individuality because their production depends on being observed. Autopoietic machines are *unities* because through their self-production they determine their own boundaries; whereas the boundaries of allopoietic machines are determined by their observer. Autopoietic machines are not constituted through inputs and outputs, and therefore if they are 'perturbed by independent events' then they may or may not 'compensate these perturbations' with internal changes that may or may not be identical to their perturbations and must *not* therefore be considered as effects of an external actor, but autonomous self-productions. They are singular, since incomparable. They are 'circular organisations', albeit unlike the ones Jonas characterises that which came to be known as 'Wiener's cybernetics', since their entire organisation is what Jonas considers to be purposive – although such language, argue Maturana and Varela, is in itself that of an allopoietic observer.[106]

Hayles emphasises that 'autopoiesis turns the cybernetic paradigm inside out.'[107] Its axiom is that, whereas the 'first order' cyberneticians of the 1940s construed its systems to be homeostatic and open to external influence, for the 'second order' all

103. Varela and Weber, "Life after Kant", pp. 101–02
104. Hayles, *How We Became Posthuman*, 10.
105. Humberto R. Maturana and Francisco J. Varela, *Autopoiesis and Cognition: The Realization of the Living* (Dodrecht/Boston: D. Reidel Publishing Company, 1980), 79.
106. Ibid., 80–81.
107. Hayles, *How We Became Posthuman*, 10.

systems are 'informationally closed'. The role of the external objective observer is ruptured, since to observe is to effect is to be internal to a system. The 'first order' was interested in the 'cybernetics of the observed system' whilst the 'second', the 'cybernetics of the observer'. Hayles writes, 'We do not see a world "out there" that exists apart from us.' Instead, 'we see only what our systemic organization allows us to see.'[108] The identity of autopoietic machines cannot be construed by an external agent, but only from within its networked production.

This means that the paradigm of homeostasis and the central concepts of Wiener's cybernetics – neither message, signal, nor information – no longer apply. In *Cybernetics* Wiener had presented, simultaneously to Claude Shannon, a measurement for the quantification of information in a message. Hayles argues that this implies the distinction between an inside and outside, which autopoiesis denies, given that it imagines an objective observer. With the concept of autopoiesis, we should rather say that what is observed is always *internal* to the observer. Jonas makes a similar argument: 'It is I who let certain "messages" count as "information," and as such make them influence my action.'[109] It is only the metabolic organism who can decide whether something counts as information *for them*. Information cannot be quantified outside of the system which autopoietically gives itself purpose. Hence, the concept of information has ceased existing or, writes Hayles, 'it has sunk so deeply into the system as to become indistinguishable from the organizational properties defining the system as such.'[110]

Subtly Hayles replaces Heinz von Foerster's logical vocabulary of 'orders' of cybernetics – the 'cybernetics of cybernetics' being logically a 'second order', as distinct from the 'first order' of Wiener's cybernetics[111] – with the feminist terminology of 'waves'.[112] This replaces a merely logical category with one with implications of a historical and generational transition which is *not discontinuous* (she faults both also Thomas Kuhn and Foucault in this regard), but 'fabricated in a pattern of overlapping replication and innovation, a pattern that I call "seriation." '[113] Doing so allows her to imply a progressive redundancy, to 'chronicle the journeys' of 'seriated change' of ideas which have coalesced around certain patterns of thought: 'conceptual shifts that took place during the development of cybernetics'.[114] The 'first wave of cybernetics' coalesced around homeostasis and took place from 1945 until 1960; the 'second wave' began with the rupture of von Foerster's work on self-enclosed reflexivity and continued until 1980. Then crashed a 'third wave' that resonates until 1995, displacing

108. Hayles, *How We Became Posthuman*, 11.
109. Jonas, 'Critique of Cybernetics,' 184.
110. Hayles, *How We Became Posthuman*, 11.
111. Heinz von Foerster, 'Cybernetics of Cybernetics,' 1979,
112. Hayles, *How We Became Posthuman*.
113. Ibid., 14.
114. Ibid., 15.

reflexivity with the concept of 'emergence', denoting the posthuman intelligence emergent through the chaotic distribution in the complexity of its biological substrate rather than in control of it. In her more recent work, Hayles has argued that there has since been a fourth wave that theorises a 'Regime of Computation' which underlies and interpenetrates human consciousness.[115] According to this movement, Wiener's problematic which we have been discussing, which clings onto the concept of the human, is triply redundant.

'About-turn'

I now turn to my defence of the concept of homeostasis.

I do not accept Hayles' reading. Firstly, by treating the logical 'orders' as historical 'waves', Hayles undoes any sense to the former, which by implication undoes at least some sense of the latter. Von Foerster invented the notion of 'second-order cybernetics' at a time of increasing frustration that the branch of cybernetics concerned with computers was concretising cybernetic ideas in such a way that had little need for the notion of an active observer,[116] and so he wanted to emphasise the cybernetics of the entire system, a recursive 'cybernetics of cybernetics' and thereby 'meta' or 'second order cybernetics'. If this equates to a 'second wave' and there is a 'third wave' which is itself updated in a later work by a 'fourth wave' then are we to think of these as the 'cybernetics of cybernetics of cybernetics' and 'cybernetics of cybernetics of cybernetics of cybernetics', *ad infinitum*? At least to me, any sense (which is not to say truth) to von Foerster's 'order' applies only to a logically first and second order.

Second, Hayles' historical periodisation, which is ungrounded at least logically, is overly simplistic to the point of inaccuracy. She considers the transition from first wave to second wave to be 1960 because of Heinz von Foerster's work of the period, but Kline has since noted a consensus among historians that it should rather be traced back to Maturana's own research on the patterned phenomena of a frog's vision from the early 1950s. Maturana and von Foerster, he writes, therein developed their ideas in conversation and concert.[117] The greater problem is that, as Francis Heylighen and Cliff Joslyn have emphasised, 'most founding fathers of cybernetics, such as Ross Ashby, Warren McCulloch and Gregory Bateson, explicitly or implicitly agreed with the importance of autonomy, self-organisation and the subjectivity of modelling. Therefore, they can hardly be portrayed as "first order" reductionists.'[118] Also, the major figures of the 'second wave' were themselves major to the first, including

115. N. Katherine Hayles, *My Mother Was a Computer* (Chicago & London: University of Chicago Press, 2005); N. Katherine Hayles, 'Unfinished Work: From Cyborg to Cognisphere,' *Theory, Culture & Society* 23, nos. 7-8 (December 2006): 159–166.
116. Francis Heylighen and Cliff Joslyn, 'Cybernetics and Second-Order Cybernetics,' in *Encyclopedia of Physical Science & Technology*, 3rd ed., ed. R. A. Meyers (New York: Academic Press, 2001).
117. Kline, *The Cybernetics Moment*, 196–98.
118. Heylighen and Joslyn, 'Cybernetics and Second-Order Cybernetics,' 4.

Bateson, Mead, von Foerster and Maturana. Not only this, but Bateson and Mead agreed in 1976 that Wiener himself was, like them, 'inside the box', that he had never strayed into 'input-output' (conceptually if not terminologically) and that his 'cybernetics was that the science is the science of the *whole circuit*.'[119] We could add that the concept of emergence is explicit in his works too, such as when he writes of an arithmetical device 'corresponding to the whole apparatus' of a network of telephones, computers and staff, of the 'communal intelligence' of a swarm of bees, and so on.[120] If the second and third 'waves' are to be found in the first, we should rather conclude with Heylighen and Joslyn that cybernetic history has only shone a 'stronger focus' on certain themes within the sea of concepts from the start of cybernetics than left wrecks in its wake.[121]

Thirdly, although Hayles implies the possibility of further 'cybernetic waves', by claiming that she believes we have 'become posthuman' it seems to me that we have therefore also become post-historical, since – as with my first critique – to speak of a postposthuman, postpostposthuman, etc., is nonsensical.

Hayles considers Wiener to have withdrawn from the revolutionary implications of cybernetics – 'that the boundaries of the human subject are constructed rather than given' – to defend the liberal human, 'fashioning human and machine alike in the image of an autonomous, self-directed individual.'[122] 'The danger of cybernetics, from Wiener's point of view,' according to Hayles, 'is that it can potentially annihilate the liberal subject as the locus of control.'[123] Hayles construes this in a number of ways but the most important is the way in which she establishes the *parallelism between the concepts of self-regulating machinery and liberal humanism*, since this is the zombie concept onto which Wiener and the 'first wave' supposedly clasp. Her argument is based on a reading of Wiener which is overdetermined by her reading of Otto Mayr's argument that the origins of cybernetics lie in David Hume and Adam Smith's notions of free market capitalism, against the clockwork system of mercantilism. Once again, it mistakenly conflates the operative image of the steam engine with that of the internet.

Mayr's free market cybernetics

Mayr argues that David Hume's 'Of the Balance of Trade' (1752) radically undermined pre-established clockwork doctrine of mercantilism, that nations become rich through

119. Margaret Mead, Gregory Bateson, and Stewart Brand, 'For God's Sake, Margaret,' *CoEvolutionary Quarterly*, no. 10 (June 1976): 32–44.
120. Wiener, *Cybernetics*, 60–61, 157. The same can be said for so many others. McCulloch and Pitt's concept of the brain as a distributed network, Ashby's homeostat as intelligent throughout its entire body, etc.
121. Heylighen and Joslyn, 'Cybernetics and Second-Order Cybernetics,' 4.
122. Hayles, *How We Became Posthuman*, 84–112.
123. Ibid., 110.

growing their treasuries while restricting imports, by depicting the international market as a *feedback loop* whereby, without State interference, a balance of trade and thereby wealth would find equilibrium. Hume asks his readers to imagine that four-fifths of Great Britain's wealth was wiped out overnight. Would the price of its labour and commodities not sink accordingly and therefore its competitiveness on the international stage not rise, and its wealth eventually return to the level of its neighbours?[124]

While Hume presents 'the earliest instance of an adequately formulated economic feedback loop', says Mayr, his friend Adam Smith abstracted this auto-regulating feedback model to a plethora of economic phenomena, giving it 'almost a life of its own.'[125] In *The Wealth of Nations* (1776) we find that free competition of economic subjects balances social justice; the attraction of workers to high wages is eased by a fall of wages due to a large supply of labour; the self-regulation of a population size to befit the size of the market; the demand and supply of commodities and labour balancing one another out. In *The Wealth of Nations*, Smith made the break in economics that his fellow University of Glasgow colleague James Watt would a decade later make in the realm of machines by inventing the flyball governor and ensuring the pressure and temperature of his steam engine would be automatically regulated by means of it.

This would signify a break with the clock in both its technical application and its operative image as, in Mayr's words, 'the quintessential symbol for authority'[126] – a break with mercantilism and absolute monarchy, the image of the clock, or what Foucault refers to as 'sovereign power'.[127] No longer would society be defined by 'a structure with a *central authority*, whose parts worked together with the same inevitability, predictability, and rapidity *as the wheels in clockwork*.'[128] It should instead be allowed to freely self-regulate itself by means of the Invisible Hand of the market, the economic expression of the steam engine, mechanical symbol of a liberated world.[129] For Mayr, Smith is *the* founding figure of cybernetics, albeit one who had not yet fully abstracted and universalised the concept of the feedback mechanism into all other domains, as he accredits Wiener for so doing.[130]

124. Otto Mayr, 'Adam Smith and the Concept of the Feedback System: Economic Thought and Technology in 18th Century Britain,' *Technology and Culture* 12, no. 1 (January 1971): 3–5. Mayr even draws this feedback loop as a servomechanical diagram, 5.
125. Ibid., 6.
126. Mayr, *Authority, Liberty & Automatic Machinery in Early Modern Europe*, xviii.
127. Michel Foucault, *History of Sexuality, vol. I: An Introduction*, trans. Robert Hurley (New York: Pantheon Books, 1978); Michel Foucault, *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan (London: Penguin, 1991).
128. Mayr, 'A Mechanical Symbol for an Authoritarian World,' Emphasis added.
129. 'Smith's Invisible Hand could not be identified with a specific person, institution, or program or with a definite bureaucratic mechanism. It was an abstract power immanent in the system. The capability to employ opposing, uncooperative forces to establish and maintain equilibrium is a characteristic of self-regulating or – in cybernetic jargon – feedback systems. The Invisible Hand was nothing but the quality of self-regulation.' Mayr, *Authority, Liberty & Automatic Machinery in Early Modern Europe*, 175.
130. Mayr, *Authority, Liberty & Automatic Machinery in Early Modern Europe*, 187–88; Mayr, 'Adam

Mayr presents the invention of the liberal subject, independent owner of their own labour power, as born of the same operative image as Watt's cybernetic steam engine. Championing both liberalism and cybernetics through coupling them together, Mayr provides grounds for the many who would construe neoliberalism and cybernetics to be synchronous, such as Tiqqun,[131] Alexander Galloway,[132] Richard Barbrook and Andy Cameron,[133] Adam Curtis[134] and the ideologues of Stalin's Soviet Union.[135] Informed by Mayr, Hayles vociferously argues that Wiener's cybernetics fails to advance beyond liberal subjectivity.[136]

But there is something entirely incongruous to Mayr's argument which has been neglected. The hint is that whilst Mayr is clearly a believer and champion of liberal capitalism's self-regulating capability, Wiener wrote passages such as this:

> There is a belief, current in many countries, which has been elevated to the rank of an official article of faith in the United States, that free competition is itself a homeostatic process: that in a free market the individual selfishness of the bargainers, each seeking to sell as high and buy as low as possible, will result in the end in a stable dynamics of prices, and with redound to the greatest common good. This is associated with the very comforting view that the individual entrepreneur, in seeking to forward his own interest, is in some manner a public benefactor and has thus earned the great rewards with which society has showered him. Unfortunately, the evidence, such as it is, is against this simpleminded theory.[137]

In direct conflict with Mayr, Wiener could stand apart from 'simpleminded' believers

Smith and the Concept of the Feedback System,' 18.

131. Tiqqun consider a 'cybernetic hypothesis' to have 'definitively supplanted the liberal hypothesis' and define cybernetics as '*an autonomous world of apparatuses so blended with the capitalist project that it has become a political project*'. Tiqqun, 'L'Hypothèse Cybernétique,' in *Tiqqun 2* (2001), 4.

132. Galloway has argued how 'the liberal hue of contemporary [academic] methodology – with quantitative positivism serving as the "governor" of the rainbow coalition – is chiefly due to a single historical phenomenon that has taken place over roughly the last century. Taking a page from the French collective Tiqqun, we might label this historical phenomenon the *cybernetic hypothesis*.' Alexander R. Galloway, 'The Cybernetic Hypothesis,' *d i f f e r e n c e s : A journal of Feminist Cultural Studies* 25, no. 1 (2014): 111.

133. 'The prophets of the Californian Ideology argue that only the cybernetic flows and chaotic eddies of free markets and global communications will determine the future.' Richard Barbrook and Andy Cameron, 'The Californian Ideology,' *Mute* 1, no. 3 (1995).

134. The twinning of neoliberalism and cybernetics is a running theme of Curtis' video essays. His trilogy *All Watched over By Machines of Love and Grace* (2011) – which takes its name from the title of Richard Brautigan's 1967 utopian beat poem which envisages 'a cybernetic meadow / where mammals and computers / live together in mutually / programming harmony / like pure water / touching clear sky.' – construes the cybernetic revolution to be concomitant with the rise of neoliberalism; and not just contingently so, as one gathers from Fred Turner's analysis *From Counterculture to Cyberculture* of the transformation of the 1960s hippy 'New Communalism' into the harbingers of a new capitalism.

135. The equation of cybernetics and capitalism, one presumes, gave meaning to the 1954 *Short Philosophical Dictionary* (the standard Soviet ideological reference) characterisation of cybernetics to be 'an ideological weapon of imperialist reaction' and a 'reactionary pseudo-science'. See, David Mindell, Jérôme Segal, and Slava Gerovitch, 'Cybernetics and Information Theory in the United States, France and the Soviet Union,' in *Science and Ideology: A Comparative History*, ed. Mark Walker (London: Routledge, 2003), 66–95.

136. Hayles, *How We Became Posthuman*, Chap. 4 especially.

137. Wiener, *Cybernetics*, 159.

in the self-regulating function of free market capitalism because he considered cybernetics to have constituted a 'Second Industrial Revolution' which broke with the 'First Industrial Revolution'.

Wiener argues The revolution of engines and textile mills was only a limited revolution. It 'concerned the machine *purely as an alternative to human muscle*.'[138] The steam engine relieved slaves and horses from the toils of pumping water from mines: 'to replace this servitude must certainly be regarded as a great humanitarian step forward.'[139] It replaced horses and water as the source of power for textile spinning machinery (although its effects on humans was anything but liberatory). The First Industrial Revolution 'displaced man as a source of *power*, without making any great impression on other human functions.'[140] Therefore the First Industrial Revolution was a partial revolution. It broke with the clockwork body typified by Descartes and Boyle but it left the dualism of body and mind unscathed. It was a revolution of the bodily organism which remodelled the organism as a self-regulating and homeostatic mechanism instead of a clockwork automata and displaced it with vastly more powerful artificial variants. But it could not model the total. Mayr may make a worthy historian of the revolution of the age of clocks and steam engines, but *he has nothing distinct to say whatsoever about what Wiener calls the Second Industrial Revolution and its age of communication and control*; the age whose operative image is the Internet. This is why Hayles is not correct (Galison neither) in arguing that Wiener clung to the subject of liberal capitalism.

The trajectory of Hayles' argument is that as of 1995 we have reached a 'Computational Universe' whereby the essential function of all beings, human and non-human, of the universe itself, is to process information. '[Computation] is a relational process that can run in the brain, with gears, disks, balls, cylinders and levers, in electromechanical and silicon devices, as well as other media not yet discovered or in nascent developments such as quantum computers.'[141] The computer 'mirrors nature's own methods.' Hayles envisages a Computational-Universal equality 'derived from the view that not only our world but the great cosmos itself is a vast computer and that we are the programs it runs.'[142] The subject of this would be the emergent posthuman who no longer conforms to the autonomous, capitalist anthropoid who commands bodies by means of disembodied information. Something akin to the Computational Universe, she writes, is envisioned by Wiener, but it differs by realising 'the cybernetic dream of creating a world in which humans and intelligent machines can *both* feel at

138. Ibid., 119. Emphasis added.
139. See chapter IX: The First and the Second Industrial Revolution of *HUHBb*. I refer here to pp. 121–23.
140. Ibid., 134.
141. Hayles, 'Unfinished Work,' 163.
142. Hayles, *How We Became Posthuman*, 239–244.

home.'[143]

This phrase, *at home*, succinctly expresses the difference between Wiener and not only Hayles but also Maturana, Varela and Jonas in their own ways. Theirs are all philosophies of the home, *oikos*, of the reproduction of life as bare life, *zoē*, the simple fact of living common to all living beings whether plant, animal or human, of a zoological universe; there is specifically no outside: the qualified life, the *bios* of the political community, no longer exists.[144] In Jonas, Maturana and Varela we find life reduced to the organism, the machine no longer an object of interest because lacking metabolism and autopoiesis. According to Hayles, all posthuman beings relate to one another without need for the outside of politics, since they are already *at home* in their 'Motherboard of Nature'.[145] Hayles writes of the politics and economics which effect the production of virtual bodies, but this is always merely about production. Even the Pentagon, we are told, have given up on Clausewitz for a future of warfare that is 'neo-cortical', relating to the 'techno-sciences of information' rather than the achievement of overwhelming force.[146] But are the true weapons of resistance today really the productions of historical contestations concerning their own production and the rediscovery of their embodied virtuality, as Hayles argues? To me this withdrawal from political confrontation is at the heart of 'second-order' milieu.

Maturana writes that he first understood the power of the word *poiesis* after reflecting on Don Quixote's struggle to choose between the 'path of letters (*poiesis*, creation, production)' and the 'path of arms (*praxis*, action)'.[147] *Autopoiesis* came to him as 'a word without a history, a word that could directly mean what takes place in the dynamics of the autonomy proper to living systems.'

A word that evaded the need to engage in political conflict. He presumably would have known of Marx's description of labour as the 'metabolism [*Stoffwechsel*] of man with nature'[148] as presumably did Jonas since, if for nothing else, this phrase is employed as *the* definition of natural labour for his fellow Heidelberg alumni and Jewish New York émigré, Hannah Arendt, in *The Human Condition*, a book whose problematic is the eclipse of the political.[149] For Marx it is precisely the *separation* of

143. Stefan Herbrechter considers posthumanism's 'deanthropocentering' of even nonhuman actors 'a radicalized form of democratization.' *Posthumanism: A Critical Analysis*, 200.

144. Giorgio Agamben, *Homo Sacer: Sovereign Power and Bare Life*, trans. Daniel Heller-Roazen (Stanford, CA: Stanford University Press, 1998), 1.

145. Hayles writes how 'Just as Mother Nature was seen in past centuries as the source of both human behavior and physical reality, so now the Universal Computer is envisioned as the Motherboard of us all.' Hayles, *My Mother Was a Computer*, 3. The phrase has a science fiction heritage, Neal Stephenson, subject of a chapter in the same book, having published a work entitled 'Mother Earth Mother Board' in 1996.

146. Hayles, *How We Became Posthuman*, 20.

147. Maturana and Varela, *Autopoiesis and Cognition*, xvii.

148. Marx, *Capital*, vol. 1, 283; Marx, Capital, vol. 3, 949-50, 959

149. 'Labor is the activity which corresponds to the biological process of the human body, whose spontaneous growth, metabolism, and eventual decay are bound to the vital necessities produced and fed into the life process by labor. The human condition of labor is life itself.' Hannah Arendt, *The Human*

humans from their metabolic nature that constitutes history and needs explanation, not their natural productive activity itself. As Marx says in the *Grundrisse*:

> It is not the unity of living and active humanity with the natural, inorganic conditions of their *metabolic* exchange with nature, and hence [with] their appropriation of nature, which requires explanation or is the result of a historic process, but rather the *separation* between these inorganic conditions of human existence and this active existence …[150]

Jonas, Maturana, Varela and Hayles jump the gun in construing a reality whereby, in Marx's words, the 'irreparable rift' produced by capitalist relations of production no longer exist.[151] By construing homeostasis to be an anachronism (or, as Hayles writes, a 'skeuomorph', its friendly cousin[152]), by denying that, in Bernard's words, 'life is conflict', by denying the constitutive threshold between the internal environment of the organism and the external environment, they turn away from the agon by which the production of history is fought for, lost and won.

Here again I am imposing the agonistic reading of homeostasis without having shown it to be there in Wiener contra Cannon, so let me now return to Canguilhem's critique in order to answer the question of what is meant by homeostasis according to the operative image of the Internet.

3.5 Wiener's critique of social homeostasis

We return to Canguilhem's critique of the wisdom of the social body. That there is no inherent homeostasis in a socius, since it has no normal state to return to aside from disorder and crisis. Social regulation is a machine, a tool, it depends on external input. In this sense Canguilhem and Jonas' arguments resonate, in that Jonas also distinguishes the tool on the basis of it needing its commands established by another. Undermining Geroulanos and Meyers' suggestion that Canguilhem's critique of Cannon's social homeostasis is quietly targeted at Wiener, it in fact resonates with Wiener's own critique too, in that Wiener argues against Cannon that, 'one of the most surprising facts about the body politic is its *extreme lack of efficient homeostatic processes*.'[153] I shall attempt to now show why Wiener also rejects the Cannon's notion of social homeostasis, but in doing so, insists on a generalised state of conflict by means of homeostasis.

Condition, with an introduction by Margaret Canovan (Chicago & London: University of Chicago Press, 1958), from p. 98 on. Arendt's employment reflects that of the chapter in John Bellamy Foster's *Marx's Ecology* entitled 'The Metabolism Of Nature And Society', which .

150. Cited by Paul Burkett in *Marx and Nature*, 30, from *Grundrisse*, 489. Emphasis added.

151. John Bellamy Foster, *Marx's Ecology: Materialism and Nature* (New York: Monthly Review Press, 2000), 141–177.

152. Hayles, *How We Became Posthuman*, 17–18.

153. Wiener, *Cybernetics*, 158.

In direct contrast to Mayr, Wiener denies the existence of an automatic self-regulation, or homeostasis, under capitalism. He derides as 'simpleminded' the 'hucksters' who believe that 'that free competition is itself a homeostatic process', that the market will regulate itself for the 'common good' if left to alone, which is to say, who project the operative image of a steam engine onto society as a whole.[154] This is why Hayles' depiction of him positing liberal individualism is incongruous. Like Canguilhem, Wiener would have surely agreed with Alliez and Lazzarato's anti-Cannon assessment that, 'Contemporary financial capitalism flees equilibrium like the plague, since balance is equal to zero profits from the point of view of maximising "shareholder value," which has no concern for world development indicators (the record of neoliberalism in this matter has been disastrous).'[155] As Wiener says, in situations like that of the market, there is only 'extreme indeterminacy and instability … there is no homeostasis whatsoever.'[156]

For Canguilhem a society cannot organically self-regulate since it can have no common concept of wisdom. Its regulation is artificial, a machine whose history is that of the imposition upon itself of such assemblages as parliament.[157] Though Wiener did not reject the organicist analogy of organism and society inherited from Cannon, he considered the *body politic* to be an organism whose natural homeostatic capability exists inversely to the size of its population – perhaps incorporating his friend J. B. S. Haldane's argument from the article 'On Being the Right Size' (1926).[158] For Wiener, very small rural and indigenous communities do tend to have a 'considerable measure of homeostasis', expressed by adequate care for the 'unfortunate', maintenance of common infrastructure such as roads and tolerance for reintegrating minor criminals.[159] Small communities exhibit social homeostasis, as Cannon described, because their distribution of behaviour, intelligence, values and social memory is relatively uniform, allowing them to inherently perform a certain shared learning without the imposition of external mechanisms. *But*, Wiener insists, small societies create this harmony and common purpose through stripping the possibility of life from those who refuse to conform, who find it 'so ubiquitous, so unavoidable, so restricting and oppressing', that they are made to flee 'in self-defence'[160] (think of

154. Wiener, *Cybernetics*, 61, 159.
155. Alliez and Lazzarato, *Wars and Capital*, 368.
156. Wiener, *Cybernetics*, 159.
157. Canguilhem, *Writings on Medicine*, 76–77.
158. John Burdon Sanderson Haldane – evolutionary biologist, socialist activist and son of physiologist John Scott Haldane – argues in 'On Being the Right Size', originally published in *Harper's Magazine* in 1926, that the natural capacity for stable self-governance (or 'socialism') is proportionally determined by the size of a political community's population, such that its optimum size would be small like a Greek *polis*. Unlike the organism, Haldane argues, this potential for stable self-governance might be artificially extendable by means of communication media. J. B. S. Haldane, 'On Being the Right Size,' in *Possible Worlds and Other Essays* (London: Chatto & Windus, 1927), 18–26.
159. Wiener, *Cybernetics*, 160.
160. Ibid.

Spinoza, Shulamith Firestone or Hermann Kafka's flights from their oppressively homogeneous community). Natural social homeostasis exists in small communities, but it is not something those who value heterogeneity would desire.

As for the large society, the cosmopolitan city, since it lacks a common history, level of intelligence, values, and memory, *it has no inherent social homeostasis to speak of*. So it is with large industrial societies that the need to produce social homeostasis by means of what Wiener calls the '*artificial homeostasis*' of political institutions arises.[161] Wiener reaches the same conclusion as Canguilhem, who writes of society imposing on itself 'historical inventions' such as parliament in order to impose regulation, but from a different and even contradictory route.

As an engineer in the 1950s Wiener worked on developing artificial homeostasis apparatuses that would regulate the organism from the outside, such as an automatic insulin dispenser, feedbacking prosthetic limbs and a 'hearing glove' for the deaf (an 'artificial external cortex') which would translate words into kinetic sensation like an inverted vocoder; these as distinct from the rigid (homostatic) prosthesis of the 'simple peg leg'.[162] Manfred Clynes and Nathan Kline – cyberneticians working on bodysuits which would automatically administer drugs to regulate the *milieu intérieur* of the wearer to artificially perform extra-terrestrial homeostasis – would in 1960, as historian Ronald Kline argues persuasively, rephrase 'artificial homeostasis' as 'cybernetically extended organism', or 'cyborg' for short.[163] A 'cyborg' is, according to this original definition, that organism whose life depends on artificial homeostasis, a homeostasis whose telos is *designed* to be the health of its wearer, as so defined by the engineer. This concept, which we employ, is more specific than that employed by Donna Haraway, whose definition of the cyborg as a 'fabricated hybrid of machine and organism' is too broad.[164] According to Wiener, Clynes and Kline, the mere occasion of prosthesis does not qualify an organism to be called a cyborg: the cyborg's prosthetic mechanism *must be self-correcting* in respect of the host organism's homeostasis. A hom*o*static cyborg, for example, would make sense in Haraway's definition, but in Wiener's it would be a contradiction in terms.

If we adopt this specific concept of a cyborg as an artificially imposed homeostasis,

161. It should be noted that Wiener xenophobically refers to indigenous peoples in this section not merely as 'primitive savages', which even Lévi-Strauss uses at the time (albeit in a deconstructive and anti-xenophobic sense) but as 'barbarians' with customs that may seem 'strange and even repugnant to … us.' Wiener, *Cybernetics*, 160; Wiener, 'Homeostasis in the individual and society.'

162. Wiener, *Cybernetics*, 25–26; Wiener, 'The Concept of Homeostasis in Medecine'; Kline, *The Cybernetics Moment*, 170.

163. Manfred Clynes says, 'We were asked to present a paper on drugs for space flight … This would have to be done automatically, of course, and this led us to applications of cybernetics to the problem. From this we established a whole new approach based on adapting the man to the environment rather than keeping him in a sort of environment to which he was naturally adapted.' Kline, *The Cybernetics Moment*, 171, and see 170–78 in general for a history of the early 'cyborg' concept.

164. Donna J. Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (London: Free Association Books, 1991), 149, 150.

we could say that what Wiener means by government is a 'social cyborg' – a homeostasis of the social organism by artificial means. In his article 'On the Homeostasis of the Individual and Society' (1951) Wiener depicts the tripartite separation of powers in this way, the Legislature, Executive and Judiciary each watching over the others' excesses of power and thereby balancing the total quantity of power in the system (not unlike Ross Ashby's homeostat).

Now, one might construe a cybernetic Montesquieu to compliment Mayr's cybernetic Smith but for Wiener's immediate *denial* of the effectiveness of this artificial social homeostasis. The reasoning Wiener here provides is the difficulty for a large society to cohere around a 'national tradition' that is not one by which it is (hom*o*statically) 'bound forever to decisions made in the past under what were perhaps irrelevant circumstances.'[165] The inherent hom*eo*static traditions of small societies, Wiener says, are transmitted through the apparatuses handed down along generations. Wiener gives the example of the inherited tools of a 'Yankee basket maker', wrought of bog iron, whose production had been learned from '[American] Indians' – these evoke in him a 'sense of the contemporary of the past' (memory) and give him a sense of 'the possibility of the stabilizing mechanisms in the present.'[166] This is to say, homeostasis. Yet, Wiener continues, the populations of the 'great cities, or in the esoteric hot house of civilization of Southern California' are too transitory for such a transmission of homeostasis, 'the span of social memory which is needed for the homeostatic action of an historical sense is too great for transients and squatters.'[167]

I find this argument somewhat obscured by the flowery way Wiener puts his argument, but my interpretation is that he is making an ecological claim that metropolitan life implies, as he writes, a 'defiance' against nature (its external environment) that endangers humanity's 'continued existence'. The social cyborg amplifies this since its organism is largely rootless, so to speak. Whereas the basket maker adapts to nature according to a direct and natural homeostasis, the social cyborg, in as much as it is necessary, is constituted in opposition to nature and is therefore partial.[168] This is not just to say that large social homeostasis is partial because it is constituted against nature in opposition to the human, but because *it is not universal to the interests of humankind itself*: therein lies the fracture which makes large-scale social homeostasis impossible. Whereas the homeostasis of the basket maker is continuous with a homeostasis of nature, the artificial homeostasis of the social cyborg is at once homeostatic with respect to the regulation of its power but anti-homeostatic with respect to the

165. Wiener, 'Homeostasis in the individual and society.'
166. Ibid.
167. Ibid.
168. In a major public conference held at MIT in the early 1960s, Wiener similarly argues, 'There is a real danger that changes in our environment have exceeded our capacity to adapt. [We may be] biologically on the way out … I think that the overall danger from the total situation is much greater than the danger of any of its particular instantiations.' Martin Greenberger, ed., *Computers and the World of the Future* (Cambridge, MA: MIT Press, 1962), 27.

regulation of nature. In large societies, homeostasis generates negative externalities. It is not simply a collective process of learning to which everyone and everything gains, as Cannon has it, but an increase in self-control *of one at the expense of the self-control of another*. In the large society the hom*eo*static renders its other hom*o*static, increasing its control while reducing that of its other. The logic of such a partial homeostasis which is opposed to the homeostasis of others is found neither in the writings of Cannon nor Mayr.

Remembering that Cannon, like Innis, considered canals, roads, rivers, trains, boats and trucks to be the veins and vessels of the body politic,[169] Wiener writes that since every organism is constituted through its 'possession of means for the acquisition, use, retention, and transmission of information' (its nervous system rather than capillary bed) the large social organism is bound by its newspapers, books, television, radio, post, theatres, cinemas schools and churches.[170] The primary function of such institutions is to establish the lines of communication necessary for a society to cohere. Wiener asks rhetorically: 'How then does the beehive act in unison, and at that in a very variable, adapted, organized unison?' The answer: 'Obviously, the secret is in the intercommunication of its members.'[171]

It seems undeniable that J. C. R Licklider, who participated in cybernetics workshops organised by Wiener in the 1940s, had this in mind when in the later-half of the 1960s he envisaged an Interactive Multi-Access Geographically Distributed ('IMAGED') network as having amongst its 'purposes' the creation of '"coherence" and "community"' amongst geographically distributed users, and announced that the 'interconnection' of the ARPANET would establish no mere community but a 'supercommunity'.[172] This would not be a rigid hom*o*static network, one, in Licklider's words, 'pre-cast' and 'designed and programmed once-and-for-all at its outset'; but a 'flexible' and 'adaptable' hom*eo*static 'labile network of networks – ever-changing in both content and configuration.'[173] Like a single organism, Licklider hoped that the internet would create a single common body of knowledge whereby the programs and data resources of the entire supercommunity would be common throughout. Arguing this, Licklider follows Cannon's belief in the wisdom of an inherent social homeostasis (or 'learning') and the belief that it is a beneficent to all, without

169. Cannon, *The Wisdom of the Body*, 313–315. See above, p. 58.
170. Wiener, *Cybernetics*, 160-61; See also Wiener, *HUHBb*, 18.
171. Wiener, *Cybernetics*.
172. Licklider, *Memorandum: Classification of Computer Networks*, 3, 6; Licklider and Taylor, 'The Computer as a Communication Device.'
173. Licklider, *Memorandum: Classification of Computer Networks*; Licklider and Taylor, 'The Computer as a Communication Device'; 'Labile' is how Sherrington describes the homeostatic living system, its fragility making it more adaptable to its environment. As David W. Bates has noticed, the British cyberneticist Ross Ashby recorded several passages of Sherrington's on the organism as a 'labile' 'moving structure, a dynamic equilibrium' into his notebooks. David W. Bates, 'Unity, Plasticity, Catastrophe: Order and Pathology in the Cybernetic Era,' in *Catastophe: History and Theory of an Operative Concept*, ed. Andreas Killen and Nitzan Lebovic (Berlin: De Gruyter, 2014), 52–53.

anti-homeostatic effects.

Yet Wiener warned precisely that under capitalism this primary function of communication in the network would be '[encroached] further and further' by secondary functions related to their commodity and political value.[174] The school and church become home not only to 'the scholar and the saint' but 'the Great Educator and the Bishop'; the newspaper degenerates into a 'vehicle for advertising and its owner's financial gain', turning news into gossip, to 'stereotyped "boiler plates"' instead of political commentary or serious features. As ever, 'the man who pays the piper calls the tune.' That in a large community the 'means of communication' (notice the slide from 'means of production') are owned by a 'very limited class of wealthy men', the 'Lords of Things as They Are' who ruthlessly control their own publicity, means that the media expresses the ideology ('opinions') of their class and attract those with ambitions for 'political and personal power'. Wiener writes that 'Of all of these *anti-homeostatic* factors in society, the control of the means of communication is the most effective and most important.'[175] Anti-hom*eo*static for society (or, he could have written, pro-h*o*mostatic), although pro-hom*eo*static for the wallets and political ambitions of the newspaper barons.

Again, notice there are multiple regimes of homeostasis at play here within the social body. Not only is there the anti-homeostasis of an increasingly confused society bombarded with gossip and marketing instead of long- and short-form news, there is a homeostasis of profit margins which keeps the publisher solvent and profitable. There is an anti-homeostasis of democratic representation but also a homeostasis of power for the celebrity-cum-politician. This is to reiterate that the network of the social cyborg is never the total society, and to emphasise that not only are the homeostases of society's internet partial, but they can be in antagonistic contradiction to those of others. The ideal end of natural homeostasis may be the health of its host organism, but the health of the corporation or a celebrity's image may be the antithesis of the health of the society as a whole. The end of artificial homeostasis is merely whatever its host defines.

If this is a site of harmony or peace, then it is so through *conflict*. Wiener refers to homeostasis as a process of 'learning', both phylogenetic and ontogenetic.[176] I referred in the last chapter to a 'Wiener Test', wherein a being is considered alive if it can play a game of strategy against its creator, a game where its capacity to learn is at stake. This identification of homeostasis with learning he takes from Cannon. Yet, breaking with Cannon, he refuses to accept that learning (homeostasis/negative-feedback) is necessarily beneficial for all. It is a constitutive conflict, of political warfare, that concerns the struggle for a greater 'learning' than an opponent has of you. This is a

174. Wiener, *Cybernetics*, 161.
175. Ibid., 160-61. Emphasis added.
176. Ibid., 169.

struggle of control: learning and stupidity, elasticity and rigidity, hom*eo*stasis and hom*o*static, life and death.

What distinguishes Wiener's account from that of the age of the steam engine is the consistency of the homeostatic machine at stake. For Bernard the organism may exist through the permeation of inner and outer environments, problematising its identity. Yet its identity is always one. At stake in the operative image of the steam engine is always the ontogenetic or phylogenetic individual. All the organs of the *milieu intérieur* of a dog co-operate to preserve the liberty of the canine with respect to its environment. Cannon stretches that single *milieu intérieur* onto the entire body politic, exaggerating the image of the steam engine to the entirety of a nation, if not humankind. In Wiener's confrontation with Cannon, it is not that he re-atomises the *body politic* into 'liberal individuals', as Hayles considers him to do, since he allows for 'collective' homeostases of small societies and, say, the newspaper corporation. Rather, in breaking with organic metaphors (the basket weaver of the small society) he implies an overlapping of possible social homeostases such that every living thing, every network, is multiple, is physically dislocated, is a network which overlaps other networks, which assimilates into other networks and dislocates itself, whose homeostasis or learning – control – enriches itself at the expense of another. The image of the steam engine may be homeostatic, but it is also resolutely self-contained and individual. It cannot figure the myriadic complexity of an internet, a nexus of networks. It is not about individuals or collectives but rather shifting intersections – it is about what Deleuze called 'dividuals'.[177]

Over and again Wiener figures the conflict, the homeostasis, of control at stake today in terms of a game of strategy. Regarding the media Wiener writes, 'That system which more than all others should contribute to social homeostasis is thrown directly into the hands of those most concerned in the *game* of power and money.'[178] He writes, 'The whole nature of our legal system is that of a *conflict*. It is a conversation in which at least three parties take part – let us say, in a civil case, the plaintiff, the defendant, and the legal system as represented by judge and jury. It is a *game* in the full von Neumann sense'.[179] And, 'The market is a *game*, which has indeed received a simulacrum in the family game of Monopoly. It is thus strictly subject to the general *theory of games*, developed by von Neumann and Morgenstern.'[180]

According to the Wiener Test, that which is living is defined by its capacity to 'learn' (homeostasis/negative-feedback) and thereby to play a game against its creator. Hence, that which properly distinguishes the social organism is a logic which accords to a 'game of strategy'.[181] To the relation of cybernetics and thereby the internet to a

177. Deleuze, *Negotiations*, 180.
178. Wiener, *Cybernetics*, 161. Emphasis added.
179. Wiener, *HUHBb*, 98. Emphasis added.
180. Wiener, *Cybernetics*, 159. Emphasis added.
181. John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior*, 3rd ed.

theory of strategic conflict I now turn.

(Princeton: Princeton University Press, 1953), 5.1, 21.2.1. Von Neumann evades short introduction, but to say that he was amongst many things a prominent participant in the Macy Meetings, and the degree of Von Neumann's association with Wiener was such that the two have been made subjects of Steve J. Heims' joint intellectual biography, *John Von Neumann and Norbert Wiener: From Mathematics to the Technologies of Life and Death* (1980).

Chapter 4

(Chess)

In the *Human Use of Human Beings* Wiener establishes that he holds to not one but *two* theories of games.[1] One relating to universal natural homeostasis, where the opponent is the *passive* '*Augustinian Evil*' of nature's inherent entropy, its lack of the good, information, truth. This type of game he specifically attributes to Benoît Mandelbrot, and I argue that at stake is an analogy Mandelbrot makes between information theory and Ferdinand de Saussure's famous image of the chessboard. The other game concerns a partial artificial homeostasis whereby the opponent is an *active* '*Manichean Evil*' who employs strategic manoeuvres to achieve whatever determinations they strive for. This relates to John von Neumann and Oskar Morgenstern's theory of games.[2] Both Augustinian and Manichean games revolve around learning, homeostasis, but they have completely distinct domains. The former is the game of science, the latter, society. In this chapter I shall argue that the internet must be understood as being defined according to the Manichean Evil.

I shall start by depicting Mandelbrot and de Saussure's theory of chess, before setting this against Wiener's game theory. I shall continue then to root this distinction in Leibniz's discussion of chess: its *continuous* reading by Michel Serres, and the necessity of a *discontinuous* reading by Wiener.

The parenthesis of this chapter's title are intended to emphasise that chess does not constitute an operative image alongside the clock, the steam engine and the internet. Rather, it is an analogy through which each can be read.

4.1 Structuralist chess

Benoît Mandelbrot and Roman Jakobson, Wiener argues, 'consider communication to be a *game* played in partnership by the speaker and the listener against the forces

1. Wiener, *HUHBb*, 82–83, 162–63.
2. Neumann and Morgenstern, *Theory of Games and Economic Behavior*.

of confusion, represented by the *ordinary* difficulties of communication'.[3] As is too often the case in Wiener's books, no source is given for this claim, and he refers only to an argument of Mandelbrot's, who copy edited *Cybernetics*,[4] not Jakobson, despite being well acquainted with the latter personally.[5] He continues, through computations Mandelbrot shows how all natural languages seem to tend towards an optimal distribution of word lengths, which implies that they have over time undergone a process of natural selection. This, as opposed to artificial languages such as Esperanto or Volapük in which no such optimal distribution of word lengths is to be found. This natural 'attrition of language', a phylogenetic homeostasis of words, implies that languages evolve towards a sort of 'optimum form of distribution' through the processes of guarding against confusion.

This being the case, Wiener argues, the 'philosophical assumption' of Mandelbrot's (and supposedly Jakobson's too) 'ordinary' and 'normal' linguistic game theory is that the 'major opponent of the conversant is the entropic tendency of nature itself'.[6] In the employment of language over time a speaker combats its tendency to naturally degrade. Like the basket maker's small society, natural languages pertain to a natural homeostasis, minimising the distribution of their elements. The primary aim of the game of normal communication is to reverse the natural tendency of all things to entropy and convey information, this reversal of the second law of thermodynamics being the basis of Wiener's definition of information as the reversal of entropy.[7]

Wiener's comments are fairly brief and, as mentioned, he does not reference any specific text but, writing in 1953, it seems likely that he would have been referring to Mandelbrot's 'Contribution à la théorie mathématique des jeux de communication', published the same year, or 'An Informational Theory of the Statistical Structure of

3. Wiener, *HUHBb*, 82–83, 162–63. Emphasis added. This sentence goes on to suggest that Mandelbrot and Jakobson consider normal communication to involve attempts to 'jam' communications. For reasons explained below, this claim is inconsistent with Wiener's argument, perhaps an editorial error, and so I ignore it.

4. Both Benoît Mandelbrot and uncle Szolem Mandelbrojt were well acquainted with Wiener, Szolem having invited Wiener to France for the trip in which he would be persuaded to write what would become *Cybernetics*. It would be published in 1948 simultaneously in France (in English), by the publisher who convinced him to write it, and the US., by MIT Press and Wiley & Co., who bullied and bought their rights to it. See Geoghegan, 'The Cybernetic Apparatus,' 96–137, 166–67.

5. For the most sensitive reading of Jakobson's theoretical and practical relation to cybernetics, see ibid., 96–137 and 'From Information Theory to French Theory.' There is also Céline Lafontaine, 'The Cybernetic Matrix of 'French Theory',' *Theory, Culture & Society* 24, no. 5 (2007): 27–46, although, as far as I am concerned it makes too much out of historical confluences and tends to violently reduce all of post-War French philosophy to cybernetics. Lafontaine's mistake is to not see that cybernetics provides the operative image of the age to which all thought has to, to a certain degree at least, reflect (as per Cartesianism in Early Modernity), rather than providing all of the philosophies themselves.

6. 82 Wiener, *HUHBb*.

7. Wiener, *Cybernetics*, 10–11; The initial model for the notion of information as the reversal of the second law of thermodynamics is in, Leo Szilard, 'On the Decrease of Entropy in a Thermodynamic System by the Intervention of Intelligent Beings,' in *Maxwell's Demon: Entropy, Information, Computing*, ed. Harvey S. Leff and Andrew F. Rex, trans. Anatol Rapoport and Mechthilde Knoller (Bristol: Adam Hilger, 1990), 124–133.

Language', which was presented the year prior and also published in 1953.[8] Unfortunately, despite the pertinence of the French paper's title, I have been unable to locate a copy of it, but even though Mandelbrot's English paper is not ostensibly a paper on games and there is no mention of Esperanto or Volapük within it, there is reason for believing that Wiener based his argument on it because of a certain footnote contained within.

Mandelbrot's footnote is assigned to his description of a linguistics which '[pushes] de Saussure's theory [of linguistics] to its logical limits', a science of language on the particular level of 'what remains as consequence of a "grinding" process in which individual "acts of speech" get averaged into all acts of speech of a single speaker, then into all acts of speakers.'[9] This would seem an apt source for what Wiener refers to as an 'attrition of language'. To add that Mandelbrot construes this equilibrium of speech acts to be analogous to the 'perfect gas of thermodynamics' but with the opposite meaning: instead of being the 'worst' case, it is the 'best' – a reference, surely, to Shannon's identification of entropy with information in opposition to noise.[10]

Now, Mandelbrot's actual footnote to this argument itself reads:

> De Saussure notes himself that the job of the linguist is similar to that of a man trying to find out about the essentials of the game of chess by considering first a single game, then a set of games by one man, and finally all games. This assimilation of language to a game is very deep, as it will turn out that the tool which will make possible a mathematical study of the decoding process will be the modern theory of games of strategy as applied to one of the aspects of de Saussure's analogy.[11]

With this footnote Mandelbrot establishes an association between information theory and Structuralism, by means of de Saussure's figure of the chessboard in the *Course in General Linguistics* (1906–1911).

'A game of chess' de Saussure famously writes, 'is like an artificial realization of what language offers in a natural form.' His rationale is threefold.[12]

Firstly, the state of the board at any one moment corresponds to the state of a language. The value of each piece depends on their relative position on the board in the same way as the value of a word depends on its opposition to all others. Only when 'endowed with value and wedded to it' is an element of chess or language made real and concrete. One can break an ivory piece and replace it with a wooden one

8. Benoît Mandelbrot, 'Contribution à la théorie mathématique des jeux de communication,' *Publications de l'Institut de statistique de l'Université de Paris* 2 (1–2 1953); Benoît Mandelbrot, 'An Informational Theory of the Statistical Structure of Language,' in *Communication Theory*, ed. Willis Jackson (London: Butterworths Scientific Publications, 1953), 486–502.

9. Mandelbrot, 'An Informational Theory of the Statistical Structure of Language,' 488–89.

10. Ibid., 498.

11. Ibid., 489.

12. I read Saussure from, Ferdinand de Saussure, *Course in General Linguistics*, trans., with an introduction by Wade Baskin (New York, Toronto & London: McGraw-Hill Book Company, 1959), 22–23, 81, 88–89 and 110.

and it would be of the same value as far as the game is concerned, so long as it has not moved square.

Second, though the value of a word varies moment to moment as does the value of a chess piece (even the lowliest of pieces, the pawn, may be more valuable than another depending on its position, say if it is primed for queening), both language and chess depend on unchangeable conventions which pre-exist and persist every game and conversation: the rules of chess and the constant principles of semiology. If there were no queen, the 'grammar' of chess would be entirely different.

Third, in both language and chess, change occurs by the move of a single, isolated, element: 'there is no general rummage.' These changes can 'revolutionize the whole game' or they can have nil effect, it is impossible to foresee what their exact extent will be. Every move is 'absolutely distinct' since it belongs entirely to the change from one state to another.

On this basis de Saussure introduces his distinction between his own *synchronic* linguistics, which concerns the arrangement amongst 'language-states', and the orthodoxy of *diachronic* linguistics, which concerns the past and future 'evolutionary phase' and 'historical grammar' of a language. In chess, he argues, it only matters what happened ten-moves prior in as much as this diachronic fact lead to the current synchronic state of the game, which is all that matters to the player. If one arrives mid-game, as in a newspaper's chess puzzle, for example, one can just as much play. In chess as with language, 'elements hold each other in equilibrium in accordance with fixed values, the notion of identity blends with that of value, and *vice versa*.'[13]

Now, de Saussure admits that his analogy between language and chess has one 'weakness': the need to imagine an 'unconscious or unintelligent player' of language to who makes their moves like the player in chess.[14] This 'sole difference' is a telling exception to a supposedly sure analogy. It shows how for de Saussure the presence at the table of an *actual* player and their opponent is not significant enough to break the analogy. The opponent is relegated to a diachronic 'external force' as much as is the previous move a 'historical event'.[15] Both are outside of the present, mathematically describable synchronic state of the game.[16] It is not that they are irrelevant, since 'a language can only be compared to the idea of the game of chess taken as a whole, including both [synchronic] positions and [diachronic] moves', but they are of a separate class with purchase only on the past and the future but not the present state of the game. 'The synchronic and diachronic "phenomenon" have nothing in common.'[17] The player could be 'unconscious', 'unintelligent', 'blind' or gone fishing

13. Saussure, *Course in General Linguistics*, 22–23, 81, 88–89, 110.
14. Ibid., 89.
15. Ferdinand de Saussure, *Writings in General Linguistics*, trans. Carol Sanders (Oxford: Oxford University Press, 2006), 143.
16. Saussure, *Course in General Linguistics*, 23.
17. Ibid., 91.

and the synchronic state of play would remain unaffected.

This is because to de Saussure the one who seeks to comprehend the state of play – the linguist – is distinct from the players themselves. As distinct as the force behind the metabolism of a plant, which when cut longitudinally, upwards along its stem, reveals in its fibres its diachronic history, and when cut transversally, horizontally, its synchronic arrangement.[18] It is not that they are opposed by a player but that the board and both players together are the linguist's opponent. *The entire board is visible to the structural linguist* so long as they are capable of shedding sufficient light upon it. The actual game of chess for de Saussure has little to do with the two players, but rather resides in the linguist's understanding – their sight – of the field of play. *The opponent of this game is no more than natural confusion of ignorance*, and while '[ignorance] plays a difficult game,' in Wiener words, 'he may be defeated by our intelligence as thoroughly as by a sprinkle of holy water.'[19]

When Mandelbrot invokes de Saussure's chessboard as an analogy of information theory applied to linguistics, he invokes a form of game theory wherein strategy plays no part. The game is in the challenge of decoding that which is originally encoded but poses no resistance to the linguist.

This is not to say that the opponent can be fully 'defeated'. In *The History of Lynx* (1991) Claude Lévi-Strauss begins with the image of the chessboard. 'Did myths not already lose the *game* a long time ago?' he asks.[20] No, when 'we play against myths', which may have come 'from very far away in space or in time', we should appreciate that 'they begin a new game each time they are retold or read.' They have not been defeated by science, which itself has to resort to creating its own myths to explain the such problems as the emergence of life, the prior and after history of the universe, and so on. The myth does not offer us 'already-played-out games' like a game of solitaire, in which the player passively submits to certain constraints to bring the random elements of the shuffled pack into order. It is rather like a *chessboard*, Lévi-Strauss argues with implicit reference to de Saussure, in that its arrangement can never be fully solved. With the chequered schema he draws out the Pacific Northwestern territories of the Salish linguistic group, and moves his first pawn.[21]

What Lévi-Strauss is here arguing may seem to imply that the myth is an active opponent who resists defeat, a Manichean opponent. But in fact, to continue the analogy of chess and information theory (which Lévi-Strauss was profoundly influenced by in the early 1950s, as Geoghegan has highlighted),[22] what the undefeatability of

18. Ibid., 87–88.
19. Wiener, *HUHBb*, 34.
20. Claude Lévi-Strauss, *The Story of Lynx*, trans. Catherine Tihanyi (Chicago & London: University of Chicago Press, 1995), xi–xvii. Emphasis added.
21. Ibid., 2–3.
22. Geoghegan, 'From Information Theory to French Theory'; Geoghegan, 'The Cybernetic Apparatus,' 138–88.

the myth signifies is the infinite quantity of information in any myth and chessboard. This is fundamental to Wiener and Shannon's definitions of information as having infinite potential value. As Wiener puts it, 'the information carried by a precise message in the absence of a noise is infinite.'[23] Lévi-Strauss' ability to endlessly return to the same board is inherent in the notion of an Augustinian game theory.

4.2 Cybernetic game theory

Prior to his cybernetic turn during WWII, Wiener's approach to social ills was characterised by what he would later call the struggle against Augustinian Evil. As he wrote in a letter to the microbiologist Paul de Kruif on 3 August 1933:

> Knowledge is a good which is above usefulness, and ignorance an evil, and we have enlisted as good soldiers in the army whose enemy is ignorance and whose watchword is Truth.[24]

To fight the war against Augustinian Evil is to shed light where there is darkness, knowledge where ignorance, since according to it, 'the black of the world is negative and is the mere absence of white'.[25] This is the struggle of the scientist where 'the arch enemy' is honourable nature's disorganisation.[26] It accords to the *universal* homeostasis in Cannon's concept of 'learning'.

As Peter Galison insists, as of Wiener's wartime work on Anti-Aircraft Predictors, he began to oppose (or, as Galison argues, compliment) this notion of evil with respect to a Manichean concept, whereby 'white and black belong to two opposed armies drawn up in line facing one another.'[27] The opponent of this game is a self-motivated, dishonourable, wilfully malicious enemy who actively resists being rendered intelligible while attempting to render *their* opponent, their enemy, intelligible for them. This is an evil whose corresponding good is unrelated to truth or wisdom, but rather the achievement of their own particular bounded homeostasis. This constitutes a decisive break with Cannon's concept of homeostasis as universal wisdom. It returns to Bernard's intimation of the concept of homeostasis as conflict, and Vernant, Loraux and Agamben's work on *stasis* as the constitutive dynamic in the establishment of the political community.

In the Manichean game there is *strategy*: the decision to reveal information to certain players and to attempt to hide it from others. The Augustinian game is not strategic. It is organised around the general moral directive that any sharpening of information is a good, since all entropy is evil. But this kind of decoding is tenable only

23. Wiener, *Cybernetics*.
24. Norbert Wiener, *Letter to Paul de Kruif*, Cambridge: MIT Archives MC22, box 2, folder 38, August 3, 1933.
25. Wiener, *HUHBb*, 154.
26. Ibid., 33.
27. Wiener, *HUHBb*, 33; Galison, 'The Ontology of the Enemy.'

in peace, against a controlled and passive opponent like nature. Where the Augustinian Evil is the opponent in the game of pure scientific interest, the Manichean concerns the strategic 'games' of war, diplomacy, politics, law, business and the war-diplomacy-politics-law-business of real science.[28] Only the latter concerns the production and control of human societies.

Where Augustinian Evil is expressed by Mandelbrot's analogy of chess and Shannon's information theory, the Manichean is rooted in von Neumann and Oskar Morgenstern's theory of games, and especially poker. The latter write that the fundamental questions essential to all 'games of strategy' are:

> How does each player plan his course, i.e. how does one formulate an exact concept of a strategy? What information is available to each player at every stage of the game? What is the role of a player being informed about the other player's strategy? About the entire theory of the game?[29]

Victory in the Manichean game of strategy is achieved according to the ratio of knowledge of one player with respect to the other.

If Mandelbrot's Augustinian game worked from the concept of information in Shannon's 'A Mathematical Theory of Communication,' in which a mathematical definition of information is given with respect to its opposite, noise, then Wiener's Manichean game takes off from Shannon's seminal paper of modern cryptology, 'Communication Theory of Secrecy Systems' (1946; declassified 1949) derived from his wartime work to prove the security of Roosevelt and Churchill's encrypted radio-telephone vocoder system.[30] Wiener's argument can be read as following especially from a footnote in this paper, too:

> See von Neumann and Morgenstern, [*A Theory of Games*, Princeton, 1947]. The situation between the cipher designer and cryptanalyst can be thought as a 'game' of a very simple structure; a zero-sum two person game with complete information, and just two 'moves'. The cipher designer chooses a system for his 'move'. Then the cryptanalyst is informed of this choice and chooses a method of analysis. The 'value' of the play is the average work required to break a cryptogram in the system by the method chosen.[31]

This is a game in which a third figure stands between a communicator and listener who, aware of the rules of their communication, has the goal of 'jamming' them. In the language of contemporary cryptology – the unified study of cryptography and cryptanalysis – this is called a 'man-in-the-middle' attack, whereby a malicious actor intercepts, modifies and thereby controls the communications between sender and receiver for their own ends; at stake in this is the secrecy of their conversation, but

28. Wiener, *HUHBb*, 32–33.
29. Neumann and Morgenstern, *Theory of Games and Economic Behavior*, 5.2.1, p. 47.
30. See Kline, *The Cybernetics Moment*, 31–35.
31. C. E. Shannon, 'Communication Theory of Secrecy Systems,' *Bell System Technical Journal* 28, no. 4 (1949): 704 ft.

also its 'integrity' and 'authenticity', the capacities for sender and receiver to trust the end and origin of their messages.[32] As the pre-eminent historian of cryptology David Kahn writes, 'if a general cannot rely upon the validity of messages that come out of his cipher machines, the cryptosystem is worse than useless.'[33] Wiener writes that in order to prevent jamming, the communicator must 'bluff' to confound their attacker, who most understand and adapt accordingly in order to then out bluff in suit. The 'game' is in their mutual bluffing and observation.

An everyday example of this that reaches beyond (Shannon's) cryptographic-signal engineering, Wiener writes, it that of the scientist who wishes to publish their research but must play this game with the 'detective-minded … lords of scientific administration' who preside over 'the realm of official and military science' who, on both sides of the Iron Curtain, reduce their information to propaganda.[34] (This helps to explain 'the barrenness of so much present scientific work.')[35] The precise dynamics of the game are less important than the overall point, that in this second kind of game the opponent is no longer the passive entropy of confusion which confounds all things until they are actively inverted into clear and distinct pleats of information, for as Shannon writes, 'from the point of view of the cryptanalyst [who tries to decipher a message without its key] a secrecy system is almost identical with a noisy communication system.'[36] The opponent of this game is a self-motivated, wilfully malicious *enemy* who actively resists being understood by spreading confusion, whilst trying to undo their own confusion as regards the player.[37]

This is no longer a 'game of perfect information', like that of Saussure, whereby the positions of all pieces and the choices each player makes are known to both players, who are thereby able to make rational decisions on the possible consequences of their own future moves.[38] It is more akin to card games, Kriegsspiel or Guy Debord's *Jeu de la guerre* where players have degrees of confusion clouding their knowledge of the 'state' of the opponent's board. Seb Franklin has written that although Wiener was concerned with machines which could play chess, he was so because he believed it

32. Bruce Schneier, *Applied Cryptography*, 2nd (New York: John Wiley & Sons, 1996), 48–49, 2.

33. David Kahn, *The Codebreakers: The Story of Secret Writing* (London: Weidenfeld & Nicolson, 1966), 754.

34. Wiener, *HUHBb*, 164.

35. Ibid.

36. Shannon, 'Communication Theory of Secrecy Systems,' 685; Kahn, *The Codebreakers*, 751–52.

37. As Shannon says, 'The word "enemy," stemming from military applications, is commonly used in cryptographic work to denote anyone who may intercept a cryptogram.' See, Shannon, 'Communication Theory of Secrecy Systems,' 657.

38. Von Neumann and Morgenstern introduce the notion of games with perfect information, with a particular emphasis on chess, in *Theory of Games and Economic Behavior*, §15, pp. 112–28. See also Anatol Rapoport, *Two-Person Game Theory: The Essential Ideas* (Ann Arbour: University of Michigan Press, 1966), 19–21, 62; Martin Hollis and Steve Smith, *Explaining and Understanding International Relations* (Oxford: Oxford University Press, 1990), 75; and Duncan R. Luce and Howard Raiffa, *Games and Decisions: Introduction and Critical Survey* (New York, London & Sidney: John Wiley & Sons, 1957), 41–43.

could be 'modelled and automated', whereas poker, a 'game of imperfect information' and von Neumann and Morgenstern's game par excellence, cannot.[39] It is thus the analogy of poker which best befits the Manichean evil, Franklin argues. While I on the whole agree, I think it should be added that, given Wiener's persistent return to the analogy of chess throughout his cybernetic writings, he was concerned that given sufficient computing power, certain 'players' may end up playing games of perfect information while their opponents play games of imperfect information – or rather, where their degree of information with respect to the state of play vastly exceeds that of their opponent. This is why he depicted Dubarle's *machines à gouverner* as a terrifying '*chess*-playing machine grown up and encased in a suit of armor',[40] and at the end of his life says of chess playing machines with both relief and trepidation that 'as yet their complete theory has not been humanly worked out'.[41] As I shall discuss, this is how Rand theorists John Arquilla and David Ronfeldt would in the 1990s strategise cyberwar: the acquisition by the State of a chess-like 'topsight' against a Kriegsspiel-like 'blind' opponent.[42] This highlights the logic of the Manichean game: the player with greater degree of clarity over their opponent is the one in control.

Now, Wiener makes an important departure from von Neumann and Morgenstern's game theory. He accepts the game theory definition of power by access to degrees of information in respect to the opponent. But he rejects its concept of subjectivity since, 'Naturally, von Neumann's picture of the player as a completely intelligent, completely ruthless person is an abstraction and a perversion of the facts.[43] This, as Franklin notes, is a common critique of game theory, but I shall argue that there is more to his argument than meets the eye and that it relates to the *control of subjectivity* as such.

In *Cybernetics* Wiener says that in society there are 'knaves' and 'fools'. 'Where the knaves assemble, there will always be fools;' Wiener writes, and 'where the fools are present in sufficient numbers, they offer a more profitable object of exploitation for the knaves.'[44] The knaves study the psychology of the fool until they become as malleable and predictable as 'a rat in a maze.' The point is that in this situation, only the knaves act in their own ruthless self-interest 'in the fashion of von Neumann's gamesters'. They do so for economic exploitation or political gain, employing a 'policy of lies – or rather, of statements irrelevant to the truth' (hence the Manichean

39. Seb Franklin, *Control: Digitality as Cultural Logic* (Cambridge, MA & London: MIT Press, 2015), 51–57.

40. Wiener, *HUHBb*, 154. Emphasis added.

41. Wiener, *God and Golem,* Inc., 22–23; Wiener uses the occasion of his lecture and discussion at the 1962 conference to further discuss the dangers of chess playing machines, notably with Hyppolite. *Le concept d'information dans la science contemporaine*, Information et cybernetique (Paris: Comité des Colloques philosophiques de Royaumont, Gauthier-Villars, 1965), 100–132.

42. John Arquilla and David Ronfeldt, *The Advent of Netwar* (Santa Monica: RAND, 1996), 103–04.

43. Wiener, *Cybernetics*.

44. Ibid., 159–60.

good does not concern truth) in order to sell a particular brand of cigarettes or 'induce [the fool] to vote for a particular candidate – any candidate – or to join a political witch hunt.' Wiener writes, 'A certain precise mixture of religion, pornography, and pseudo science will sell an illustrated newspaper.' And further, 'A certain blend of wheedling, bribery, and intimidation will induce a young scientist to work on guided missiles or the atomic bomb.' But how do these knaves establish the recipes of their special blends? Through 'radio fan ratings, straw votes, opinion samplings and other psychological investigations, with the common man as their object'. And who is responsible for performing this research? Precisely those who Wiener refuses to extend cybernetic methodology to at the end of *Cybernetics*: sociologists and economists.[45]

Let me rephrase this in more conventional cybernetic terms. Society consists of people with lesser *degrees of information* in respect of their society ('fools') and greater ('knaves'), or more accurately greater and lesser degrees of both since 'no man is either all fool or all knave.'[46] There is a degree of foolishness to every knave, just as there is a degree of *entropy* in all *information*. The 'players' of a society (the networks of an internet) embody the theory of information, each possessing a different degree of information to which their control corresponds. Those with greater information have the financial means to employ social scientists to *feedback* the behaviour of those with lesser information to them, in order that they can better *target* them with *messages* that make them accord with the interests of the sender, the one with more information. These messages have no connection to truth because their intention is to convince those with lesser information to behave in a certain way whilst maintaining the lie of their being unconditioned. This degree of *control* is successful according to the discrepancy between the degree of information of the *controller* and that of the *controlled*. Hence, not only does the controller have an interest in refining their quality of information with respect to the controlled, but also in degrading the quality of information of the controlled. To feed the controlled back entropy allows the controller to extract wealth from the controlled (through the sale of their brand of cigarettes) or extract power, for to amass power is to extract it from another, according to this zero sum logic. The wealth and power of the controller can be fed back into further social research, and as such the controllers act increasingly for themselves whilst the controlled act increasingly for their controller, with an increasingly entropic and confused capacity to understand who their controller is. This society has no single *homeostasis*. It has the homeostasis (*negative feedback*) of the entrepreneur and celebrity-politician's accession at the expense of an *anti-homeostasis* (*positive feedback*) of the confused and controlled consumer, the ever-greater fool who is increasingly mistaken in their belief that they act for their own interests.

Expand the rules of this game to a cosmos of politicians and capitalists ('Lords

45. Wiener, *Cybernetics*, 162–63.
46. Ibid., 160.

of Things as the Are') and consumers, and one gets a starkly different image of a society governed by communication, a society in the image of the internet, than one does from Cannon's 'social homeostasis' or Licklider's 'supercommunity'. This is the Manichean game which defines the conflict of power on the internet between networks by means of control.

4.3 Leibniz's jest

The distinction between an Augustinian evil and Manichean can be read in a more nuanced way by distinguishing the heterogeneity of the elements (the problem of the One and the Many) as ensuing from the problem of *translation*, for the Augustinian evil, and *control*, for the Manichean. This would be a distinction based on an affirmative, continuous reading of Leibniz's theory of games, as Michel Serres has done, and a discontinuous, critical variant by Wiener.

Preempting von Neumann and Morgenstern, Leibniz proposed an (unrealised) 'comprehensive study of games, dealt with mathematically': first of all a study of 'all the games which rely on numbers', then 'the games which also involve position, such as backgammon, checkers and especially chess'; and lastly 'the games which involve motion, such as billiards and tennis.'[47] He contributed to the Prussian Academy's first scientific study of games and held Fermat, Pascal and Huygens' pioneering studies of 'games of chance' [*de aléa*] in high regard, writing, 'Games themselves deserve study, and if a penetrating mathematician were to investigate them, he would find many important truths, for men never show more spirit than when they are jesting.'[48]

Leibniz preempts de Saussure by using chess to illustrate the relationality of space as the relative *place* of bodies in relation to one another. Where de Saussure writes how, as with language, the internal state of the board is dependent on the singular relation of the pieces to one another such that 'the fact that the game passed from Persia to Europe is external',[49] Leibniz already in the *New Essays* (1705) invokes the image of Arabs 'playing chess on horseback by memory' to illustrate how 'place' is determined either in particular with respect to other bodies or universally with respect to the universe, even if those relations are imagined within the mind.[50] The roving chess-speaking Arab condenses into one the structuralist analogy of chess and language, place as relationality and relationality as sign.

The employment of chess as a model of relationality and the idea that games

47. Cited by the editors of G. W. Leibniz, *New Essays on Human Understanding*, ed. and trans. Peter Remnant and Jonathan Bennett (Cambridge: Cambridge University Press, 1996), lxiv–lxv.

48. Leibniz, 'Reply to the Thoughts on the System of Pre-established Harmony Contained in the Second Edition of Mr. Bayle's Critical Dictionary, Article Rorarius', *Philosophical Papers and Letters*, 584. Also Loemker's Introduction, fn. 39, p. 61.

49. Saussure, *Course in General Linguistics*, 22.

50. *New Essays on Human Understanding*, 148–149

exhibit the divinity of a mind coincide in the notion of the *échantillons architectoniques*, the operative image. To re-enter Leibniz's system through the *Theodicy*'s section T147 to which he refers the reader of the *Monadology*'s paragraph M83 which I discussed earlier on in respect of the 'operative image', and mentioned in respect of the Leibnizian-Hobbesian monster with which I began our discussion:[51]

> Here is another particular reason for the disorder apparent in that which concerns man. It is that God, in giving him intelligence, has presented him with an image of the Divinity. He leaves him to himself, in a sense, in his small department, *ut Spartam quam nactus est ornet*. He enters there only in a secret way, for he supplies being, force, life, reason, without showing himself. It is there that free will plays its *game*: and God makes *game* (so to speak) of these little Gods that he has thought good to produce, as we make *game* of children who follow pursuits which we secretly encourage or hinder according as it pleases us. Thus man is there like a little god in his own world or Microcosm, which he governs after his own fashion: he sometimes performs wonders therein, and his art often imitates nature.[52]

How does this game, this totality of rules herein defined by Leibniz, work? God, whose omnipotence is matched by his omniscience and perfect benevolence, who knows everything to its infinitely clear and distinct degree, God for whom nothing is secret, sneaks secretly into the chambers of the universe in which humans reside, their minds. The game God plays is like a speculative Hide and Seek subject to the Law of Continuity. He enters 'in a secret way … without showing himself', and through his cryptographic fulgurations he (re)creates the world at each moment, choosing according to his perfect wisdom the best possible variant. As *échantillons architectoniques* humans finitely imitate his knowledge, power and will, but given that these are encoded in an infinite series of cryptograms, this imitation game involves a cryptanalytic decipherment.[53] The game that is played is played between God and mind is that of *cryptology*, of God's encipherment and of the mind's decipherment.

Games, Leibniz tells us, improve the 'art of invention',[54] and this is so because to invent is to imitate God's own machines, through the operative image, and thereby become a little divinity of a microcosm. In order to imitate one needs to decipher, one needs to see what is already there but hidden. Leibniz envisages a deciphering machine, the *art of combinations*, an algebra for all things, a complex alphabet of arithmetically arrangeable concepts.[55] Not only would this be applicable for mere

51. See pp. 32–35 above.

52. T147. Translation from G. W. Leibniz, *Theodicy: Essays on the Goodness of God, the Freedom of Man and the Origin of Evil*, ed., with an introduction by Austin Farrer, trans. E. M. Huggard (Bibliobazaar, 2007).

53. It is common to confuse cryptography, as the enciphering of a message, with cryptanalysis, as the deciphering of message. Deleuze makes this mistake when he writes in *The Fold*, 'A "cryptographer" is needed, someone who can at once account for nature and decipher the soul, who can peer into the crannies of matter and read into the folds of the soul.' Deleuze, *The Fold*, 3.

54. Leibniz, *New Essays on Human Understanding*, §466.

55. Leibniz depicts his *arte combinatoria* for his disputation for the philosophical faculty at Leipzig, and

arithmetic, logic and music but for 'various games', and also *cryptography* as well as its opposite, the '[analysis of] what has been compounded', what is today called *cryptanalysis*.[56]

Now, as Lucie Mercier has written in her thesis *The Inside Passage* (2017), Michel Serres developed for Structuralism a cybernetic reading of Leibniz which pivots around cryptology for his own doctoral thesis, *Le Système de Leibniz et ses modèles mathématiques* (1968).

Recognising that representation involves for Leibniz a 'passage from confusion to truth', Serres conceives of the understanding as a layered and confused 'palimpsest' through which knowledge, says Mercier, 'becomes an operation of *decipherment*.'[57] To resolve through Leibniz's calculus an equation is to '[reproduce] the operations of perceptions but via symbols'. This is, in Serres' words, a progressive 'decomposition of the *cryptogramme*, extraction of the resolving element.'[58]

When Mercier writes that Serres 'does not address mathematical idealities as mere givens, rather he adopts a genetic perspective on them', we are called to rethink Socrates, Meno and his unnamed slave's rediscovery of the doubled square in a twice Leibnizian sense: since he deciphers a knowledge that was inside of him all along but occluded, but also, as we learn following Socrates' first question, *because he speaks Greek*:

> Serres considers the *translational* origin of geometry from the perspective of a regular dialogue between two interlocutors. For communication to take place, 'two persons need to know the same graphic, they need to know how to code and decode a meaning by means of the same *key*.'[59]

Like the soil in which Meno's slave draws his square, like the infinite other variations of possible vocables, the cryptogram's key is established through the distinction and separation of 'background noise'. As de Saussure says of the chessboard, its configuration is unique, and what is moreso than a monad, subject to 'Leibniz's law' of the *identity of indiscernibles* whereby any two things that are not absolutely alike cannot be one and the same thing. (M9) The deciphered key is the *image* in the sand with all its contours and irregularities, its image is not the ideal form but

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the *Dissertatio de arte combinatoria*, also written in 1666, is an expansion of his thesis. *Philosophical Papers and Letters*, 73–84.

56. In his 'Letter to Walter von Tschirnhaus' (May 1678), Leibniz writes, 'Cryptography is also a part of this science, although the difficulty here lies not so much in compounding as in analyzing what has been compounded, or in investigating its roots, so to speak. What a root is in algebra a key is in cryptographic divination.' *Philosophical Papers and Letters*, 192–93, See also, 'On Universal Synthesis and Analysis, Or the Art of Discovery and Judgment', *Philosophical Papers and Letters*, 233.

57. Mercier, 'The Inside Passage,' 106. Serres' thesis *Le Système de Leibniz et ses modèles mathématiques* (1968) still awaits translation and has received little Anglophone engagement, and as such I rely fully on Mercier's account of it. To avoid added confusion I may simply refer to Serres' reading of Leibniz as such, whereas in truth I rely on the tripple 'translation' of Mercier's reading of Serres' reading (plus of course my own reading of Mercier). Make of *this* palimpsest what you will.

58. Ibid., 107.

59. ibid., 153, emphasis added; Plato, *Meno*, 81–82.

only a *model*, in as much as all monads but God express the universe from their own perspective of varying degrees of distinction and confusion. As Mercier writes, 'only the understanding of each topography's specific lineaments, can provide a comprehensive universality.' For Serres, the *passage* from local to universal calls for a 'method by models' and a 'philosophy of the example', whereby the example is concretely an image. Irreducible to one another, these *échantillons archetectoniques* have no single universal language and communicate through *translation* amongst languages, model to model, image to image. This is a communication governed by decipherment, of a refining of the key. Leibniz, says Serres, 'deciphers their languages as two different languages designating a single meaning, translatable into one another by a common law: the translation from centre to centre.'[60]

This affords a productive and critical potential. As every monad reflects every other, everything *can* be translated, everything can be rendered analogous, every language bears a parallelity, *but* all of this only to a degree since, though the cryptogram is progressively decomposable (broken down), the monad itself is ultimately indecomposable: *there is no universal language but that of the combinatorial arts*, which is a 'system of faithful translations'. That everything appears through combinatorial *translation* is, for Serres, Leibniz's own 'transcendental'.[61] The Structuralists can describe so many 'languages', Lévi-Strauss can endlessly play chess against a single myth. *There are as many operative images as there are operations in need of modelling*.

This jars with Wiener's cybernetics, for which, I seek to argue, there is a single language, a single operative image for every age, which for ours, I am arguing, is the internet. For which there *is* a metaphysical language which does not translate transcendentally at all but describes according to a single historically situated ontology, a 'fundamental science' in Heidegger's words,[62] which is *heterogeneous because the homeostases of its networks conflict*. This construes the entire social life of humans according to a single cybernetic-game theoretical vocabulary of conflict and control, which Serres' universal translatability is incapable of accounting for and, moreover, engaging politically with.

Wiener's position parallel's Bruno Latour's depiction of how, 'Serres abandoned Leibniz. Serres did his thesis on Leibniz, the reconciliator par excellence. But then he slowly realized that the sciences were not a way to limit violence but to fuel it.'[63] In Wiener's transition to the problematic of Manichean evil he too abandons Leibniz. Wiener would have also agreed with Latour that with the internet,

60. Mercier, 'The Inside Passage,' 182.
61. Ibid., 118. Emphasis added.
62. Martin Heidegger, 'The End of Philosophy and the Task of Thinking,' in *On Time and Being*, trans. Joan Stambaugh (New York, San Francisco & London: Harper & Row, 1972), 58.
63. Bruno Latour, 'The Enlightenment Without the Critique: A Word on Michel Serres' Philosophy,' in *Contemporary French Philosophy*, ed. A. Phillips Griffiths (Cambridge: Cambridge University Press, 1989), 92.

> There are neither wholes nor parts. Neither is there harmony, composition, integration, or system. How something holds together is determined on the field of battle, for no one agrees who should obey and who command, who should be a part and who the whole.
>
> • There is no pre-established harmony, Leibniz notwithstanding, harmony is *post*established locally through tinkering.[64]

In the next chapter I shall show that Wiener indeed himself abandoned Leibniz, the 'patron saint for cybernetics', whose philosophy more than any other profoundly influenced him in his formative youth, and which provides the foundation from which Wiener could critically re-calibrate Leibniz's system into cybernetics and the operative image of a Manichean internet. This would be his monstrous Hobbesian fusion.

64. Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan and John Law (Cambrdige, MA & London: Harvard University Press, 1988), 164.

Chapter 5

Internets

5.1 Back to the Neo-Kantians

Of all the aspects of Leibniz's system that could be emphasised, from Wiener's 'prodigious' youth onward he seemed to have gravitated to the fact that, as he wrote in his entry on Metaphysics for the 1918-1920 *Encyclopedia Americana*, 'Leibniz regarded the monads as possessing ideas of various grades of clearness and distinctness, and believed that matter was made up of those with the vaguest ideas.'[1] This is to the extent that among his other philosophical entries for the *Encyclopedia* (Soul, Substance, Mechanism-Vitalism, Dualism, Postulates, …), which he considered 'fresh … original and good' still after *Cybernetics* to the extent of having 'toyed' with the prospect of republishing them,[2] there is, surprisingly, an entire entry on 'Apperception'. That is, the term which Leibniz invents in 1700 to institute a distinction between perceptions and the act of perceiving [*apercevoir*] from the self-conscious apperception of the content of perceptions themselves [*s'apercevoir de*], which in the *Monadology* he describes as 'the consciousness or the reflective knowledge of this internal state' (M14).[3] Leibniz's distinction between *apperception* and mere *perception* would afford in the nineteenth century the distinction between perceptions which are *conscious*, and those which are *unconscious*, and it is within this context that Wiener situates his *Encyclopedia* entry. Further, this distinction furnishes the basis of the older Wiener's concepts of information and entropy, for a cybernetics premised on a precise break with the monadology.

Wiener introduces apperception as 'a psychological term referring to higher consciousness' which has come under 'considerable confusion' in Anglophone psychology

1. Norbert Wiener, 'Metaphysics,' in *Norbert Wiener: Collected Works*, ed. P. Masani, vol. 4 (Cambridge & London: MIT Press, 1918), 939.

2. Wiener, *Ex-Prodigy*, 251.

3. See, Leibniz, *New Essays on Human Understanding*, 161–62, xlix; 'Principles of Nature and of Grace', *Philosophical Papers and Letters*, 637; R. McRae, *Leibniz: Perception, Apperception and Thought* (Toronto: University of Toronto Press, 1976); and Deleuze, *The Fold*, 98–99.

such that the *Encyclopedia*'s intervention (rather than exegesis) is called for. Returning to Leibniz, he writes that the ' "windowless" monad', which every human soul is, 'develops by an inner unfolding', and when this unfolding reaches a 'point of clear self-conscious being', he writes, it attains 'apperceptive consciousness'. But, '[if] this development is only partial, if its states are vague and only partially self-conscious', then the monad has only attained a 'level of perceptive consciousness.' As Leibniz says, 'we always have an infinity of minute perceptions [*petites perceptions*] without being aware of them. We are never without perceptions but are often without apperceptions, namely when none of our perceptions stand out.'[4] Wiener continues, 'Thus for Leibniz the terms perception and apperception designated simply different degrees of clearness and distinctness of consciousness … with no reference whatever to the apprehension of external things.'[5]

It is striking that Wiener makes no mention in 'Apperception' of his teacher Bertrand Russell's venerable *A Critical Exposition of the Philosophy of Leibniz* (1900). This, given that the book resuscitated Leibniz scholarship in English and that Wiener wrote his 1913 doctoral thesis on Russell and Whitehead's mathematical logic, that he studied under Russell at Trinity College in 1914 and wrote in 1915 a lengthy paper on 'Bertrand Russell's Theory of the Nature of Reality'. The intersection in Russell of the great reader of Leibniz and symbolic logician of the age seems in retrospect obvious for someone who would go on to write,

> just as the calculus of arithmetic lends itself to a mechanization progressing through the abacus and the desk computing machine to the ultra-rapid computing machines of the present day, so the *calculus ratiocinator* of Leibniz contains the germs of [Turing's] *machina ratiocinatrix*, the reasoning machine.[6]

But Wiener in a section of the 1918 *Encyclopedia Americana's* 'Metaphysics' entry entitled 'The Metaphysics of the Technical Philosopher' casts Russell aside as 'essentially a Humian in spirit' and therefore the 'recrudescence of British empiricism … [which] is off the main stream [sic] of philosophical development during the latter part of the 18th century and the entire 19th.'[7] With respect to Russell's logic Wiener consistently takes a parallel position in his later cybernetic writings, effectively dismissing his logic as rigid and homostatic, unlike Gödel and Turing's.[8]

4. Leibniz, *New Essays on Human Understanding*, 162.

5. Norbert Wiener, 'Apperception,' in Masani, *Norbert Wiener: Collected Works*, 4:951–952.

6. Wiener, *Cybernetics*, 141. Turing himself said: 'I expect that digital computing machines will eventually stimulate considerable interest in symbolic logic … The language in which one communicates with these machines … forms a sort of symbolic logic.' Martin Davis, *The Universal Computer: The Road from Leibniz to Turing* (New York & London: W. W. Norton, 2000), 3-20, 199.

7. Wiener, 'Metaphysics,' 939.

8. In a manuscript from 1952 entitled *The Book and the Church* Wiener recollects how he considered Russell and Whitehead's attempt to provide a 'complete set of postulates covering all of logic' in actual fact only a mere 'written codification of a process which was actually employed in thinking', an observation he recalls having received – surprisingly – 'scant support from Mr. Russell' when put to him in Cambridge whilst writing the *Principia Mathematica*. Wiener would carry this view through his

To Wiener the source of 'main steam' modern European philosophy is Kant, and in 'Apperception' he turns from Leibniz instead to the *Neo-Kantians* – the fourth generation post-Kantians whose works flourished until the end of WWI.[9] Specifically, to Johann Friedrich Herbart and Wilhelm Wundt, who instituted the use of 'apperception' in psychology.

How did Wiener encounter Neo-Kantian psychology? For one, there is a straight passage of ideas to Wiener from the Neo-Kantian philosopher Rudolf Hermann Lotze, whom Gillian Rose reminds us was widely considered in the late-nineteenth century to be on a par as a philosopher with Kant and Hegel.[10] During Wiener's PhD at Harvard between 1911-1913 (he completed at eighteen years of age) Wiener took a course with George Santayana, who not only left on Wiener a lasting impression 'that philosophy was an intrinsic part of life, or art, and of the spirit', but who wrote his own doctoral thesis on Lotze.[11] The young Wiener also attended two-years of seminars on scientific method under Josiah Royce, who himself studied under Lotze, supervised Santayana's thesis, and would have, had health permitted, supervised Wiener's too; these seminars would be recalled by Wiener as having given him 'some of the most valuable training I have ever had.'[12] But I would argue that the most important conduit to the Neo-Kantian ideas of Herbart and Wundt would have been William James, himself highly indebted to Lotze, whose books Wiener 'devoured' as a child, being taken less by James' pragmatism than his psychological writings wherein 'his insight showed itself in every paragraph'.[13]

James' major textbook *The Principles of Psychology* (1890) makes good use of all three Neo-Kantians and singles out Wundt's apperception (he quotes Wundt on it at length with reference to Leibniz) for apparently being identical to his own concept of 'adjustments', the results of sensorial and ideational processes discharging into the

life, conforming it to Gödel's insistence on the incompleteness of logical systems: 'Logic is an account of a process which goes beyond its formal rules … incompleteness belongs to the nature of logic itself'. (*The Book and the Church*, pp. 1–3) In *A Treatise on Cybernetics*, another manuscript penned the same year, he similarly writes that Russell and Whitehead's classical mathematical logic 'has arrived at a sharp consciousness of its own limitations through the work of Gödel and Turing, and Turing's work is more particularly associated with the machina ratio sinatrix.' (p. 2) *The Book and the Church* extends this to Wiener's (unfortunately *cliché* strewn) description of the 'Bible of Marx' and the 'Church of Stalin' from the conclusion of *HUHBa*. The point is that Russell and Whitehead's work presents logic as rigid and homostatic, whereas Gödel, Turing and thereby the digital computer opens the field to infinite variety and change. See also *Ex-Prodigy*, 193.

9. Nicolas de Warren and Andrea Staiti, 'Introduction: towards a reconsideration of Neo-Kantianism,' in *New Approaches to Neo-Kantianism*, ed. Nicolas de Warren and Andrea Staiti (Cambridge: Cambridge University Press, 2015), 5–6, 10; Rudolf A. Makkreel and Sebastian Luft, eds., *Neo-Kantianism in Contemporary Philosophy* (Bloomington & Indianapolis: Indiana University Press, 2010), 1.

10. Gillian Rose, *Hegel Contra Sociology* (London: Athlone Press, 1995), 5.

11. Wiener, *Ex-Prodigy*, 164–66, 171.

12. ibid.; Wiener mentions Lotze in his *Encyclopedia* entry on 'Soule', and references him in 'Metaphysics'; For introductory remarks on Lotze, see: Manfred Kühn, 'Interpreting Kant Correctly: On the Kant of the Neo-Kantians,' in Makkreel and Luft, *Neo-Kantianism in Contemporary Philosophy*, 124–26.

13. Wiener, *Ex-Prodigy*, 109–10.

brain, body or environment.[14] The 'nuclear self', James writes, is not a single and static being but 'adjustments collectively considered'. Wiener quotes from *The Principles of Psychology* in his 'Apperception' entry to invoke James' image of a baby's perceptions being 'one great blooming, buzzing confusion', a 'chaos' of little perceptions which education shall distinguish and render rational 'cosmos', albeit in a non-progressive fashion.[15] Though James is never mentioned in the older Wiener's works, it seems likely that this early encounter had a special influence on him given his cybernetic depiction of self-regulation as 'adjustment',[16] life itself as 'metastability' and death as 'stability'.[17] James' emphasis on living individuality as collective adjustment has its philosophical roots in Leibniz, for whom life and death are distinguished by varying degrees of activity in perception and 'every monad is adjusted … that its perceptions will always accord with every other created monad.'[18] Yet for Leibniz the accord of a monad's perceptions with another's occurs not through their actual adjustment with each other but through their pre-established 'adjustment' by God. For James as for Wiener, young and old, adjustment is rooted in Leibniz's concepts of perception and apperception but read specifically through a Neo-Kantian rejection of pre-established adjustments. We shall return to the profound consequences of this for cybernetics.

Wundt, the young Wiener writes, adopted the distinction between '*apperception*' for mental process that are clear and distinct and under the '*control*' of volition and '*uncontrolled*' or obscure '*perception*'. It is this distinction which English psychologists have become confused over, he writes, since in English 'perception' implies an already clear and self-conscious recognition of things. These English psychologists are like Cartesians, in Leibniz's words, 'who have given no thought to perceptions which are not apperceived.' (M14) The emphasis on control in respect of the degree of apperception is striking with hindsight, but more so is his depiction of Herbart:

> With Herbart all mental acts are but the interaction of ideas. When a new idea enters the mind it causes a connection among the ideas already present. It disturbs the equilibrium. It is welcomed by the ideas akin to it, and opposed by those which are not. When it finally becomes adjusted and settled into its proper position among pre-existing ideas the new relation thus brought about is the result of apperception.[19]

He continues,

> As the bodily organism separates and assimilates only such elements of the food taken into it as are needed for growth and repair, so in some what similar manner does the mind select and appropriate only such of its presentations as manifest a

14. William James, *The Principles of Psychology* (New York: Henry Holt, 1931), vol. I, 302–03.
15. Wiener, 'Apperception,' 951–52; Wiener quotes from, James, *The Principles of Psychology*, vol I, 488.
16. Wiener, *Cybernetics*, 181.
17. Ibid., 58.
18. M51, M69.
19. Wiener, 'Apperception,' 951.

> certain kinship to what is already consciously and vitally present, and rejects the rest.[20]

Through Herbart's reading of apperception the young Wiener seems to have already struck on the tenet of what he would call 'cybernetics'. That a mind is no more than the interaction of its 'ideas' (*messages*); that an idea 'enters the mind' (*communication*) and thereby disrupts its 'equilibrium' (*metastability*), forcing it to change (*control*); that the mind automatically adjusts itself to a condition of equilibrium by assimilating certain ideas and expelling others (*homeostasis*, *negative feedback*, *self regulation*); that the organism (*life*), functions analogously to cognitive systems (*thought*) in this respect, selecting from its environment what gives it life and expelling that which does not. To read the conclusion of 'Apperception' that, 'The point is that in all perception there is more or less apperception', may not be striking in itself a reading of Leibniz, but when the same writer would invent the modern concept of information a quarter-century later as the 'negative logarithm' of confusion and entropy, that 'Entropy is a measure of disorder, information a measure of order', the correlation of apperception and information, and likewise perception and entropy, becomes hard to ignore.[21] That as there are infinite degrees of clear and distinct apperceptions and infinite degrees of confused and indistinct perceptions for Leibniz, for information theory there is an infinite quantity of information and as much for entropy.

The sense in which Herbart and Wundt are not a 'recrudescence of Leibniz' for the young Wiener may be illustrated by W. T. Harris' introduction to Herbart's *A Text-Book in Psychology* (1891), in which Kant is described as importing 'almost exactly' Leibniz's apperception into the transcendental unity of apperception.[22] This is, of course, *not* exactly the case, neither because Kant's use of apperception is so true to Leibniz's nor because the Neo-Kantians are so to Kant. Although the central role apperception plays for the *Critique of Pure Reason* is a reason Kant could characterise the first Critique as 'the genuine apology for Leibniz' contra his Cartesian 'partisans',[23] the apperceptive self-consciousness that Leibniz intended appears in the *CPR* only as '*empirical* apperception', that is, the 'inner sense' and 'consciousness of oneself in accordance with the determinations of our state in internal perception'. (*CPR* A106) This apperception is, for Kant as for Leibniz, *episodic*; Leibniz writes: 'we are nothing but empiricists' – lacking in apperceptive self-consciousness – 'in three-

20. Ibid.

21. *HUHBb*, 102. In *Cybernetics*, 64, he makes the famous definition: 'we have said that amount of information, being the negative logarithm of a quantity which we may consider as a probability, is essentially a negative entropy.'

22. Johann Friedrich Herbart, *A Text-Book in Psychology*, ed. William T. Harris, trans. Margaret K. Smith (New York: D. Appleton, 1891), xv.

23. Immanuel Kant, *The Kant-Eberhard Controversy: An English Translation Together with Supplementary Materials and a Historical-Analytic Introduction of Immanuel Kant's on a Discovery According to Which Any New Critque of Pure Reason Has Been Made Superfluous by an Earlier One*, trans. Henry E. Allison (Baltimore and London: John Hopkins University Press, 1973), 250, 160.

quarters of our actions.' (M28) Kant's empirical apperception, which corresponds to Leibniz's apperception, is preceded by the 'pure' or 'transcendental' apperception which, *ever-present*, grounds the possibility of unifying intuitions and the concepts of the understanding into judgements.[24] For Kant, transcendental apperception, unlike empirical apperception, is the undetermined source of its own determinations. It gives rise to the *cogito*, the original 'I think' which allows the synthesis of intuitions to be the property of a subject.[25]

But for Leibniz it is precisely what he derides as the 'Scholastic prejudice' of the Cartesians with their determining spirit's *cogito* – its being substantially separate from the body-machine – which his apperception is deemed to annul. (M14) For Leibniz the reflexivity of apperception allows a mind to discover innately within itself necessary metaphysical notions such as God, being, substance and infinity, and as such allow it to think an 'I' from which all these are contained and derived.[26] Kant's use of apperception cannot be read as an 'almost exact' import of Leibniz's since Kant distinguishes an originary, pure and persistent sense (the transcendental apperception) from a determined and intermittent sense (empirical apperception). A consequence of this is a shift in emphasis from Leibniz's degrees of perception and apperception of any and every substance to, in the *CPR*, the architectonic of the possible knowledge *of the human alone* (although in the *Critique of Judgement* and *Opus Postumum* the problem of non-human cognition would return to trouble him[27]).

As concerns the Neo-Kantian employment of apperception, Michel Fichant argues in his *Dictionary of Untranslatables* entry on 'Perception/Apperception' that Herbart's use of apperception construes it to be the observation of already-formed perceptions, the 'I' (or 'ego') is thereby not the *origin* of apperception, as per both Leibniz and Kant (in their distinct ways), but the *result*.[28] Following Nicolas de Warren and Andrea Staiti, one might say that when Fichant dismisses Neo-Kantianism as 'the end of the philosophical use of the term "apperception",' he resonates the two typical

24. Howard Caygill, *A Kant Dictionary* (Oxford: Blackwell Publishing, 1995), 81–83.

25. B132–141. Herbart himself rejects the spontaneous combination of the manifold on the basis that combination results from the 'immediate unity of the soul' rather than by a spontaneous act. Also, because he sees the combination of the manifold as dependant on the external condition of the way in which intuitions meet. He also asserts that spontaneity cannot be supported by empirical psychology (which is surely one of Kant's arguments for it, but anyway.) Herbart, *A Text-Book in Psychology*, 50–51.

26. M30 and 'Principles of Nature and of Grace', *Philosophical Papers and Letters*, §5, 638.

27. In the *CJ* Kant is moved to reflect on nature in terms of purposiveness, although he recoils from depicting it in terms of inner determination and restricts natural purposiveness to the 'as if' of empirical determinability. (*CJ* 195–97) Varela and Weber argue in 'Life after Kant' (2002) that this renders his Newtonianism tenuous and thereby introduces an 'unstable middle position' which allows, in the form of a 'work in progress' pursued into the *OP*, the concept of self-organisation or autopoiesis to emerge. Interesting as this argument may be especially to Kant scholars, to me it seems that we can already look towards Leibniz for a philosophy which accounts for the self-production of organisms, and that what of this problem is found in Kant can be traced back to a Leibnizian problematic rather than his original invention.

28. Fichant, 'Apperception', *Dictionary of Untranslatables: A Philosophical Lexicon*, ed. Barbara Cassin et al., trans. Steven Rendall et al. (Princeton and Oxford: Princeton University Press, 2014), 767.

responses to Neo-Kantianism among philosophers since its fall to oblivion after WWI.[29] First, that expressed by Lukác's characterisation of Neo-Kantianism as being a bourgeois academic philosophy isolated from the concrete dialectical forces of world history, and thereby being 'totally insignificant for the evolution of philosophy'.[30] And Heidegger's 1929 characterisation of Neo-Kantianism as a mere 'theory of knowledge' [*Erkenntnistheorie*] that effectively legitimises the natural and social sciences' claim to dominion over all realms of knowledge and absconds philosophy from metaphysics and the ontological problem of being.[31]

A century on from its post-WWI collapse, efforts are now underway to restore legitimacy and interest in the movement through emphasising its under-recognised effects on twentieth century European thought.[32] Warren and Staiti's edited volume points to the crucial role Neo-Kantianism played in the ' "pluralisation" of rationality' into disciplines such as art history, sociology and, not least, cognitive psychology. They argue that if the universality of philosophy is construed in the sense of philosophy's capacity to speak productively to disciplines other than itself, then Neo-Kantianism represents one of philosophy's last universal frameworks.[33] Rudolf A. Makkreel and Sebastian Luft's volume rebukes the construal of Neo-Kantianism's rendering of philosophy the 'handmaiden of the sciences' by emphasising its participants' lasting contribution to the philosophy of culture, and moreover the hidden dependencies of many of Neo-Kantianism's contesters on its own affirmations, or at least their negations thereof, whether phenomenology, critical theory or other philosophies born of the interwar crisis of German culture and science.[34]

It is within the context of the contemporary reappraisal of Neo-Kantianism that a rereading of Wiener's cybernetics contextualised by it might take place. For example, that the Neo-Kantians considered developments in the exact sciences to be challenges for philosophy to bridge, rather than positivistic existential threats to be

29. The reasons for Neo-Kantianism's decline were not just limited to philosophical debates, although one might argue they were reflected in them. It failed to recruit new members as members passed away in the 1920s, and was significantly effected by the rise of antisemitism given that many Neo-Kantians, including Ernst Cassirer and Richard Hönigswald were Jewish, as was the founder of the Marburg School, Hermann Cohen, who died in 1918. In Nazi exile their network became fragmented and their output and reception suffered. As Makkreel and Luft argue, even though Cassirer enjoyed success in American exile after 1933, his works there were introductory and he was received more as a classical historian of ideas rather than the creative philosopher of the *Philosophy of Symbolic Forms*. Makkreel and Luft, *Neo-Kantianism in Contemporary Philosophy*, 7; Warren and Staiti, *New Approaches to Neo-Kantianism*, 8.

30. Georg Lukács, *The Destruction of Reason*, trans. Peter Palmer (London: Merlin Press, 1980), 322; Warren and Staiti, 'Introduction: towards a reconsideration of Neo-Kantianism,' 4–5.

31. Warren and Staiti, 'Introduction: towards a reconsideration of Neo-Kantianism,' 6–15; Martin Heidegger, *Kant and the Problem of Metaphysics*, 5th ed., trans. Richard Taft (Bloomington, Indiana: Indiana University Press, 1997), 193–194.

32. These take off from the only major history of the movement in English, Klaus-Christian Köhnke's *The Rise of Neo-Kantianism* (1991), whose Kuhnian study ends in 1900.

33. *New Approaches to Neo-Kantianism*, edited by Warren and Staiti (2015).

34. *Neo-Kantianism in Contemporary Philosophy*, edited by Makkreel and Luft (2010).

dismissed, seems to be also fundamental to the older Wiener's outlook. The Neo-Kantian framing of philosophy in systematic terms to concrete human subjectivity, lending itself as it does to ethical, political, pedagogical and theological considerations, resonates through Wiener's critical reflexivity with regards to the use and dangers of cybernetics for human society and, in his final book especially, with respect to a relation to God. And negatively, perhaps Heidegger's attacks on the Neo-Kantians from the outset of his project to develop a fundamental ontology could be reread through his twilight lamentations of cybernetics having become the 'universal science' of the age.[35] These are possibilities whose investigation lies beyond the scope of this thesis, but which I raise as possible avenues for untouched research (so far as I am aware).

For now, I leave things by posing that Wiener's early encounter with the Neo-Kantian psychologists' reading of Leibniz by Wundt, Herbart and James was a formative moment in the development of cybernetics and that Wiener's Leibnizianism shares with them certain qualities. An emphasis on apperception in the sense of a subjective principle of knowledge formation rather than a mode of discovery of innate ontological truths. Apperception construed not only in terms of the conscious perception of inner ideas but also that of sense-impressions, since as Herbart writes, '*the inner perception* is analogous to the outer.'[36] Consequently, that substances, contra Leibniz, *have windows*. The capacity to refer to the cognitive capacities of non-human animals, unlike the Kant of the CPR and as per Leibniz's Principle of Continuity ('nature never makes leaps'[37]) since for Herbart all animals share the 'lower' faculties of 'imagination' and 'sensuous pleasure' but humans, crossing the threshold of conscious apperception, are capable of higher 'understanding' and 'aesthetic feeling'.[38] With Wiener's science of control and communication in animals and machines this would of course continue to be the case.

To pursue this argument would be to counter such claims as Heidegger's student Hans Jonas, that cybernetics is 'out to capture' philosophy.[39] Rather, it would be to position cybernetics within the context of, as Makkreel and Luft say, the 'prematurely silenced' field of Neo-Kantianism.

35. Heidegger explicitly turns to cybernetics as of the mid-1960s, in *End of Philosophy and Task of Thinking* (1964), the *Der Spiegel* interview (1966), the Zollikon (1967) and Heraclitus (1966) Seminars and his birthday address to Eugen Fink (1966). Unfortunately several dimensions of translational problems afflict a reading of these, and not only for the usual reasons of *traduttore, traditore* do they exemplify Wiener's claim that 'any transmission of, or tampering with, messages decreases the amount of information they contain, unless new information is fed in.' (*HUHBb*, 84)

36. Herbart, *A Text-Book in Psychology*, 30–31.

37. As formulated in the *New Essays*, §56. Leibniz rephrases the axiom differently throughout his work. In the *Monadology*, §13 he writes: 'every natural change takes place by degrees'. In his letter to Burcher De Volder of March 24/April 3 1699: '*no transition is made through a leap*'. The principle holds that there is an infinity of points between any two given points, whether spatial ('compound') or otherwise. *Philosophical Papers and Letters*, 515

38. Ibid., 38, 45.

39. Jonas, 'Critique of Cybernetics,' 190.

5.2 Wiener's determinations

To Leibniz the distinction between apperception and perception accounts for every substance being an *entelechy*, or, as Hermolaus Barbarus translated this Aristotelian concept into Latin (having apparently consulted none other than the Devil), a *perfectihabia*. Substances – entelechies and perfectihabias – lack nothing since they actively realise their own potency, a 'complete specification' (M12) which is pre-established by God according to his perfect wisdom, but which is only apparent to the created substances themselves according to their singular degree of self-reflective apperception, the continuum of greater or lesser perceptions which are also their degree of perfection. Implicit in this is that Leibniz denies inter-substance causality (M7) that monads have 'windows', since all action is the progressive unfolding of an essential inner *intra*-substantial causation. Monads do not act on one another. Their perceptions and apperceptions are of themselves. Although 'we say that' one monad acts on another, especially in the spatial realm of extended (or rather 'compounded') substances, this, Leibniz holds is never truly the case. What we mean when we say that one monad acts outwardly is that it has a greater degree of perfection and apperception, that it has a greater explanatory power than that which we say is acted upon.[40] The monad of the mind can be said to cause the monads of the fingers and toes to swim in the sea because, although the digits perceive the infinite ripples and contours of the water, the mind has a greater degree of clear and distinct perceptions than the confused little digits and it can thereby offer a better explanation. The mind, in this situation, has a greater degree of 'action' than the fingers and toes, which have a greater degree of 'passion'. The calculus is implicit in this: the differential of the mind's apperceptive activity with respect to the perceptive passivity of the digits constitutes the degree of what we may say is the mind's causal power over the toes. A fish can be said to have been caught on the spear because it was more confused than the hunter. But the mind has also its degree of confusion, the waves crashing on the distant shore are confused and indistinct to it, and when, back on the boat, sleep takes over, the ways of the waves lose even more clarity and distinction.[41] There is only one substance which is pure of all confusion and indistinction at any and every moment – *God* – whose infinite perfection and apperception in respect of the world allows us to say that all things are his effects and none are his cause.[42] God is the apex of a pyramid of perceptions and thereby power which cascades down through all beings.

To phrase this differential of causes and effects in Leibniz's monadology inversely, the degree to which one being is *secret* to another is the degree to which it can be

40. Gilles Deleuze, *Expressionism in Philosophy: Spinoza*, trans. Martin Joughin (New York: Zone Books, 1990), 328.

41. Leibniz employs his famous image of the crashing waves in 'Principles of Nature and of Grace', *Philosophical Papers and Letters*, §13, 640.

42. See, M19/20 and Strickland's explanations pp. 111–13.

said to be in *control*.

Where for Leibniz the active but unconscious striving of all things towards perfection is an hermitic affair, an undulating continuum of cryptological perceptions pre-established by God at the outset of time and continuously recreated, for the Wiener of cybernetics, it is a cryptological communion of the Godless little gods. Where for Leibniz the fundamental substance of the universe is the monad, for Wiener it is the 'black box', a machine whose output can be predicted by means of its input, but whose internal transformations are yet unknown.

In *Cybernetics* Wiener situates his main engagement with Leibniz within the context of a history of automata, the rational explanation and reduplication of the mechanisms by which nature operates. The problem of the three *operative images*: the clock, the steam engine and the cybernetic machine (the internet). For the Early Moderns after Descartes this question centres around the means by which the soul and body maintain unison despite their substantial differences, and it is in respect of this problem that Leibniz liked to employ his figure of 'two clocks or watches which are in perfect agreement'.[43] Wiener's argument here in *Cybernetics* rehearses that made in his *Encyclopedia Americana* 'Metaphysics' entry, working through Descartes to the Occasionalists Malebranche and Geulincx and then onto Spinoza and Leibniz. These in turn echo Leibniz's argument from 'A New System of the Nature and the Communication of Substances, as well as the Union Between the Soul and the Body' (1695) and his following letter to Basnage de Beauval (1696).[44] In these Leibniz treats the mind-body problem ('how the body causes anything to take place in the soul, or vice versa, or how one substance can communicate with another created substance'[45]) with analogy to relations of force in material systems, and thereby, like Geulincx before him (whether he knew so or not), invokes the image of the two clocks which keep in perfect concordance because the master clockmaker God has coordinated their internal principles of change in advance such that they can act 'entirely as if they were mutually influenced or as if God were always putting forth his hand'.[46] Leibniz (and not Hobbes, as for Otto Mayr) is rendered the representative of the Age of the Clock when Wiener writes:

> Leibniz considers a world of automata, which, as is natural in a disciple of Huygens, he constructs after the model of clockwork. Though the monads

43. Leibniz, 'A New System of the Nature and the Communication of Substances', *Philosophical Papers and Letters*, 459.

44. Compare, for example, Wiener, *Cybernetics*, 40–44, to 'Metaphysics,' 938–39, and 'A New System of the Nature and the Communication of Substances', Leibniz, *Philosophical Papers and Letters*, 454–60.

45. Ibid., 469.

46. Ibid., 457; Arnold Geulincx, *Ethics*, ed. Hans van Ruler, Anthony Uhlmann, and Martin Wilson, trans. Martin Wilson, with a comment. by Samuel Beckett (Leiden & Boston: Brill, 2006), §19, p. 232.

> reflect one another, the reflection does not consist in a transfer of the causal chain from one to another. They are actually as self-contained as, or rather more self-contained than, the passively dancing figures on top of a music box. They have no real influence on the outside world, nor are they effectively influenced by it.[47]

It is Leibniz's image of the clock which is succeeded in the nineteenth century by those for whom the body is a heat engine (by implication, Claude Bernard and Charles Darwin). Their model is in the twentieth century overturned by the communication theorists, by cybernetics.

This is not a linear evolution. For one, because clocks and heat engines, like those of their respective Ages still retain a use value in a way that, for example an Intel 386 CPU from 1989 would no longer do today. But moreover because the problematic which Leibniz established is the same which Bernard and Darwin and the cyberneticists in turn have attempted to answer. Wiener writes, 'I may be pardoned the fancy of thinking that if Leibniz were alive today, he would adjust himself rather readily to the present modes of thought. Even though the answers which we now give differ from the Leibnizian answers, the questions posed are very similar.'[48] And in *HUHBb*, 'My views in this book are very far from being Leibnizian, but the problems I am concerned with are most certainly Leibnizian.'[49] This is not just to say that Leibniz contingently shared today's interests, that 'even in his computing machine, Leibniz's preoccupations were mostly linguistic and communicational';[50] but that with his operative image of nature Leibniz provides the foundation for the cybernetic ontology.

This can be shown by comparing the foundational cybernetic text, 'Behavior, Purpose, Teleology' (1943) by Wiener, Rosenblueth and Julian Bigelow (chief engineer to be of von Neumann's MANIAC), to Leibniz's own first mature philosophical publication, 'Meditations on Knowledge, Truth, and Ideas' (1684).[51] Both texts are similarly attempts to delimit series of recursive sets of categories delineating infinitude such that their structures are homomorphic conceptual trees, which I have reproduced on p. 111. The design of both trees is defined by the negativity of knowledge and power on the lower-left and their positivity on the upper-right, both of which signify an infinity of degrees. I wish to argue that the cyberneticians' reanimation of Leibniz's ontological system can be discerned through an overlaying of these two schemas, together with a subsequent paper by Wiener and Rosenblueth, 'The Role of Models in Science' (1945), which draws out an implicit aspect of their 1943 work to explicitly invent, I believe, the modern philosophical concept of information.

47. Wiener, *Cybernetics*, 41. He repeats the image of the music box in *HUHBb*, 22–23
48. Wiener, *Prolegomena to Theology*, 60.
49. Wiener, *HUHBb*, 20.
50. Ibid.
51. Collected in, Leibniz, *Philosophical Essays*, 23–27.

The root of the tree in 'Behavior, Purpose, Teleology' is *behaviour*, defined as 'any change of an entity with respect to its surroundings'.[52] By this definition the paper's schema can be read as one of *control*, since Wiener will soon define control as 'nothing but the sending of messages which effectively change the *behavior* of the recipient.'[53] Behaviour (or control) is conceptualised through the model (or substance) of the box, whose *output* is a 'change produced in the surroundings by the object', and *input* is 'any event external to the object that modifies this object in any manner.'[54] Now, behaviour can either be *active* or *passive*, and there is an infinite degree of each. This is the first set the authors give, although they write that it could be extended further to the negative – there is no limit to how passive behaviour can be. Active control is that in which an object is the source of its own output. Passive, where the input 'energy' (to later become 'message': cybernetic concepts are still presented in 'Behavior, Purpose, Teleology' in a thermodynamic vocabulary) is the source of its behaviour, *where another is in control*. A number of axioms are already implicit here. The terms of this discussion are those of servomechanics, implying the model of 'boxes' which take inputs and outputs. The box is in an environment. It is, one might say, an 'open system' which means that the question of its activity or passivity is not binary and simple but is determined deferentially, box-to-box and boxes-to-boxes. There can always be a greater degree of energy running into the box's output stream than the box is capable of engaging itself, and vice versa.

The concept of activity is refined according to a further continuum: *purposivity* and *non-purposivity* (or *randomness*). Something with a degree of activity can be said to have purpose if its 'act or behavior may be interpreted as directed to the attainment of a goal.'[55] Key here is *may be interpreted*, almost apologetically invoked, which signifies that this schema is an epistemology concerned with possible knowledge, rather than absolute classification, and that the subject of knowledge is distinct from its object. The behaviour of something does not equate to its having selected for itself that purpose. This is as much as to say in the Aristotelian taxonomy of causes that the final cause cannot be reduced to the efficient, except it goes further: one can only *interpret* the presence of the efficient causes from a final cause, and this interpretation is always subject to more or less certainty. In this way it breaks free of the strict delineations Aristotle imposed over what kind of being could have purpose. The roulette wheel is designed for purposelessness, they write, but their argument implies that any serious gambler would study the wheel for flaws that might imply patterns

52. Wiener, Rosenblueth, and Bigelow, 'Behavior, Purpose, Teleology,' . Given this paper's five-page brevity I hope the reader may excuse me from referring to individual pages in what follows.
53. Wiener, *HUHBa*, 8. Emphasis added.
54. Wiener, Rosenblueth, and Bigelow, 'Behavior, Purpose, Teleology,' 1.
55. Ibid.

and thereby purposes in its results. This emphasis on the determinability of an entity's purposivity is crucial, as we shall soon see.

Continuing along the taxonomy. There is a kind of purposivity which is guided by *negative feedback*, whereby 'the signals from the goal are used to restrict outputs which would otherwise go beyond the goal.'[56] On the opposite spectrum there is *non-feedback*, an example given being a frog who shoots their tongue towards a fly and cannot alter course when away it moves. Again these are not absolutes, but infinities: non-feedback can be seen as the vacillation of a *positive feedback* which has become so extreme as to render it altogether entirely without feedback in any meaningful sense.

The self-regulating negative feedback can in turn be *predictive* or *non-predictive*. It can feed its inputs and outputs through a store of memory and *extrapolate* a prediction of a future relevant to its intended purposive behaviour, a prediction which, by definition of the future's uncertainty, can always be improved and can therefore always be rendered for the worse.

Along this axis, the Cyberneticists argue, all things can be classified according to their perceived behaviour. If, as for Leibniz following Aristotle, the *entelechy* of a being is defined according to its capacity to strive towards its own ends, then this is a scale by which the 'perfection' of every being can be assessed. The axis defines their ontology.

What distinguishes this from Structuralism is that it posits a single ontology: one continuum for all things, all situations, all machines. Whilst it can be used for analogies, between a roulette wheel and a frog for example, there is no translation between models: only a universal grammar. This becomes even more apparent in Wiener and Rosenblueth's subsequent paper, 'The Role of Models in Science' (1945), in which they discuss the 'progressive concretization of a theoretical model' (a formulation befitting of Simondon) from a state of simplicity to one which 'asymptotically [approaches] the complexity of the original situation.'[57] 'The best material model for a cat', they write, 'is another, or preferably the same cat.'[58] 'The only completely satisfactory map to scale of a given country [is] that country itself.'[59] 'The ideal formal model would be one which would cover the entire universe, which would agree with it in complexity, and which would have a one to one correspondence with it.'[60] Whoever could 'grasp the universe directly as a whole … would possess the third category of knowledge described by Spinoza.' The ultimate concretisation of the model is that by which

56. Ibid., 2.
57. Norbert Wiener and Arturo Rosenblueth, 'The Role of Models in Science,' *Philosophy of Science* 12, no. 4 (October 1945): 320.
58. Ibid.
59. Ibid.
60. Ibid.

knowledge is eternal and anticipates all, which 'knows all the things that can follow', in which an eternal mind agrees in essence with all essences including God.[61]

But Spinoza's third category of knowledge (*tertium cognitionis*) is ruled out (or at least 'probably'). Rather we live with partial models, since 'the main tool of science is the human mind and that the human mind is finite.' Once again, Wiener may have already decided on this during his PhD.[62] If that is the case then, as with his *Encyclopedia* entries, with cybernetics Wiener finally gave his own answer to the question of the rational organisation of substances. But this would not be complete without its key category, *information*.

Wiener and Rosenblueth's 'Models' paper begins with the observation that 'the scientist behaves dualistically, [but] his dualism is operational and does not necessarily imply strict dualistic metaphysics.'[63] Their reference to metaphysics might be surprising in the paper with which Wiener first expounds the modern concept information, that is, in the guise of 'operational dualism'.

Like the 'Behavior' paper this paper is also replete with such dualisms. *Simple* systems and *complex* systems. *Factual* and *abstract* problems. The specifics of *lower* levels like the effect of a drug on nerves and *higher* levels which evade testability. These are all quite quotidian until they describe *material models* as distinct from *formal models*. The former being, 'the representation of a complex system by a system which is assumed simpler and which is also assumed to have some properties similar to those selected for study in the original complex system'.[64] At the very least the material model would change a scale, like studying a blue whale by means of a dolphin. The formal model is 'a symbolic assertion in logical terms of an idealized relatively simple situation sharing the structural properties of the original factual system.'[65] The vocabulary does not yet exist, but this dualism seems to suggest the distinction between analogue and digital computers, which Wiener formally presents to the world in *Cybernetics*.[66] The '*analogy machine*', as he there calls it, the pinnacle of which being Vannevar Bush's differential analyser which tended to be built of rods, wheels, disks,

61. Wiener and Rosenblueth, 'The Role of Models in Science.' Spinoza, *Ethics*, V P31–33, *Complete Works*, 376–77.

62. Wiener submitted an entry to Harvard's prestigious Bowdoin Prize in 1912 in which he discusses the occasional presence of self-consciousness and concludes: 'The knowledge of relations, then, is the beginning, the end, and the whole of true knowledge. It is all that we have, and it gives us all that we need for science. Our knowledge is an imperfect and incomplete map of reality, drawn to scale, which can be improved and corrected as time goes on, though the material on which it is written is a matter of indifference.' – *information is information, not matter or energy* – 'The task of science is to explore the unknown parts of existence, and to survey and plot its known parts.' *The Place of Relations in Knowledge and Reality*, 25.

63. Ibid., 317.

64. Ibid.

65. Ibid.

66. For a palpable sense of the 'shock of the new', see the *Le Monde* review of *Cybernetics* which Wiener translates the concluding paragraphs of for inclusion in *HUHB*. It especially focuses on the invention in the USA of the new kind of computer. Pierre Dubarle, 'Une nouvelle science: la cybernétique. Vers la machine à gouverner...,' *Le Monde*, December 28, 1948,

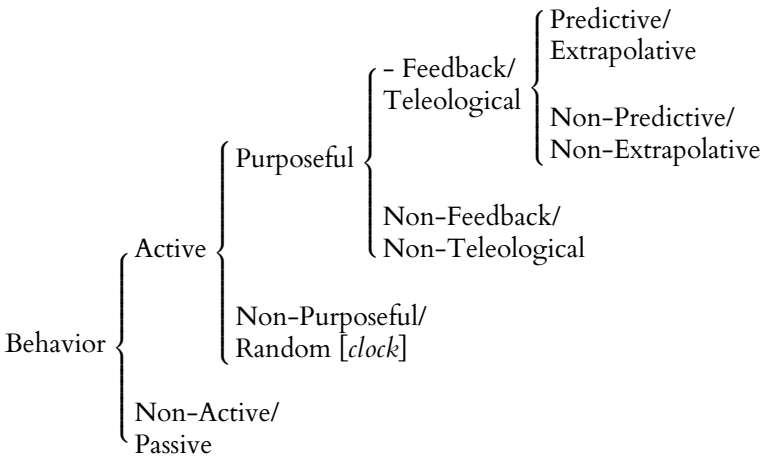

Figure 5.1: Schematic diagram provided in Wiener *et al.*, 'Behavior, Purpose, Teleology', p. 3. Braces added.

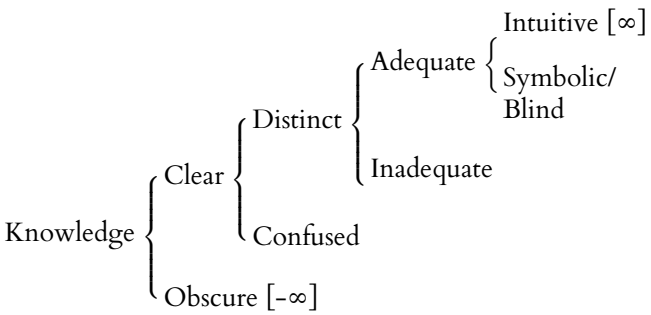

Figure 5.2: Diagram representing the schema of Leibniz's 'Meditations on Knowledge, Truth, and Ideas'.

belts, spheres and other mechanical elements (Meccano versions were constructed in Britain[67]), represents its object on 'some continuous scale' to a degree of accuracy determined by its size, like a slide rule. The '*numerical machine*' represents arithmetical and logical algorithms by means of (preferably binary) numbers, giving potentially infinite degrees of accuracy.[68] As Wiener says, 'The former measures. The latter counts.'[69] If the material model and analogue computer (analogy machine), and formal model and digital computer (numerical machine) can be aligned, then we see that for Wiener the distinction between the machines is no more than methodological, hence his claim in 1961 that 'the difference between the digital and the analog machine is a matter of inconvenience in technique, and not of great philosophical importance.'[70] The dualism of the material model (analogue computer) and formal model (digital computer) ensues from the more fundamental dualism whose grammar is established by their distinction between an *open box* and a *closed box* problem.[71]

This distinction between an open and closed box in effect rephrases the purposive and non-purposive behavioural distinction from their 'Teleology' paper, which, we recall, concerns not exactly whether a thing seeks after its own end or not but rather the degree to which this can be '*determined*'. The open and closed box are ideas, they stand for the capacity to determine an entity's activity, purposivity, self-regulation, predictability and extrapolability – which is to say, its *self-determination*. The terms 'open box' and 'closed box' would be respectively replaced by *white box* and *black box*,[72] thereby avoiding confusion between 'open systems' and 'closed system', systems which are open to external influence, and avoiding the confusion of thinking that a model could be completely open or closed to the observer, pitch black or pure white. Every real box appears to be a shade of grey, to others and to itself. Black is its indetermination, its perception, its passion; white its determination, its apperception, its activity. In the 'Models' paper Wiener and Rosenblueth write:

> There are certain problems in science in which a fixed finite number of input variables *determines* a fixed finite number of output variables. In these, the problem is *determinate* when the relations between these finite sets of variables are known. It is possible to obtain the same output for the same input with different physical structures. If several alternative structures of this sort were inclosed in boxes whose only approach would be through the input and output terminals, it would be *impossible to distinguish* between these alternatives without

67. Wiener says that of all the possible physical quantities the analogue computer could measure, such as 'currents or voltages or the angles of rotation of shafts or quantities of still different sorts … the form to which [Bush's differential analyser] gravitated was a form of meccano set'. *I Am a Mathematician*, 136. On differential analysers actually built of Meccano in the UK in 1930s see, William Irwin, 'The Differential Analyser Explained,' Auckland Meccano Guild, July 2009, accessed August 20, 2018, http://amg.nzfmm.co.nz/differential_analyser_explained.html.

68. Wiener, *Cybernetics*, 116–32, especially 117–19.

69. Wiener, *I Am a Mathematician*, 137.

70. Wiener, *Prolegomena to Theology*, 60.

71. Wiener and Rosenblueth, 'The Role of Models in Science.'

72. Wiener, *Cybernetics*, 180.

> resorting to new inputs, or outputs, or both. For instance, a given electrical impedance as a function of frequency can be realized with many different combinations of resistances, capacitances and inductances. As long as *closed* boxes containing such elements are only tested for self and mutual impedances across the terminals, their accurate *internal structure cannot be determined*. To *determine* that [internal] structure additional terminals would have to be used. The more terminals available, the more *open* the system. An *entirely open* system would need an *indefinite* number of terminals.[73]

Their use of 'determinacy' here is double. As a verb concerning inputs ('any event external to the object that modifies this object in any manner') which *determine* – in the sense of a restriction (*de-termino*, 'of limits') – behavioural outputs ('change produced in the surroundings by the object'). This is to say, *control* its behaviour. And as an adjective that designates the possibility of *determining* knowledge in the sense of imposing boundaries on the continuum of otherwise indefinite possibilities, possibilities which otherwise appear a 'homogeneous chaos', to use a phrase of Wiener's from 1938.[74] A closed box is one whose internal structure is indetermined, which could be constituted by an infinite number of possible functional arrangements even though its output behaviour corresponds to any other. A dog may exhibit as much pleasure as a human when fed chocolate, but without imposing further types of inputs ('terminals') on it, the chocolate's poisonous effect on its organs will be indeterminable. By employing more terminals it becomes more of a white box to me. The black box's inner determinations become lighter, but there is no pure white since an indefinite (infinite) number of terminals would be thereby needed; for the same reason there is no completely closed box either.

Now, the more open a box becomes to me, the more my determination of it increases, the more I am able to determine its behaviour. Hence the opening words of Wiener and Rosenblueth's paper: 'The intention and the result of a scientific inquiry is to obtain an understanding *and a control* of some part of the universe.'[75] Understanding and control, knowledge and power, cannot be separated, they are one and the same. This is why cybernetics is the science of *communication and control*. Why it being named after Watt's governor is so appropriate: the governor is a device which continuously determines the engine in both the sense of determining a communicative understanding (input) and determining its behaviour (output).[76]

73. Wiener and Rosenblueth, 'The Role of Models in Science,' 318–19. Emphases added.

74. Norbert Wiener, 'The Homogeneous Chaos,' *American Journal of Mathematics* 60, no. 4 (October 1938): 897–936.

75. Wiener and Rosenblueth, 'The Role of Models in Science,' 316. Emphasis added.

76. A recent paper by physicists Jordan M. Horowitz and Massimiliano Esposito, 'Thermodynamics with Continuous Information Flow,' *Physical Review X* 4, no. 3 (July 2014) (2014) attempts a 'tweezing apart' of the 'continuous coupling' of input and output in autonomous systems such as the thermodynamic governor and homeostatic organism, in order to quantify their information. It is striking that though aware of Szilard's rendition of Maxwell's Demon, a milestone of information theory, the authors seem oblivious to the paradigmatic cybernetic history of their problematic, as though completely forgotten.

The statistical terms into which 'determination' would concretise fails to capture this unity. '*Information*' and its negative logarithm *entropy* were first propounded in Wiener's *Cybernetics*[77] and equivalently in Shannon's 'A Mathematical Theory of Communication' (and it seems that Shannon, who almost always takes the concept's credit today, was far more under Wiener's influence than vice-versa[78]). Information and entropy (or 'noise') bear no semantic relation to one another and so encourage, certainly in popular discourses at least, tendencies to, firstly, treat information and entropy as two separate concepts; secondly, to forget that both information and entropy are infinite quantities; and thirdly, to fail to realise the dual meaning of them as both communication *and control*. One might argue that this has encouraged the recrudescence of Cartesianism, of knowledge and body as distinct from one another. Information has been identified with the message itself, with the total possible epistemological determination of a communication, occluding the necessary indeterminacy of every viewpoint; it renders finite the possible determinability of knowledge and power; and it reimposes the notion of an immaterial knowledge and knowing substance distinct from the body and its dynamic forces.

While Léon Brillouin's neologism 'negentropy' perhaps dampens the first two problems above, it still fails to speak for the third and moreover it further occludes the concept's philosophical genealogy.[79] Instead, retaining the vocabulary of determinability and indeterminability and their various cognates helps situate the *concepts* of information and entropy within not only Wiener and Rosenblueth's pre-1948 writings but also the history of philosophy, without reducing their mathematical novelty. Doing so emphasises that the problematic Wiener and Rosenblueth refer to originates in Aristotle's famous discussion of whether a determination of there being a naval battle tomorrow necessarily determines its occurrence.[80] And it helps reveal the concepts in Leibniz's system, since as Nicholas Jolley argues, it was the ancient and medieval Aristotelian tradition of the problem of determinism with respect to *truth* that Leibniz was most interested, rather than that of causal determinism as per

77. Wiener, *Cybernetics*, 10-11, 58, 62, 64.

78. Bigelow recalled: 'In the time I was associated with Wiener [at MIT], Shannon would come up and talk to Wiener every couple of weeks and spend an hour or two talking with him…Wiener would exchange ideas with him in a most generous fashion, because Wiener had all the insights of what information theory would be like and he spewed out all these ideas and his comments and suggestions to Shannon.' (Kline, *The Cybernetics Moment*, 31–32) As Kline charts, they both formulated the statistical definition of information at roughly the same time, Wiener in respect to time series and neural nets and Shannon in respect of cryptology. Despite the much vaunted fact that Wiener defined information as negative entropy and Shannon as positive entropy, they considered their definitions functionally identical. (ibid.) Shannon himself wrote a footnote in 'A Mathematical Theory of Communication' stating that 'Communication theory is heavily indebted to Wiener for much of its basic philosophy and theory.' (p. 34ft).

79. 'Negentropy' is first employed in Leon Brillouin, 'The Negentropy Principle of Information,' *Journal of Applied Physics* 24, no. 9 (24 1953): (1952).

80. Aristotle, *De Interpretatione*, 18b17–19b1.

contemporaries like Hobbes.[81]

For Leibniz this is expressed in his principle of sufficient reason, or as he refers to it in the *Theodicy*, the 'principle of *determinate* reason' [*le principe de la raison déterminante*],[82] one of the two 'great principles' which grounds reason – the other being the principle of non-contradiction (or principle of identity) which stakes that, 'We judge *false* that which includes a contradiction, and *true* that which is opposed or contradictory to the false'[83], or 'A is A and cannot be non-A'.[84] The principle of determinate reason stakes that 'nothing happens without a reason why it should be so rather than otherwise',[85] or as in the *Theodicy*,

> that nothing ever happens without there being a cause or at least a *determinant* reason, that is, something that can serve to explain *a priori* why it is existent rather than non-existent, and why it is thus rather than any other way. This great principle holds for all events, and a contrary example will never be given: and although most often these *determinant* reasons are not well known to us, we nonetheless sense that there are some.[86]

The principle states that there is a determinate reason to the existence of all things, the occurrence of every event and the necessity of all truths. This is to say, a cause which determines every effect, but a cause which is grounded in reason, or more specifically, in the being with the greater clarity of reason since, as Deleuze says of Leibniz, 'Causality always moves not just from the clear to the obscure, but from the clearer (or more-clear) to the less-clear, the more-confused.'[87] In every monad but God's, every created substance, there is an infinity of such causes, an indeterminate quantity of determinations. As not only cause but also effect, we minds are 'insufficiently acquainted' with our determinations, 'most often these reasons cannot be known to us', (M32) but the faculty of reason and moreover our knowledge of the existence of the 'universal determining cause' (God)[88] depends on the acceptance of the principle of determinate reason. And our limited apperception with respect to our predetermination by God, our 'complete specification' which we unfold from creation on, is what allows us to consider ourselves free. We can consider ourselves free because we cannot apperceive our infinite predeterminations. What of our little perceptions we do apperceive, we do by degrees, which is to say limitedly, but also in terms of discreet quantities, like the differentiation of a curve whose precision tends asymptotically towards precision, or as Wiener and Rosenblueth say,

81. Jolley, *Leibniz*, 126.
82. Leibniz, *Theodicy*, §44.
83. M31
84. Second letter to Caroline and Clarke, *Philosophical Papers and Letters*, 677; See also his 'Letter to Herman Conring' (19 March 1678), *Philosophical Papers and Letters*, 187.
85. Second letter to Caroline and Clarke, *Philosophical Papers and Letters*, 677.
86. Ibid., §150. Strickland's translation, from the Appendix to his translation of the *Monadology*.
87. Deleuze, *The Fold*, 134.
88. 'On What is Independent of Sense and of Matter: Letter to Queen Sophia Charlotte of Prussia' (1702), *Philosophical Papers and Letters*, 552

'asymptotically [approaches] the complexity of the original situation.'[89] Leibniz's principle of determinate reason grants minds the possibility to ever ascend or descend the ladder of determining causes.

Leibniz's system contains a taxonomy of this asymptote which is functionally equivalent to that in Wiener, Rosenblueth and Bigelow's 'Behavior, Purpose and Teleology', in which one never constructs a perfect model (or a perfectly base one) for if one did it would be, as per the principle of non-contradiction, the same thing entirely. As Wiener and Rosenblueth argue, 'Lewis Carroll fully expressed this notion in an episode in *Sylvie and Bruno*, when he showed that the only completely satisfactory map to scale of a given country was that country itself.'[90] Leibniz's taxonomy is laid out in his 'Meditations on Knowledge, Truth and Ideas' (1684) wherein he elaborates on the argument that:

> knowledge is either obscure or *clear*, and again, clear knowledge is either confused or *distinct*, and distinct knowledge either inadequate or *adequate*, and adequate knowledge either symbolic or *intuitive*: and, indeed, if knowledge were, at the same time, both adequate and intuitive, it would be *absolutely perfect*.[91]

I have drawn this out into a tree diagram on p. 111.

The problem which gives force to Leibniz's schema is Descartes' depiction of *truth* as being in ideas that are inseperably clear *and* distinct, such that they cannot be doubted, as opposed to the falsity of the confused and obscure.[92] For Descartes these are binary categories. An idea is clear if it is 'present and accessible to the attentive mind', distinct when clear and also 'so sharply separated from all other perceptions that it contains within itself only what is clear.'[93] Methodologically, Descartes separates knowledge which is *confused and obscure*, such as that provided by the immediate senses, from knowledge which is *clear but not distinct*, such as pain, from knowledge which is *clear and distinct*, such as the *cogito*, the three substances (mind, body, God), duration, order, number, and so on. The obscure and confused, the clear but confused, and the clear and distinct are the three degrees of knowledge for Descartes. The third degree pertains to those truths which are universally *accessible* to every mind.[94]

With the *Meditations on Truth and Knowledge* Leibniz retains the Cartesian phrase 'clear and distinct' but construes it within a continuum of an infinity of degrees such that one can have certain degrees of clear and distinct perceptions simultaneously to

89. Wiener and Rosenblueth, 'The Role of Models in Science,' 320.
90. Ibid., 320. Wiener and Rosenblueth are referring to vol. I, ch. 11 of Carroll's final work.
91. Leibniz, *Philosophical Essays*, 24.
92. Descartes, *Discourse on Method*, *The Philosophical Writings of Descartes*, vol. I, 130.
93. Descartes, *Principles of Philosophy*, *The Philosophical Writings of Descartes*, vol. I, 207–08.
94. *Principles of Philosophy*, *The Philosophical Writings of Descartes*, vol. I, 208, 211.

having an infinity of degrees of confusion, an unfathomable proposition for Descartes. Where for Descartes the clear and distinct emerge from God while the confused and obscure 'participate in nothingness',[95] for Leibniz, as Deleuze says, 'clarity emerges out of obscurity by way of genetic process',[96] through an inversion or fold. This system allows him to attribute varying degrees of clarity and distinction, confusion and obscurity, to every substance (not only minds) at any given moment, and present them as reflecting the entire universe of substances but from a haecceitic perspective and degree, each a differently clouded mind, such that every monad can be situated singularly with respect to one another.

Further, to Descartes' diad of clarity and distinction Leibniz adds adequacy and intuition, and to both an inverse form. His tetralogy of positive terms (clear, distinct, adequate, intuitive) does not merely add two new categories but reconfigures their entire system to be concerned with knowledge as an *infinite* quantity which emerges out of its inverse, as determination from indetermination.

Leibniz conceives of the *obscure* as analogous to the one who cannot recognise in the flower before them the flower of their memory, or who (the Schools be thanked) cannot sufficiently grasp Aristotle's concept of *entelechy* or the Four Causes. The *clear*, 'when I have the means for recognizing the thing represented', is either confused or distinct. Such recognition itself is either *confused* or *distinct*, and this depends on what degree it is enumerable into individual 'marks' [*nota*] or not. Hence we cannot explain the colour red to a blind person if it is only clear to us, but if we can distinctly 'enumerate' it like a assayer would of gold, then we would, through the conceptual language of mathematics. A distinct knowledge of simple notions is one thing, but with respect to composites, it is either *inadequate* or *adequate*, the latter being approached by 'the knowledge of numbers' – an allusion perhaps to his calculus of reason. The adequate in turn is either *symbolic* (or *blind*) or *intuitive*, the latter when every aspect of a notion is considered in all of its complexity, the former when its sense 'appears only obscurely and imperfectly to the mind'.[97]

Deleuze, referring to Serres' 1968 dissertation and Yvon Belaval's *Leibniz critique de Descartes* (1978), describes the various aspects as 'filters' [*filtre*] of obscurity, confusion, inadequacy and blindness.[98] Any clarity or adequacy that a monad has is only so because it has emerged out of its opposite, its determinations filtered from its indetermination. Mercier, writing on Serres, writes of the progressive decomposition of a cryptogram as an 'application of successive filters'.[99] A filter is an apparatus

95. *Discourse on Method*, 38.
96. Deleuze, *The Fold*, 90.
97. Leibniz, 'Meditations on Knowledge, Truth, and Ideas'. Like the cyberneticians' 'Behavior, Purpose, Teleology', this is a very short text, just over four pages long, and so I refer to the paper in its entirety not individual pages.
98. Deleuze, *The Fold*, 90–91.
99. Mercier, 'The Inside Passage,' 107.

which encodes, in output mode, and decodes (in input), a modulator-demodulator 'modem' that is a fundamental model for both Wiener and Shannon's communication theories, Wiener writing of it 'transmitting power of the entire complex' of a sequence of communication.[100] Perhaps a thinking in terms of lens filters could give sense to Wiener's odd reading that Leibniz conceived of his windowless monads' perception 'largely in optical terms', that 'interaction really becomes nothing more than a subtle consequence of optical interaction'.[101] Deleuze, Serres and Mercier intimate the repetition of Leibniz's schema in the cybernetician's 'Behavior, Purpose and Teleology'.

But not to a sufficient degree. The filter may be a model for communication but, once again, not for control. The trajectory Leibniz pursues in his schema is that from a determination of the mere effects of things, the infinite obscurity and passivity of a blade of grass, to a determination of their causes, the infinitely intuitive, absolutely perfect knowledge and activity of God. What the schema charts is not only degrees of perception and apperception conceived as communication, but of *power*, since the monad with the greater causal power is that with the greater degree of apperception. A monad's level of activity and passivity, its degree of acting or being acted upon, is an attribute of its degree of knowledge with respect to another monad. Leibniz's taxonomy is a cascading pyramid of determination in its double sense of knowledge and power, with the primitive monad of God at its apex, the bare monads of minerals and plants at its base, and animal souls and minds vacillating in between across all the aspects to various degrees. This is not only a pyramid of knowledge but also one of power. But of course, only by analogy since there is no inter-substance causality.

5.3 Breaking the pyramid

From Wiener's reading of the Neo-Kantian psychologists onward, substances are construed as actually intercommunicating, no longer by mere analogy. As de Saussure might have said, this one change alone 'revolutionizes the whole game'. Yet the Structuralists do not grasp the extent of this revolution, which does not just shift the grammar of the pieces but adds a very real opponent – it shifts the very nature of the game itself.

To 'play' against God in Leibniz's monadology is to decipher that which appears obscure within oneself, to reverse one's own passivity. This is obviously a single player game not a game of strategy, a game of science not of politics or war. To play the game as a scientist in the cybernetic schema is to decipher that which is inside or

100. Wiener, *HUHBb*, 149. The modulator-demodulator is *the* model for Shannon's 'A Mathematical Theory of Communication,' and his theory was developed with respect to his work on the cryptographic vocoder system employed by Roosevelt and Churchill during WWII. See, Kline, *The Cybernetics Moment*, 31–32

101. Wiener, *HUHBb*, 19–20.

that which is outside but determined by the 'absence of a conscious or purposeful' opponent.[102] Wiener was fond of Einstein's formulation, 'God may be subtle, but he isn't plain mean' to depict the opponent of science, but his system implies that not only is God subtle, he is infinitely weak and passive: in accordance with the second law of thermodynamics, God's universe degrades towards a final heat death.[103] Leibniz vehemently opposed any notion of the universe being imperfect when he argued against the Newtonian belief (at least that so characterised by Leibniz) that 'force does naturally lessen in the material universe' such that 'God Almighty wants [i.e. needs] to wind up his watch from time to time; otherwise it would cease to move.'[104] Whether Leibniz would understand cybernetics or not, as Wiener believed he would, he would have certainly despised it: not only is the universe so deficient as to persistently wind down but there is even no God to wind it back up again. Instead the universe is only 'wound up' locally by beings (machines, animals, humans, boxes, forms of life) which act as 'little gods' in that they represent 'pockets of decreasing entropy in a framework in which the large entropy tends to increase.'[105] This is so because in homeostasis they have sufficient activity to determine their own adaptation instead of passively letting the universe determine it according to its natural death drive. They act as Maxwell demons which *locally* reverse the second law of thermodynamics by sensing and sorting (determining in both senses of communication and control) the entropic tendencies of their environment. So long as these substantive demons can decipher and distinguish the palimpsest of atoms distinctly enough, they can determine by means of adaption their own behaviour, maintaining a 'metastable' equilibrium. To fail to distinguish these sufficiently is to die. Wiener writes: 'as Leibniz says of some of his monads, it receives a large number of small impressions, until it falls into "a certain vertigo" and is incapable of clear perceptions. In fact, it ceases to act as a Maxwell demon.'[106]

What structure does this then take, if the God who pinches Leibniz's pyramid together at the point of infinity no longer exists? André Robinet – scholar of early modern philosophy, editor of the collected works of Nicolas Malebranche, cybernetician – employs a profound expression to depict the structure of a cybernetic society: 'a

102. Ibid., 163. Wiener's translation.
103. Ibid.
104. Letters to Caroline and Clarke, I.4, V.100.
105. Wiener, *HUHBb*, p. 31. In the introduction he writes that, 'while the universe as a whole, if indeed there is a whole universe, tends to run down, there are local enclaves whose direction seems opposed to that of the universe at large and in which there is a limited and temporary tendency for organization to increase. Life finds its home in some of these enclaves. It is with this point of view at its core that the new science of Cybernetics began its development.' (p. 15).
106. Wiener, *Cybernetics*, p. 58. This would seem to be a reference to M21 in which Leibniz depicts death as a '*un vertige*' in which a monad is unable to distinguish its perceptions: 'But when there are a vast number of little perceptions [*petites perceptions*] in which there is nothing distinct, we are stupefied [*étourdi*], as happens when we continuously spin around the same direction several times: this makes us dizzy [*il vient un vertige*], which can make us faint and prevent us from distinguishing anything at all. And death can put animals into this state for a time.'

tangle of interconnected myriagons.' [*un enchevêtrement de myriagones interconnectés*][107] This alludes to the famous problem of imagining complex shapes posed by Descartes, to which Leibniz responds. Descartes uses the ease of understanding the difference between a chiliagon (a figure bounded by a thousand equal lines) from a myriagon (one bounded by ten-thousand) to distinguish the faculties of the understanding from the imagination, given the impossibility of imagining (visualising) in the 'mind's eye' any difference between such complex figures. Whereas in *understanding* the mind 'turns' inward to 'inspect … ideas which are within it', with *imagination*, Descartes argues, it 'turns' outward to bodies and 'looks at something in the body which conforms to an idea understood by the mind or perceived by the senses.'[108] To Leibniz this implies an incursion of confused senses on the clarity of the polygon's idea. When considering a chiliagon, Leibniz argues, the mind proceeds by a combinatorial logic in which words (side, equality, thousandfoldedness) are used in place of ideas which would be too complex and confused for it to handle at once: 'in place of the ideas I have of these things, since I remember that I know the meaning of those words, and I decide that explanation is not necessary at this time.'[109] The properly distinct idea of a myriagon is therefore *blind*, or obscure sensation, and *symbolic*.

It is precisely Leibniz's procedure of seeking clarity through bounding confusion in abstract concepts which Wiener and Rosenblueth depict in their paper on 'Models': the closed (black) box, whose interior I am effectively blind to, allowing for determinations of the otherwise infinite and unwieldy white box, which computer scientists have since named the procedure of 'black box abstraction.'[110] The myriagon which Robinet depicts is therefore an asymptotically black box, and the structure of the cybernetic system is a 'tangle' [*enchevêtrement*] of such black boxes: a network, but one whose very relationality eludes clear determinability, whose every relation is effectively a black box.

This is the very opposite of Leibniz's pyramid, where however obscure a perception is, one can always be certain that what is, what has happened and what is true, is so because it has descended from divinity above. One might jump to call the cybernetic situation horizontal or equal, as Hardt and Negri do. Yet the fact that cybernetic relations themselves are black boxes ensures that this cannot be clearly known to be the case. Moreover, and contra any sense of utopianism, that the relations between

107. '*L'univers pyramidal de la fin de la* Théodicée *prend l'allure d'un enchevêtrement de myriagones interconnectés.*' André Robinet, *Le Défi Cybernétique: L'automate et La Pensée* (Paris: Gallimard, 1973), 114. My translation.

108. Descartes, *Sixth Meditation* 72–73.

109. Leibniz, *Philosophical Essays*, 24–25; Leibniz, *New Essays on Human Understanding*, 261–62.

110. In their classic programming textbook, Abelson, Sussman and Sussman write: 'it is crucial that each procedure accomplishes an identifiable task that can be used as a module in defining other procedures. For example, when we define the `good-enough?` procedure in terms of `square`, we are able to regard the `square` procedure as a "black box." We are not at that moment concerned with *how* the procedure computes its result, only with the fact that it computes the square.' *Structure and Interpretation of Computer Programs*, 26

the black boxes are constituted through determination in its double sense means that these relations, these cryptological lines of communication, are each relations of power, of determining determinations. To deign their equality is to focus on their epistemologico-communicational sense alone (information) as though it could be distinguished from control, to dematerialise and depoliticise it. The cybernetic system is not *a* pyramid but a myriad of pyramids. A myriad of hierarchies in every direction. Its shape is a myriagon.

Ideally, for the scientist, the structuralist, the philosopher, this new shape does not necessarily mark a noticeable shift to them, since their opponent no more than passively resisted them in the first place. Such scientists sustain themselves through a homeostasis of knowledge, their existence dependant on their deciphering determinations of distinct knowledge from their opponents: nature and the known body of human literature. As of Anaximander, who 'opened the doors of nature' as Pliny said,[111] 'science' is a phylogenetic homeostasis which determines the adaptive evolution of the species, the 'we'; the student is the one who survives through adapting themselves to their environment through ontogenetic homeostasis, the 'I'. There have been great hopes that cybernetic networks would reconcile the individual and species. Licklider's Library of the Future, his hope that the interconnection of his internet 'will make available to all the members of all the communities the programs and data resources of the entire supercommunity.'[112] Gene Youngblood and the post-'68 Teilhard de Chardinesque ambition of the New Communalist Video Artists to create a global 'videosphere' of human minds through cybernetic communication media, which repeated itself in the 1990s utopia of 'cyberspace'.[113] Hardt and Negri's multitude whose singularities act in common. These still assume the functionally equivalent passive Augustinian evil which Leibniz strove against. The scientist can 'black box' their environment such that theirs and Leibniz's are functionally equivalent, the fact that truth descends from all sides rather than from above being ignorable. But what of politics, war, law, business? Of science in its real instantiation in the politico-martial-financial economy where determination in the sense of power, specifically control, is at stake?

To control another is to have a greater degree of determinate perfection in the cybernetic schema in the triple sense of epistemology (information), teleology (purpose), and force (control) over one's actively resisting Manichean enemy. The game whereby epistemological determinations are actively shared strategically for the advantage of the player, not naturally, or hidden for the same ends. This is a homeostasis where the 'I' can be a 'we', so long as the 'we' is not a single *phylum*, but

111. Cited by, Carlo Rovelli, *The First Scientist: Anaximander and His Legacy*, trans. Marion Lignana Rosenberg (Yardley, PA: Westholme, 2011), xviii.
112. Licklider and Taylor, 'The Computer as a Communication Device,' 31–32.
113. Gene Youngblood, 'The Videosphere,' *Radical Software* 1, no. 1 (1970): 68, 159.

rather a myriad of *phylae* with shifting, labile 'I's. Canguilhem argues that there can be no social homeostasis of the entire human species since it has no collective purpose, no inherent determination according to which it strives. What cybernetics proposes is not inconsistent with this. It agrees that a socius is that in which determinations are shared equally. What it establishes is a system for determining these overlapping, myriadic socii, or *internets*.

5.4 Heterarchy

This is to say that instead of a simple pyramidal hierarchy, there is instead a myriagonal *heterarchy*.

This concept has been employed in three relevant recent works: Fred Turner's *From Counterculture to Cyberculture* (2006), David Stark's 'Ambiguous Assets for Uncertain Environments' (2001) and Benjamin Peters' *How to Not Network a Nation* (2016). Turner depicts as 'heterarchical' the multiple competing value systems at play in the paradigmatic computer networks through which Silicon Valley's culture would gestate. On the Whole Earth 'Lectronic Link (WELL), and Global Business Network (GBN), both founded in the mid-1980s and heavily participated in by persons active in the 'New Communalist' counter-culture of the decade prior, Turner writes how users characterised their postings as of a horizontal social register premised on the unrequited exchange of informational gifts, whilst simultaneously ignoring and recognising the degree to which by doing so they were instituting a new 'informational economy' which they individually profited from. The heterarchy of such a community is in its contradictory public and private investments.[114] Turner borrows the concept from Stark, who uses the term to depict the paradigm of the post-Communist 'modern firm': neither characterised by the horizontality and independence of the free-market nor the hierarchy and dependence of a centrally-planned economy, but rather relations of interdependence. Such firms have the 'properties of networks', the network is no longer a property ('social capital'). They 'distribute' authority to every unit and render each accountable to one another; the increased interdependencies ensures that the coordination of their 'feedback loops' cannot be managed from above; they are 'adaptive systems' since they are sites of competing and coexisting value systems – they survive in order to innovate (adapt) and not vice versa; they 'court and even create ambiguity … they speak in many tongues', eroding accountability and locatable authorship; they blur the boundary between public and private and the very boundaries of the firm.[115] Stark makes not a single mention of cybernetics,

114. Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago & London: The University of Chicago Press, 2006), 153–59, 189–90.

115. David Stark, 'Ambiguous Assets for Uncertain Environments: Heterarchy in Postsocialist Firms,' in *The Twenty-First Century Firm: Changing Economic Organization in International Perspective*, ed. Paul

he needs not: its operative image is ether. Peters' book on the failed attempts to create civilian computer networks in the Soviet Union employs heterarchy, after Stark,[116] to describe the informally competitive, nonlinear and nonhierarchical arrangements of institutions within the structure of the centralised and rigid hierarchy of the post-Stalin command economy, the 'presence of ambiguities that result from competing formal regimes of evaluation'.[117] While he follows Stark in his reading of heterarchy as an ambiguous 'third way' between hierarchy and horizontality, his historical deployment of the concept is somewhat opposite: whereas Stark reads it to be the future of firm, Peters reads it as the very reason why attempts to realise Soviet Internets failed: '*heterarchies* of conflicting private interest stalemated virtuous attempts to reform the hierarchical economic bureaucracy. If the [American] Internet is not a thing but an agreement, as the phrase goes, perhaps the Soviet Internet is not a thing but a disagreement.'[118] This reintroduces the dichotomy between the horizontality of agreement, as in the US where capitalist institutions supposedly 'behaved liked socialists' to realise the ARPANET, and the hierarchy of disagreement, as in the USSR where 'socialists behaved like capitalists'.[119] What Stark's heterarchy surely signifies is the disagreement *in* agreement (rather than against it) as much as hierarchy within horizontality. Hence Turner's locating it within the American counter-cultures surrounding the early Internet and Stark's own study of it (as within post-socialist firms) having taken inspiration from 'high-tech' and 'new media' firms in America.[120] This is to argue that the Internet that exists has always been heterarchical, in accordance with Stark's formulation.

Peters makes the prescient observation that, despite Stark's belief to have coined the term,[121] 'heterarchy' had already been coined in an early cybernetic paper by Warren McCulloch,[122] whose concepts of neural networks were the model of Paul Baran's survivable packet ('block') switching network which characterises today's Internet architecture.[123] McCulloch's short paper 'The Heterarchy of Values Determined by the Topology of Nervous Nets' (1945) questions the possibility of locating the source of purposive behaviour within a neural network, or to locate a 'drome' (a feedback loop of two neurons) whose 'value' hierarchically determines the behaviour of all other 'dromes' in an organism. McCulloch derides hierarchy according to

DiMaggio (Princeton & Oxford: Princeton University Press, 2001), 74–101.

116. Benjamin Peters, *How to Not Network a Nation: The Uneasy Story of the Soviet Internet* (Cambridge, MA: MIT Press, 2016), 22.

117. Ibid., 22–24, 74–78, 173.

118. Ibid., 193.

119. Ibid., 2.

120. Stark, 'Ambiguous Assets for Uncertain Environments,' 75.

121. Ibid.

122. Peters, *How to Not Network a Nation*, 18, 22–24.

123. The founding paper of neural networking having been, Warren S. McCulloch and Walter Pitts, 'A logical calculus of the ideas immanent in nervous activity,' *The Bulletin of Mathematical Biophysics* 5, no. 4 (December 1943): 115–133 (1943).

its etymology (*hierós*, holy + *arkhía*, rule, origin), as implying 'a kind of power or importance which culminated in the notion of the sacred or holy' and the structure of the Church whereby 'the many ends are ordered by the right of each to inhibit all inferiors.'[124] Calling this 'Platonic' – though it would equally suit the Platonism of Leibniz – he argues that in a network where at least three feedback loops are connected into a greater loop – the same number of connections Baran considers to create a 'distributed' network – not only does the 'consistency' of the network's interrelation become of 'a higher order than had been dreamed of in our philosophy' but it becomes 'sufficiently endowed to be unpredictable from any theory founded on a scale of values.'[125] There is no Leibnizian chamber into which God whispers his messages, nor anything akin to Descartes' pineal gland from which a soul controls its body. Instead of such 'hierarchies of values' there is 'a heterarchy of values, [which] is thus internectively too rich to submit to a *summum bonum*.'[126] Heterarchical networks such as the nervous system, or after Baran, the Internet, have a greater consistency, are unpredictable and they defy hierarchy.

Unfortunately McCulloch does not elaborate more than this. Clearly concerned with retaining a sense of *arkhía*, rule, through difference or otherness (*héteros*), he could simply mean that purpose is immanent equally through an entire network, or he could mean, in a richer sense like Stark's, that the locus of its hierarchies are obscured by its uniformity, it being 'anywhere but *here*', such that it is, in Peters' words, a 'third way'. Either way or otherwise, McCulloch's brevity certainly opens the possibility of productive readings. Along with Stark's theory of heterarchy, I conceive it as a signifier of the paradoxical interrelations amongst networks, adopting the term 'heterarchy' perhaps unorthodoxically with respect to McCulloch (who one imagines hardly vaunted orthodoxy either).

Yet it seems to me the dynamism of the term is still lacking. Why do internetworks have this paradoxical and obscure status with respect to hierarchy and horizontality, the peace of agreement and the war of disagreement? Beyond descriptors and at its most abstract level, what dynamism makes this so? What logic makes the Internet not singularly horizontal but myriadically heterarchical?

5.5 The rules of the game

To answer this one must carefully distinguish the various modalities of communicative determinations with respect to determinations of control, the various possible moves that the heterarchical game of communication and control allows for.[127]

124. Warren S. McCulloch, 'The Heterarchy of Values Determined by the Topology of Nervous Nets,' *The Bulletin of Mathematical Biophysics* 7, no. 4 (December 1945): 227–227.
125. Ibid.
126. Ibid.
127. Dedicated to CH, without whom this section could not have been written.

The simplest element of a network is a *node*, but these cannot be thought in isolation since to do so is to establish a *network* of communication between them. To observe is to effect, hence *determinations* are the lines which connect vertices into a network. A network of nodes is the most simple structure that can be thought. I define a network as having a common purposive determinacy, a community. Now, a network may intersect with other networks whose determinacies are distinct and contradictory to the network itself, especially when real. A reductivist example: a familial network may intersect with a school network, a work network, a migration support network, a network of immigration bureaucrats and networks immigration police, each of whom has a distinct purposive determination. I call this determinate multiplicity of intersecting networks *an internet*. The virtual totality of all internets is *the Internet*, the absolutely indeterminate system that eludes determinate thinking but establishes its possibility. The Internet corresponds to Leibniz's 'universe', an internet to a 'world' (of which God chooses the best compossible variant), a network to a 'monad'.

That every network can intersect with any other into an internet means that real networks are not primarily connected and disconnected through translation. What distinguishes these networks is not that their languages deny translatability, an Augustinian problematic, but that they possess *contradictory purposive determinations*. When there are contradictory purposes at stake, the distinction between one network and another, or *self* from *other*, is maintained by a fracture of communication channels, by the determinative *control* over *access* to informational determinations. These determinative controls can either have a primary quality that is positive or negative, aimed at *increasing* the determination of its own network or *decreasing* the determination of another. In a strategic competition, one would only seek to increase the informational and controlling determinacy of one's own network, whereas one would seek only to reduce the determinacy of an opponent. Given that control is determined relatively by whichever network has the greater differential of informational determination with respect to another, to aim to decrease the opponent's determination may have the equivalent effect of increasing one's own determination. But not necessarily. To increase one's own determination may have the secondary effect of increasing the opponent's – such as the USSR developing atomic weaponry after the US demonstrated its possibility, and to attack the opponent's determination may induce an entropic 'blowback' effect on the determination of one's own.

I count six types of possible determinations in a cybernetic system, as depicted in the Table of Determinations (fig. 5.3). These are presented as philosophical concepts not everyday terms.

Cryptography involves the capacity encrypt a message and legitimately decrypt it. To *encrypt* a communication to a specific set of networks, one or finitely many, is to establish them within one's own network, aligning their purposes with one's

	Sender/Author	Recipient	Determinate effect
Encode	My network	Either	Either
Encrypt (Encipher)	My network	My network	Increases determinacy of my network
Disinform	My network	Other network	Decreases determinacy of other network
Decode	Either	My network	Either
Decrypt (Decipher)	My network	My network	Increases determiancy of my network
Cryptanalyse	Other network	My network	Increases determinacy of my network & decreases determinacy of other network

Figure 5.3: Table of Determinations

own as *against* another's. Wiener writes of 'bluff' and 'jamming forces'.[128] To send an encrypted message is to consolidate an internet into a network. An encrypted message (a cryptogram) contains a plainly *encoded* message like a shell to a hermit crab. The purpose of transmitting a cryptogram is to increase the informational determination of one's own network and not that of the enemy, for, if this strategic concern was not relevant, there would be no need to encipher the message and one would instead merely *encode* it such that it could reach any network, increasing, decreasing or having no effect on their determinations. Not every message is actually of strategic relevance, but every message is of potential strategic relevance given a certain opponent. Every active being knows it must encrypt. Even a silverfish knows that it must hide or play dead when a human approaches, encrypting its presence. Only extremely passive networks – a luminous star, a deeply comatose animal – would under all circumstances only encode and not encrypt their messages. Wiener's distinction between objects which can be subjected to cybernetic analysis and those which would suffer from the 'close coupling' of observer and observed could be reread as being premised on the distinction between a being which is too passive to resist observation and that with sufficient activity to encrypt itself.

Now, to be capable of *decryption*, a cryptogram is to be legitimately received within the same network as its sender and to therefore share their determinate purpose against the networks which have been excluded. A message intended strategically for one's own network would contain a positive informational content and therefore by deciphering it one increases the determinacy of the network as a whole. By *decoding* an encoded message that has not been encrypted, one may increase, decrease or not effect the determinations of one's own networks, as could the opponent. Every decoded message loses a degree of its original encoded message and this provides a rule for the entire game of determinations: as Stuart Hall argues in 'Encoding/Decod-

128. Wiener, *HUHBb*, 162.

ing' (1980), a broadcaster's desire for 'perfectly transparent communication' will be partially inflected or wholly rejected by the decoding recipient. This allows Hall to conceive of a resisting 'politics of signification'. But with Hall's model being traditional broadcast media (television, radio, newspapers, etc.), he does not conceptualise the capacity for a transmitter to improve their capacity to increasingly 'target' the recipient with communications that would agree with them; he has no concept of a homeostatic network which learns from observing the recipient's behaviour what would strategically accord with their purposive determinations.

Such observation takes place by means of the mirror of cryptography, *cryptanalysis*, to break open a cryptogram from which one's network was intended to be excluded. Forms cryptanalysis can take include mathematical 'codebreaking', espionage, surveillance, cracking (what passes for 'hacking' in popular discourse[129]) website tracking, voyeurism, or the tracking of an enemy aircraft as with Wiener's anti-aircraft predictor. It is the mirror of cryptography in the sense of being a form of writing secrets, since the cryptanalysand is not to have sufficient informational determinations as to the fact that their opponent is covertly within their community, or how to expel them, and a form of decryption in that it raises the informational determinacy of the cryptanalyst with respect to their enemy, the cryptanalysand. As David Kahn says, cryptanalysis is an aggression, a bellicose act.[130] Not only does it enrich the informational determinacy of the cryptanalyst's network, but if discovered by a cryptanalysand unwilling to acquiesce to their loss of control it ruptures the purposive determination of their community, since their capacity to communicate and thereby act strategically with respect to the cryptanalyst is rendered redundant. The best solution of the cryptanalysand is to remove the cryptanalyst, which might entail a counter-cryptanalysis in kind to discover who they are, but because absolute security would require an infinite determination (hence Bruce Schneier's dictum, 'Security is a process, not a product'[131]) the 'minimax' outcome would be that defensive mode of resistance which cryptologists call 'resilience': the capacity to contain the impact of failure and to adapt to changes in circumstance.[132]

The Manhattan Project's pioneering 'compartmentalization' of knowledge into access-defined micro-networks – which as historian Matthew Connelly argues has since become the model of governance in general and a cause for the vast arcana at the heart of the modern State[133]]galison-2004-remov-knowlgalison-2010-secrec-

129. 'A cracker is an individual who attempts to access computer systems without authorization.' *Internet Users' Glossary, RFC 1392* (1993). See also Eric S. Raymond's *Jargon File* entry 'Cracker', http://www.catb.org/~esr/jargon/html/C/cracker.html.

130. Kahn, *The Codebreakers*, 758.

131. Bruce Schneier, 'The Process of Security,' Schneier on Security, April 2000, accessed June 7, 2018, https://www.schneier.com/essays/archives/2000/04/the_process_of_secur.html.

132. Bruce Schneier, *Beyond Fear: Thinking Sensible about Security in an Uncertain World* (New York: Copernicus Books, 2006), 119–32.

133. Matthew Connelly, 'The Cold War and the Culture of Secrecy,' January 2015, accessed May 15,

three-acts – is a realization of resilience, preventing the crypytanalyst from stealing informational determinations of the whole network by dividing it into smaller networks based on more direct purposive determinations ('Need to know'), thereby producing plethoras of internets. Baran and Licklider's 'survivable network', the ARPANET-Internet, pertains to the same logic: in order to ensure the cryptanalytic indeterminability of the capitalist communication infrastructure as a whole, subdivide and overlay the existing communication networks such that any 'attack surface' is limited. Schneier contrasts 'resilient', 'dynamic' and '*heterogeneous*' systems to 'brittle', 'static', '*homogeneous*' ones, systems which contain 'too many secrets' for whom attack or failure can constitute its catastrophe.[134] The heterogeneity of the resilient internet, he writes, implies a greater capacity for *adaptability* to changes of circumstances, less encumbered by the need for a consensus of purposive determinations across a wider network. The resilience of a system is, positively, to employ a cybernetic vocabulary, its degree of hom*eo*stasis, or rather, considered negatively, its degree of hom*o*statics. Hence in a strategic conflict where cryptanalysis is a threat, homeostasis not only implies a horizontal decentring of organs but their cryptographic stratification, the engendering of networks with greater and lesser degrees of determinations: obscure hierarchies of control. This renders it implausible to speak of internets as equal in control.

It also raises a great problem: if a network with a single informational determination is fractured into a myriadic internet, how does it maintain a single purposive determination, a single end, let alone distribute sufficient informational determinations across its thresholds? The cohesion of an internet depends on networks which rationally overlap, which 'bring everyone together'. The production of individuals through surveillance which Foucault wrote of is antiquated according to such a logic, which truly is a logic of heterogeneous 'dividuals', as Deleuze termed it, 'made up of codes indicating whether access to some information should be allowed or denied'.[135]

The cybernetic game of strategy poses another type of determination. By *disinforming* I intend the strategic transmission of entropy not to one's own network, since this would be contradictory to one's purposive determination, but to the opponent's. The purpose of disinformation is to degrade the opponent's determinacy. This is distinguished from 'misinformation' which designates the accidental and non-strategic transmission of entropy. Unlike the confused phrase 'fake news', which should be avoided,[136] disinformation has a clear signification and a resolutely twentieth century

2015, http://www.lse.ac.uk/IDEAS/events/events/2015/15-01-13-M.-Connelly3.aspx; Daniel Nemenyi, 'Submarine State: On secrets and leaks,' *Radical Philosophy*, September–October 2015, 5; [.

134. Schneier, *Beyond Fear*.

135. Deleuze, *Negotiations*, 180.

136. The guidelines of the House of Commons' Digital, Culture, Media and Sport Committee's *Disinformation and 'fake news': Interim Report* (2018) are sound on the matter of rejecting the term 'fake news'. They argue that what became Donald Trump's signature phrase lacks clarity of definition, and its multiple meanings include 'a description of any statement that is not liked or agreed with by the

history.

If defected secret service officers from the Soviet Union are to believed, the term 'disinformation' is itself a product of an act of disinformation since it translates the strange Russian noun '*dezinformatsiya*' whose un-Slavic peculiarity derives from the attempt to portray it as French in origin – by none other than Joseph Stalin himself.[137] Disinformation has been a weapon of both sides of the Cold War, as well as industries (e.g. the fossil fuel, tobacco and pharmaceutical industries funding of disinformative research conducive to their profits). Its aim is not necessarily to replace the information it counters (and thereby to increase the community of the disinforming network), but to divide the target network against itself so as to render the resulting internet incapable of purposive determination. As a former Czechoslovak intelligence officer has written, Soviet propaganda attempted to promote 'positive images of the Soviet Union' but they were also designed by the KGB 'for internal demoralization and erosion of power in target countries.'[138] Whereas cryptanalysis can be said to do this 'passively', forcing the hand of the other network to dissolve itself into a internet, disinformation is, as the KGB called it, an 'active measure' which does this directly.[139] Given today's cybernetic communication infrastructure, disinformation has become, as a recent RAND study argues, extremely cheap to wield on massive scales, in terms of both technical costs and likely repercussions.

Yet the same authors are only capable of posing as its 'antidote' 'compelling factual evidence supplied in a timely manner.'[140] Similarly, the recent interim report on disinformation by the UK House of Commons Digital, Culture, Media and Sport Committee, which construes disinformation to be a threat to the 'very future of democracy', recommends in conclusion that Ofcom, the British telecommunication and broadcast regulator, be granted powers to enforce content standards online as it does for television and radio – a rather measly antidote given Ofcom's abject failure to counteract, for example, climate change disinformation in the traditional media.[141] Such toothless redetermination campaigns, which might be openly encoded or encrypted, are at the disadvantage of always being reactive to disinformative manoeuvres which can attack far faster than can be defended, if only since a lie is easier to make than to disprove. Further, they miss the point that disinformation is an attack on the very consistency of the network that it would want to furnish. Which

reader.' (p. 7–9). Instead, they advise the use of 'disinformation' and 'misinformation'.

137. Ion Mihai Pacepa and Ronadld J. Rychlak, *Disinformation* (Washington DC: WND Books, 2013), 4–6, 34–39.

138. Ladislav Bittman, *The KGB and Soviet Disinformation: An Insider's View* (Washington: Pergamon-Brassey, 1985), 2.

139. Ibid., ix–x, 1–4.

140. Linda Robinson et al., *Modern Political Warfare: Current Practices and Possible Responses* (Santa Monica: RAND, 2018), 229–33.

141. Damian Collins MP et al., *Disinformation and 'fake news': Interim Report*, Report (House of Commons Digital, Culture, Media and Sport Committee, July 24, 2018), 7–8.

Trump or Brexit supporter would be convinced by a network claiming to proffer 'official' evidence of their fallacies? Such a network would already be an enemy. Whereas resilience at least allows a network to structurally decompose itself into an internet in such a way that its networks may overlap with one another through a rationally arranged internet, disinformation targets the very rational network itself. The purpose of disinformation is to disperse a network into an incoherent, confused and passive internet.

Through injecting indetermination into the opponent's network, disinformation increases the aggressor's degree of control with respect to the victim. Yet reducing the determinacy of an opponent's network, shattering it into myriadic internets, is not without risk. Can the consequent networks be determined as intended – known and controlled? 'Blowback' is the US intelligence jargon for unintended consequences. By reducing the indetermination of the opponent, the determination of the Internet itself has been reduced, and it may take no small effort on the part of the aggressor to ensure that their own network is not degraded in turn, that the release of entropy loses its cryptographic limitations. Heterarchy is not a zero sum game: the Internet consists in an infinite possibility of determination as well as indetermination.

These six types of determination constitute the possible manoeuvres of a network on their most abstract level, as I have been able to count them. These are the operations by means of which it can attempt, through cunning, to survive the *homeostatic* conflict that is life, that defines every network with respect to their internets. They are not mutually exclusive, they can be used in combination and by degrees. When Wiener, Rosenblueth and Bigelow transpose over Leibniz's taxonomy of knowledge, truth and ideas their taxonomy of behaviour, purpose and teleology, they establish as the greatest determination the life of that network, not its wisdom and goodness. This is why Wiener argues that human society is not engaged against the Augustinian evil for universal truth, but defined by the struggles against Manichean evil whereby the opponent positively exists and actively seeks control.

5.6 Cyberwar and Netwar

In the 1990s and early 2000s, RAND researchers John Arquilla and David Ronfeldt invented two major concepts for depicting such conflicts: *cyberwar* and *netwar*. The latter would become fundamental for Hardt and Negri, who write in a chapter on war, 'After the end of the cold war, nation-states no longer cloud our view and network enemies have come out fully into the light. *All wars today tend to be netwars*.'[142] My argument is close to this concept, and so I should relate it.

Cyberwar and netwar, Arquilla and Ronfeldt write in 2001, 'encompass a new

142. Michael Hardt and Antonio Negri, *Multitude* (London: Penguin, 2005), 55.

spectrum of conflict that is emerging in the wake of the information revolution.'[143] The authors phrase the difference between cyberwar and netwar as being one of degree rather than kind – the former marks the 'mostly military' end of this spectrum, the latter its 'lower-intensity, societal-level counterpart.'[144] I am not convinced that they can be distinguished into military and civil domains as the authors claim, especially since netwar is said to 'blur' the boundaries of peace and war.[145] But if one takes cyberwar to be the emphasis of their first collaborative publication, 'Cyberwar is Coming!' (1993), in which both 'cyberwar' and 'netwar' are invented, and netwar representative of their subsequent post-1994 works, and if one notices a shift in the authors' reading of the concepts between these works, then cyberwar and netwar could be distinguished as representative of the authors' initial 1993 argument and their argument from 1994 onward, respectively, rather than the purportive distinction between military and civilian domains.

Why 1994? Because of two events. As the year opened the North Atlantic Free Trade Association (NAFTA) came into force and the indigenous *Ejército Zapatista de Liberación Nacional* (EZLN or the 'Zapatistas') declared war on the Mexican state and neoliberalism in general, employing an apparently new form of organisation which Arquilla and Ronfeldt would take to be paradigmatic of a revised concept of *netwar*.[146] This concept would draw heavily from the other event in 1994 to have profoundly shaped their writings, the publication of Kevin Kelly's widely read *Out of Control: The Rise of Neo-Biological Civilization*, wherein the concept of the *swarm* is invented. The Rand researchers overlaying of these two events into their theory of *netwar* would provide the break from their initial *cyberwar* concept, and this would be almost transparently adopted by Hardt and Negri for their own theory of revolutionary action, despite the resolutely statist motivations of Arquilla and Ronfeldt and, moreover, the new age and neoliberal perspective of Kelly. As opposed to the authors of *Multitude*, it is with Arquilla and Ronfeldt's earlier, effectively abandoned concept of cyberwar that my argument bears closer affinity.

Their initial 1993 paper 'Cyberwar is Coming!' aptly begins by quoting Clausewitz: 'Knowledge must become capability.'[147] This refers to Clausewitz's contention that the mind and life of the distinguished commander is so totally assimilated in the fluid circumstances of the battlefield that they practice an *art* of war [*Kriegskunst*] not

143. John Arquilla and David Ronfeldt, *Networks and Netwars: The Future of Terror, Crime, and Militancy* (RAND Corporation, 2001), ix.

144. Arquilla and Ronfeldt, *Networks and Netwars*, ix, 2–5; and, John Arquilla and David Ronfeldt, 'Cyberwar is Coming!,' in *In Athena's Camp: Preparing for Conflict in the Information Age*, ed. John Arquilla and David Ronfeldt (Santa Monica: RAND, 1997), 28.

145. Arquilla and Ronfeldt, *The Advent of Netwar*, 13, 99–103.

146. They would feature throughout their writings, and would make the direct subject of a book-length work from 1996, David Ronfeldt et al., *The Zapatista: Social Netwar in Mexico* (RAND Corporation, 1998).

147. Arquilla and Ronfeldt, 'Cyberwar is Coming!,' 23.

a science [*Kriegswissenschaft*], hence '*Das Wissen muß ein Können werden*', scientific knowledge must become artful capability (*Kunst* being etymologically derivative of *Können*).[148] Clausewitz derides the commander who approaches war as a *science* for employing 'a mental process not of his own invention, of whose logic he is not at the moment fully conscious', whereas knowledge for the Napoleonic commander – an *artist* – is so 'absorbed into the mind that it almost ceases to exist in a separate, objective way' and his ever 'appropriate decisions' are an 'expression of his own personality.'[149] To phrase this argument using the grammar of this thesis, this would accord to the highest grade of knowledge in Leibniz's taxonomy, intuitive knowledge, the divine clarity of apperceptions with none of their complexity obscured; or in Wiener, Rosenblueth and Bigelow's taxonomy, the predictive and extrapolative behaviour of a being with such a high degree of determination as to perceive the battlefield in the lightest shade of whiteness, for whom the battlefield is an extremely white box.

This aligns with Arquilla and Ronfeldt's concept of cyberwar (by which, again, I mean their earlier pre-1994 work) to the extent that they too consider cyberwar to be 'war about "knowledge" – about who knows what, when, where, and why, and about how secure a society or a military is regarding its knowledge of itself and its adversaries.'[150] 'It means turning the "balance of information and knowledge" in one's favor, especially if the balance of forces is not.'[151] This seems to have been a lesson particularly impressed by the First Gulf War, for as the inventor of the internet's TCP/IP protocol Vint Cerf remarks in a History Channel documentary,

> If you knew where things were, and you knew what was available, better than your opponent did, then you can organise your offensive. And I think we learned that pretty clearly in the 1992 Gulf War, where we clearly knew where things were better than our opponents did.[152]

Arquilla and Ronfeldt argue, like Wiener, that the model of contemporary warfare is not a game of perfect information like chess, where the positions of all pieces are known to both players, but instead a game of imperfect information like kriegsspiel 'in which both players start "blind" to their opponent's position'.[153] Perceptive advantage is the main factor of victory, so knew the Mongols who 'relied almost entirely on learning exactly where their enemies were while keeping their own whereabouts a secret until they attacked.'[154] Arquilla and Ronfeldt focus on what I call cryptography and cryptanalysis above, but they also touch on disinformation, degrading the enemy's knowledge, too:

148. Carl von Clausewitz, *On War*, trans. Michael Howard and Peter Paret, with an introduction by Beatrice Heuser (Oxford: Oxford University Press, 2007), 97–98.
149. Ibid.
150. Arquilla and Ronfeldt, 'Cyberwar is Coming!,' 28.
151. Ibid., 30.
152. Vint Cerf, in *In the Beginning: The Origins of the Internet* (The History Channel, 2000).
153. Arquilla and Ronfeldt, 'Cyberwar is Coming!,' 34.
154. Ibid.

> It means trying to disrupt, damage, or modify what a target population "knows" or thinks it knows about itself and the world around it. … It may involve public diplomacy measures, propaganda and psychological campaigns, political and cultural subversion, deception of or interference with local media, infiltration of computer networks and databases, and efforts to promote a dissident or opposition movements across computer networks.[155]

Hence with cyberwar (their initial concept of cyberwar and netwar from 1993) Arquilla and Ronfeldt conceive of a type of conflict not inconsistent with what I have attempted above to philosophically show is contained in cybernetics.

It is not exactly that this consistency ceases to be the case, but that their emphasis subtly shifts to what would become a more popular, but to me less convincing ground. Their next collaborative work *The Advent of Netwar* (1996) marks the start of their shift to a topological theory of conflict premised on a linear theory of the 'evolution of societies' across four 'basic forms'. First, the *tribal* form, headless, concentric and based on relations of kin, is incapable of large agriculture and is vulnerable to clan feuds. This began to emerge five thousand years ago. That this imitates Hobbes' state of nature myth is reflected in its nefarious modern instantiations, 'dynasties, old-boy networks, mafias, ethnonationalists, urban gangs,' and perhaps surprisingly, 'diaspora'.[156] Secondly, the *institutional* form with its top-down hierarchy excels where the tribal form fails: constructing armies, enforcing laws, creating empires and pursuing other large undertakings. It allows for 'rival hierarchies' to coexist, but only if they 'stay out of each other's terrain.'[157] The limitation of this pyramidal form which emerged in ancient empires is its capacity to 'process complex exchanges and information flows'.[158] This flaw is most pronounced in the economic realm, hence the third 'basic form', the capitalist *market* which follows Adam Smith and the Physiocrats (the ancient *Agora* does not count for them as a 'philosophical and organizational concept') 'enables diverse actors to process diverse exchanges and other complex transactions'.[159] The market limits the institutional form to the state and in combination with it allows for greater complexity of political democracy. Its weakness is its propensity to facilitate socio-economic inequality.[160] Finally, Arquilla and Ronfeldt's fourth 'basic form' is the *network*, which came into its own only recently and is adept at dealing with social inequality such that it 'may thus result in vast networks of NGOs', a 'global civil society', but it may also result in an '*un*civil society' of criminal gangs and terrorist groups: those both of the Right, such as white supremacists, and the Left, the exemplar given being Hamas (!).[161]

155. Ibid., 28.
156. Arquilla and Ronfeldt, *The Advent of Netwar*, 27–28.
157. Ibid., 29–30.
158. Ibid.
159. Ibid., 31–32.
160. Ibid.
161. Ibid., 24, 33–34.

Arquilla and Ronfeldt attribute the network form with three topologies: a *chain network* ('as in a migration or smuggling chain'), a *star network* ('as in a franchise or a cartel'), or an *all-channel* or *full-matrix network*, in which all members are 'highly internetted' to one another, 'as in a collaborative network of militant peace groups where everybody is connected to everybody else.'[162] The network itself is 'nonhierarchical' although hierarchical organisations may comprise its nodes, resulting in a 'hybrid' network.[163] Even the star network, while centralised, is considered nonhierarchical. This is because hierarchy is constituted for them through having a centre of command, or in the military, through the doctrine of Command, Control, Communication and Intelligence (C^3I). Networks are distinguished from hierarchies in that they have no central leadership or command structure, and therefore, woe, 'they defy counterleadership targeting (i.e., "decapitation")'.[164] But the network form is also distinguished from the similarly acephalous tribal form[165] in that it is capable of exerting large, even planetary-scale control. As a wargame, the models of chess and kriegsspiel are on the way to the footnotes – netwar is structured like Go whereby 'victory is achieved not by checkmate, as there is no king to decapitate, but by gaining control of a greater amount of the "battlespace."'[166] Although the depiction of warfare as 'epistemological' or 'neo-cortical' will not completely vanish,[167] the focus of their 1993 cyberwar paper on the US 'blinding' their opponents and maintaining 'topsight' over them (or, *they* play kriegsspiel, *we* play chess)[168] will become less than secondary to the form of battle essential to their new theory of networks.

In *Swarming & the Future of Conflict* (1999) – published in the wake of the Battle of Seattle and the formal start of the Alter-globalisation movement[169] – Arquilla and Ronfeldt contend that four doctrines of strategy have been developed throughout history; these clearly correlate to their four 'basic forms' of society: the chaotic and weak *melee* (tribes), large-scale *massing* (institutions), smaller-scale *manoeuvres* (markets) and finally today the network *swarm*.[170]

> Swarming is seemingly amorphous, but it is a deliberately structured, coordinated, strategic way to strike from all directions, by means of a sustainable pulsing of force and/or fire, close-in as well as from stand-off positions.[171]

162. Ronfeldt et al., *The Zapatista: Social Netwar in Mexico*, 11–12; Arquilla and Ronfeldt, *Networks and Netwars*, 7–10.
163. Arquilla and Ronfeldt, *The Advent of Netwar*, 49–50.
164. Arquilla and Ronfeldt, *The Advent of Netwar*, viii, 12, 109; Ronfeldt et al., *The Zapatista: Social Netwar in Mexico*, 119.
165. Arquilla and Ronfeldt, *The Advent of Netwar*, 27.
166. ibid., viii.
167. Eg., Arquilla and Ronfeldt, *Networks and Netwars*, 14.
168. Arquilla and Ronfeldt, *The Advent of Netwar*, 103–04 This text will be the last to refer to kriegsspiel. In subsequent texts the authors will only refer to chess and Go.
169. Referenced on p. 2 of *Swarming & the Future of Conflict*.
170. John Arquilla and David Ronfeldt, *Swarming & the Future of Conflict* (Santa Monica: RAND, 1999), 8. In a less pronounced form this is already argued in *The Advent of Netwar*, vii–viii, 105.
171. Ibid., vii.

The swarm is resilient, it rushes to threatened nodes like antibodies, it is adaptable, redundant, difficult to defeat as a whole, it blurs offence and defence, war and peace.

RAND's institutional unconscious speaks through Arquilla and Ronfeldt's work. Though never cited, their attribution of intelligence, resilience and adaptability to the network form speaks from Paul Baran's theory of a redundant network which has a 'modicum of intelligence somewhere within the system',[172] such that it can route its messages autonomously, unpredictably and without hierarchy. Arquilla and Ronfeldt distinguish star and all-channel 'Bucky Ball' (geodesic) networks: Baran distinguished 'star' and 'mesh' networks, and described chains as the most basic and least redundant network topology too.[173] Arquilla and Ronfeldt even describe the network design as not a hierarchy but a 'heterarchy', although since all the nodes 'know what they have to do' they consider 'panarchy' more befitting.[174]

But the major source of the shift to their post-'Cyberwar is Coming!' argument would seem to be the publication of Kevin Kelly's *Out of Control: The Rise of Neo-Biological Civilization* (1994). A beekeeper,[175] Kelly argues that a swarm intelligence or 'hive mind' is emergent in the increased complexity of networks:

> More is different. Keep adding grains of sand to the first grain and you'll get a dune, which is altogether different than a single grain. Keep adding players to the Net and you get … what? … something very different … a distributed being, a virtual world, a hive mind, a networked community.[176]

Employing the language of cybernetics, Kelly writes that swarms are adaptable, evolvable, resilient, boundless and generative of novelty (unpredictability).[177] They are boundless because they sport 'positive feedback loops' which he believes lead to *increasing* order: 'Life begets more life, wealth creates more wealth, information breeds more information, all bursting the original cradle.'[178] Kelly's reading of the 'network effect' as a simple positive feedback loop is mistaken: positive feedback means an incapacity to realise an intended *telos* because the effects of one's behaviour which are inconducive to achieving the ends are not counteracted (are left undetermined). The exponential growth of a network is a *negative feedback loop for the one who wants it to interface every human and non-human on the planet*; it may be a positive feedback loop from another perspective. Kelly sees in the exponential growth of networks nothing but a simple good, in interview adding: 'I do think of technology as a form of life.

172. Paul Baran, *Reliable Digital Communication Systems Using Unreliable Network Repeater Systems* (RAND Corporation, 1960), 4.
173. Baran, *On Distributed Communications*, vol. I, 1–4.
174. Arquilla and Ronfeldt, *The Advent of Netwar*, 9–10.
175. Kevin Kelly, 'Out of Control: the New Biology of Machines, Social Systems and the Economic World,' Original pub 1994. This is Kelly's web version pdf, 2008, 9, accessed July 4, 2018, http://kk.org/books/ooc-mf.pdf.
176. Ibid., 214.
177. 21–25 ibid.
178. Ibid., 22.

And in general, I think, the more life we have the better.'[179]

From the perspective of the State, the exponential growth of an 'out of control' network intelligence is a threatening proposition. Arquilla and Ronfeldt adopt Kelly's argument that swarm intelligence is a necessary evolutionary step for humanity but construe its beneficence to be contingent on its relation to State. Whereas according to Kelly, the State is at best a force of restriction to the single, global, swarm intelligence – 'No one controls the Net, no one is in charge. … The Internet is … the largest functioning anarchy in the world.'[180] – to the RAND theorists this self-governance and resilience to hierarchical military control presents, as their Zapatista-supportive correspondent Harry Cleaver was perhaps the first to notice, the spectre of 'ungovernability.'[181] This new irresistible form of power lead to Arquilla and Ronfeldt's realisation that '*It takes networks to fight networks*' and that the military would need to reorganize itself, as Cleaver puts it, 'in ways homologous to the organizational forms used by its "enemies."'[182] The hierarchical military would need to overcome its reliance on the doctrine of 'massing' and adopt the doctrine of swarming, or rather 'battleswarm', becoming a network in order to render networks such as the Zapatistas governable.[183]

This 'radical restructuring of the traditional military apparatuses and the forms of sovereign power they represent'[184] furnishes the paradigm of Hardt and Negri's tetralogy. For them not only must the military '*become* [rather than simply use] a full matrix, distributed network' but the institution of power in which the military apparatus is embedded must itself become a 'network power', transforming itself from imperialism to Empire, a global form of sovereignty whose power is effected through distributed, modulating networks of command.[185] Following from Cleaver's (a translator of Negri) depiction in 1996 of 'the emerging class war in cyberspace' as one whereby the State adapts to and feeds, vampire-like, off of 'forces that had escaped

179. J. J. King, 'The Right Connections: Tea With Kevin Kelly,' in *Proud to Be Flesh: A Mute Magazine Anthology of Cultural Politics after the Net*, ed. Josephine Berry Slater and Pauline van Mourik Broekman (London: Mute Publishing/Autonomedia, 1997), 52.
180. Kelly, 'Out of Control,' 389.
181. Harry Cleaver, 'The Zapatistas and the Electronic Fabric of Struggle,' 1995, accessed February 9, 2018, http://la.utexas.edu/users/hcleaver/zaps.html#44; Ronfeldt initiated correspondence with Cleaver after the autonomous Marxist published his analysis of the Zapatista uprising almost immediately after its occurrence, which emphasised their use of the internet, in February 1994. See, Harry Cleaver, 'Cyberspace and Ungovernability,' 1995, accessed February 9, 2018, http://la.utexas.edu/users/hcleaver/kcgovernability.html.
182. Arquilla and Ronfeldt, *The Advent of Netwar*, 81–82; Harry Cleaver, 'Reforming the CIA in the Image of the Zapatistas?,' June 6, 1996, accessed February 9, 2018, http://la.utexas.edu/users/hcleaver/kccia.html.
183. Arquilla and Ronfeldt, *Swarming & the Future of Conflict*, 78–79.
184. Hardt and Negri, *Multitude*, 58.
185. Hardt and Negri, *Empire*, xi–xvii.

their command',[186] Hardt and Negri posit the Multitude as the 'new proletariat' whose constituent power precedes Empire and is subjected to its imitation, exploitation and control:

> The multitude is the real productive force of our social world, whereas Empire is a mere apparatus of capture that lives only off the vitality of the multitude – as Marx would say, a vampire regime of accumulated dead labor that survives only by sucking off the blood of the living.[187]

The 'image' of the Multitude is 'the Internet'.[188] Citing Arquilla and Ronfeldt, Hardt and Negri write of it having a 'swarm intelligence' that is 'based fundamentally on communication'.[189] It is leaderless, open, polycentric (decentralised) or distributed, self-governing and impervious to hierarchy.

Ostensibly, the distinction which Hardt and Negri assert between their swarm and Arquilla and Ronfeldt's is that the RAND theorists apparently assume a homogeneity of agents or particles, whereas theirs is 'composed of a multitude of different creative agents': this is a shift from the Kantian categories of *universal* and *particular* quantities of judgement to the *singular*.[190] 'They remain different in terms of race, sex, sexuality, and so forth.'[191]

The collective intelligence of this multitudinous swarm of singularities derives not from its having a pre-established identity but through its creation of *the common* by means of its inter-communication, its 'collaborative social interaction' in the 'space *between*' its members, not from a central point of command. The Multitude's production of the shared common through which it is self-constituted is its economy.[192] Its revolution or resistance with respect to centralised and dictatorial command creates within it a nonhierarchical democratic network of collaborative relationships; this constitutes its politic.[193] In short, the multitude is 'an open network of singularities that links together on the basis of the common they share and the common they produce.'[194]

Approaching a cybernetics, Hardt and Negri write that this network is like a *brain* whereby '[there] is no one that makes a decision … but rather a swarm, a multitude that acts in concert.'[195] There is no Cartesian hierarchy of control, no transcendent mind ruling over the body, thought is emergent from 'billions of neurons in a coherent

186. Cleaver, 'Reforming the CIA in the Image of the Zapatistas?'
187. The vampire image which Cleaver and (after him) Hardt and Negri refer to is in Marx, *Capital*, vol. I, 10.1, 342. See Hardt and Negri, *Empire*, 61–62, xv, 43, 344; *Multitude*, 90.
188. Hardt and Negri, *Multitude*, xv.
189. Ibid., 57, 91–93.
190. Immanuel Kant, *Critique of Pure Reason*, trans. Paul Guyer and Allen W. Wood (Cambridge: Cambridge University Press, 1998), A70/B95–A71/B96.
191. Hardt and Negri, *Multitude*, 92.
192. Ibid., xv–xvi.
193. Ibid., xvi.
194. Ibid., 129.
195. Ibid., 337.

pattern', or so 'the scientists tell us'.[196] Which scientists? Hardt and Negri's source is both uncontroversial and telling: the eminent neurobiologist Antonio Damasio's work *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain* (2003). When Hardt and Negri write that 'the human body is itself a multitude organized on the plane of immanence'[197] one knows that the philosopher of their swarm and of the 'cybernetic revolution'[198] – who Haraway supposedly also carries the flag of by 'breaking down the barriers we pose among the human, the animal, and the machine'[199] – is not Leibniz, but, of course, *Spinoza*.

Spinoza is the philosopher of the 'network of networks' because he furnishes a way to conceive of the 'multitude of multitudes' as able to 'act in common as one body',[200] the body which, as Hardt and Negri quote from the *Ethics*, 'is composed of many individuals of different natures, each of which is highly composite.'[201] 'Spinoza provides an ontology whereby the immanence of the body and immanence of democratic politics coincide completely.'[202] This is not the place for a detailed analysis of the democratic Spinoza of '68 which resurfaces here since I have already presented my case that Wiener's Leibniz is the foundation of the Internet and society of control. I shall therefore restrict what follows to a short comment.

Spinoza, like Leibniz, proffers a system of determination in indetermination such that Wiener and Rosenblueth could invoke him (albeit negatively) in 'The Role of Models in Science', where they introduce the modern concept of 'information' (though not the word itself or mathematical definition). The accuracy of their reading of Spinoza aside, it points to a potential for an alternative reading of information and entropy from the starting point of Spinoza instead of Leibniz (although not, perhaps, its non-contradictory possibility). As Deleuze emphasises, the model of the body which Spinoza proposes in the famous claim that 'no one has yet determined what a Body can do'[203] does not overcome the Cartesian superiority of mind over body by an inversion of its hierarchy, but rather through establishing a parallelism such that the indetermination of body is an indeterminism of the mind: not only does the body surpass our knowledge of it, but '*thought likewise surpasses the consciousness that we have of it*.'[204] We have thoughts of which we are not conscious, unconscious thoughts, and these perceptions could be interpreted as the entropic indeterminations from which our informative determinations (apperceptions) come through.

196. Hardt and Negri, *Multitude*.
197. Ibid.
198. Ibid., 185.
199. Hardt and Negri, *Empire*, 91.
200. Hardt and Negri, *Multitude*, 190.
201. *Ethics*, book 2, proposition 13, postulate 1.
202. Hardt and Negri, *Empire*, 73.
203. Cited in Michael Hardt and Antonio Negri, *Commonwealth* (Cambridge, MA: Harvard University Press, 2009), 121.
204. Gilles Deleuze, *Spinoza: Practical Philosophy*, trans. Robert Hurley (San Francisco: City Lights, 1988), 18.

Hardt and Negri describe this original indetermination as a 'state of poverty' with all of poverty's associations implied: negatively the misery, fear, servitude, isolation and evil of the 'state of nature' but also the positive tension of a desire for liberty, security, sociality, the absolute and the good – *a desire for multitude*. Desire is of this trajectory because of the ontological definition of singularities themselves: they are nonindividual since they are modes of a common ontological substance (God or Nature), yet because this eternal substance is haecceitic, so they too are irreducibly singular, and they live and transform in 'an interindividual rapport'.[205] The nature of this rapport is *love*, since the intuitive knowledge of *commonality*, the third category of knowledge (*tertium cognitionis*), is internal to their ethical praxis. In the metamorphosis of becoming capable of civil life they do not join another's community by relinquishing their liberty through a social contract but *produce* a more powerful democratic common existence. Epistemologically they create and share in 'common notions' which constitute rationality and increase the power of clear and distinct thought, or what might be called 'information'. Ethically they are oriented with their backs to common evil and towards the common good. Politically their common power is *democratic* since it is produced by those who have constituted it, and as such it shirks hierarchy.[206] Construing the internet to be 'the prime example of this democratic network structure',[207] Hardt and Negri hear Spinoza's voice in Subcomandante Galeano's (née Marcos) concluding declaration of the founding meeting of the Alter-globalisation movement:

> We declare: That we will make a collective network of all our particular struggles and resistances. An intercontinental network of resistance against neoliberalism, an intercontinental network of resistance for humanity.
>
> This intercontinental network of resistance, recognizing differences and acknowledging similarities, will search to find itself with other resistances around the world.
>
> This intercontinental network of resistance is not an organizing structure; it doesn't have a central head or decision maker; it has no central command or hierarchies. We are the network, all of us who resist.[208]

Arquilla and Ronfeldt assert that 'netwar has two faces, like the Roman god Janus', a tension between war and peace, chaos and order, 'individual self-assertion and the

205. Antonio Negri, *Spinoza for our Time: Politics and Postmodernity*, trans. William McCuaig, with a foreword by Rocco Gangle (New York: Columbia University Press, 2013), 73.

206. This hopefully acceptably condensed summary is drawn from an interlinear reading of Negri's chapter 'Multitude and Singularity in the Development of Spinoza's Political Thought', in *Spinoza for our Time*, 69–82, and Hardt and Negri, *Commonwealth*, 53.

207. Hardt and Negri, *Empire*, 298–99.

208. Marcos, 'Tomorrow Begins Today: Invitation to an Insurrection', Notes from Nowhere, ed., *We Are Everywhere* (London & New York: Verso, 2003), 37. These words concluded the Zapatista-organised First Intercontinental Encounter for Humanity and Against Neoliberalism, which approximately three thousand activists from around the world attended in January 1996, two years following the start of the Zapatista uprising.

progress that comes with integration into larger, ultimately global groupings'.[209] Hardt and Negri take this duality of netwar seriously. They write in the preface to *Multitude*, 'You might say, simplifying a great deal, that there are *two faces* to globalisation.'[210] Janus is the threshold which distinguishes, on the one face, the hierarchical network of Empire that divides, isolates, wars, subjects to servile labour and reduces to the evils of poverty; while, with the other face, the nonhierarchical network of multitude whose singularities constitute through the praxis of love the epistemological, ethical and political common. As god of doors and gates, departures and returns, beginnings and ends, Janus, the RAND theorists argue, 'was the god of communications, too.'[211] This is consistent with his being a symbol of modern communication theory if chaos and order are conceived as indetermination and determination. But is an ontology of conflict premised on Spinoza consistent with communication theory per se?

5.7 Leibniz contra Spinoza

I believe the closeness of Spinoza and Leibniz's respective systems, coupled perhaps with a desire to find the Spinoza of '68 realised in our times, has lead Hardt and Negri to mistakenly project onto the internet a Spinozistic ontology when what is at stake, as deduced from Wiener's writings, is rather a post-Leibnizian one.

The properly cybernetic critique of Hardt and Negri is implicit in Leibniz's own objections to Spinoza's metaphysics. Though Leibniz considered Spinoza's metaphysics his monadology's only true competitor,[212] he renounced it on the basis that it, in Loemker's words, 'denied power, and therefore existence, to individuals'.[213]

While Leibniz and Spinoza are both 'monists' in the sense of denying Descartes' dualism of substances by affirming a single substantive kind, Leibniz emphatically pluralises his substances into the infinity of monads, whereas Spinoza recognises only the single substance of God or Nature through which an infinity of affections or modes are conceived. Leibniz ridicules Spinoza for holding that 'there is only one substance, God, who thinks, believes, and wills one thing in me, but who thinks, believes, and wills an entirely contrary thing in someone else'.[214] To suggest with Spinoza that 'the whole universe is merely one substance' is to misconstrue the concept of substance and render it a 'misnomer'.[215]

At stake in this critical difference are the two philosophers' respective notions of

209. Arquilla and Ronfeldt, *Networks and Netwars*, 21, 347.
210. Hardt and Negri, *Multitude*, xiii.
211. Arquilla and Ronfeldt, *Networks and Netwars*, 21.
212. Jolley, *Leibniz*, 72.
213. 7. See Leibniz, 'Letters To Louis Bourguet', *Philosophical Papers and Letters*, 662–63.
214. Leibniz, 'Reflections on the Doctrine of a Single Universal Spirit' (1702), *Philosophical Papers and Letters*, 559.
215. Leibniz, 'Correspondence with De Volder', *Philosophical Papers and Letters*, 532.

singular substances, or the problem of the One and the Many. In the *Ethics* Spinoza argues that, 'In the universe there cannot be two or more substances of the same nature or attribute'.[216] Leibniz himself also accepts this principle of the identity of indiscernibles, writing in the *Monadology*: 'For in nature there are never two beings which are perfectly alike, and in which it is not possible to find a difference which is internal, or based on an intrinsic denomination.'[217] But he construes the consequence of the axiom differently, arguing that while any two substances may share the same perception (since each reflects the entire universe within themselves) their situations and therefor degree of clarity and distinction of apperception necessarily differ. Hence, 'every monad is different from every other.'[218] Leibniz's is a philosophy of *equivocal* expression whereby all monads are unified by the harmony of their perceptions but distinguished from every other by their singular clarity and confusion over any given perception; Spinoza's is a philosophy of *univocal* expression whereby 'adequate' ideas which are freed from obscurity and confusion cannot be expressed clearly if another can only express it in confusion. Whereas Leibniz poses signifying expressions, Spinoza poses common forms.[219]

Agreeing with Spinoza that any substance must be self-caused or 'prior to its affections'[220] but departing from his attribution of such substantiality solely to God, Leibniz construes the infinity of monads as substances who cause themselves. Not only do they have perceptions, but they also have *internal* principles of change that themselves brings about the passage from one perception to another, or *appetition*.[221] The confused sensible appetitions which animal souls cannot transgress are their *passions*, whereas the clearer appetitions from the mind's reason are their *will*.[222] In will, minds are little Gods who *determine* their universe, creating their *échantillons architectoniques* by deciphering the universal palimpsest. Immanence is not a quality shared among minds but within each mind in its capacity of willing, its 'inherent force of producing immanent actions'.[223] Ours is the 'best of possible worlds' because it derives not merely from God's being, as per Spinoza, but from his active determining choice.[224] Every monad is, so to speak, its own author, even if according to an ascending ontological hierarchy the ultimate author is God. According to Leibniz, by denying the power of such an internal principle of change, Spinoza strips the very existence away from the individuals he designates as 'modes'.

216. Spinoza, *Ethics* I P5, *Complete Works*, 218–19.
217. M9. See in general, ibid., 71–74.
218. Ibid.
219. Deleuze, *Expressionism in Philosophy*, 321–35.
220. Spinoza, *Ethics* I P1, *Complete Works*, 218
221. M15.
222. Leibniz to Nicole Remond (July 1714), Leibniz, *Monadology*, 278.
223. 'On Nature Itself, or On the Inherent Force and Actions of Created Things', Leibniz, *Philosophical Papers and Letters*, 502–03.
224. M59.

Wiener's secular monadology (his cybernetics) is opposed to Hardt and Negri's ethology on an equivalent basis to Leibniz. Hardt and Negri's only true network is the multitude itself since only the multitude has a purpose: the constitution of the common. The singularities who strive against poverty do so not for their own enrichment or that of any other network's but the wealth of the multitude itself. The constitution of the common is driven by universal love. Nothing else. Every partial desire is that of Empire, the dissolution and division of the common. Singularities only raise their own determination (information, purpose, control) as an effect, a secondary consequence, of raising the multitude's. In this sense there really are only two faces to netwar for Hardt and Negri, or better, precisely one substance in flight against its own entropic indetermination.

Wiener's cybernetics construes an infinity of such substances. To each network, its own determination, its own activity. Hardt and Negri mistake Maxwell's demon for Janus. There is not a single double-faced head governing all things but an infinity of Maxwell's demons, each with a face turned towards the chaos of their indetermination and another turned to the order of their determination. The flight from poverty has no necessarily democratic tendency. There is no wisdom to the body. It is rather a contingent game of strategy in which the player with the greatest determination wins.

This kind of conflict bears more affinity to Arquilla and Ronfeldt's initial concept of cyberwar, which is to say, prior to their adoption of the concept of 'swarm' from Kevin Kelly and their application of it to the Zapatistas. That said, in Arquilla and Ronfeldt's 'Cyberwar is Coming!' there is already a nascent sense that despite the terms of contemporary conflict including disinformation and cryptanalysis, certain networks are pre-established and forever consistent, notably the State. The concept of a 'swarm' reinforces this through its connotations of nonhierarchy from below: the RAND theorists are ultimately interested in strategising 'counternetwar' on behalf of the State. Kelly's theory plays a pivotal role in establishing the basis for this transition. One can follow a 'paper trail' of footnotes back from Hardt and Negri to Arquilla and Ronfeldt[225] and then from Arquilla and Ronfeldt to Kelly,[226] but the authors of *Multitude* not once make the latter connection between themselves and Kelly, conveniently writing as if the notion of swarming is simply a RAND military doctrine. The same is true for Cleaver. This means Hardt and Negri structure their project around a concept whose origins and meaning they fail to appreciate, but assume to be essential to the 'cybernetic revolution'. They fail to ask the question, *Who is Kevin Kelly?*

225. Hardt and Negri, *Multitude*, 368–69, 373.

226. Arquilla and Ronfeldt, *The Advent of Netwar*, 11; Ronfeldt et al., *The Zapatista: Social Netwar in Mexico*, 15, 45, 79; Arquilla and Ronfeldt, *Swarming & the Future of Conflict*, 48; Arquilla and Ronfeldt, *Networks and Netwars*, 12, 177.

Whole Earth Catalog editor, founder of the WELL network, founding executive editor of *Wired* magazine, born-again Christian and reader of second-order cybernetics. Alongside John Perry Barlow of the Grateful Dead and 'Cyberspace, a new home of Mind'[227] and along with Silicon Valley journalist and venture capitalist Esther Dyson, Kelly played a major role in realising the networks around Stewart Brand's vision of computer technology liberated from corporate and governmental contexts.[228] After *Out of Control*, in which Kelly invents the terms swarm and 'hive mind', he publishes the article (subsequently expanded into a book) 'New Rules for the New Economy' (1997, 1998) which Turner describes as being 'one of the most widely read business manuals of the 1990s'.[229] In these works the New Economy of computer-savvy network entrepreneurship (the 'Network Economy') is naturalised according to 'logic of the net' whereby the successfully adaptive organism and the profitably commercial firm are construed to be equivalent.[230] This ontogenetic homeostasis functions on a phylogenetic level too: Silicon Valley itself is 'one large, distributed company' with the benevolent aim of 'advancing technology' for humanity, the interests of each company and their industry as a whole lacking any particularity.[231] Kelly is a first-rate second-order cybernetic neoliberal, an exemplar of Turner's theory of the hippie-radical hyper-capitalist, and his concept of swarm relates fundamentally to the intelligence of the market free of State intervention: '[the] free-market economy – a swarm if there ever was one'.[232] The unsparing editors of *Mute Magazine* (the 'anti-*Wired*'), would write: 'Like most neoliberals, Kelly hides his rampant free market thinking behind a barrage of unsubstantiated clichés about the natural order of things.'[233]

Is this neoliberalism already intrinsic to Kelly's *Out of Control*, whose central concepts of swarming and 'hive mind' are at the heart of Hardt and Negri's understanding of networks? In an essay also published by *Mute*, Luciana Parisi argues so. Parisi contends that Kelly's theory of a nonhierarchical 'control without control' furnishes the neo-Darwinian analogy whereby 'the self-organisation of natural systems mirrors the increasing development of the free market.'[234] As Kelly argues in *Out of Control*, only the 'grand mesh' of the network – not the 'chain, pyramid, tree, circle, hub' – can possibly 'contain true diversity working as a whole. This is why the network

227. John Perry Barlow, 'A Declaration of the Independence of Cyberspace,' Electronic Frontier Foundation, February 8, 1996, accessed March 28, 2016, https://www.eff.org/cyberspace-independence.
228. Turner, *From Counterculture to Cyberculture*, 14, 131–140.
229. Ibid., 15.
230. *From Counterculture to Cyberculture*, 15–16. See *New Rules for the New Economy* (1998), an extension of his *Wired* article published the year prior.
231. Kevin Kelly, *New Rules for the New Economy: 10 Radical Strategies for a Connected World* (New York & London: Viking, 1998), 26, 28.
232. Kelly, 'Out of Control,' 22.
233. Slater and Broekman, *Proud to Be Flesh*, 26. See also, King, 'The Right Connections: Tea With Kevin Kelly,' 52–57
234. Luciana Parisi, 'Abstract Sex,' in Slater and Broekman, *Proud to Be Flesh*, 154.

is nearly synonymous with democracy or the *market*.'[235] To say 'it takes networks to fight networks' – as Arquilla, Ronfeldt, Hardt and Negri all insist – is as much to say that only the market can control the market. This law attains the value of an ontological truth because it is backed by Kelly's neo-Darwinian determinism: all other forms of organisation apart from the horizontal self-regulating network have become redundant.

Hardt and Negri may attempt to distinguish the capitalist market from the concept of democracy but otherwise Kelly's naturalised second-order cybernetic principle of self-governance thrives in their work; that is, Cannon's social homeostasis. Parisi seems to notice this for without mentioning the relevant 'paper trail' between Kelly and Hardt and Negri (via Arquilla and Ronfeldt) she moves straight from her attack on Kelly's biological determinism – its taking determinant, unitary forms as exemplary of all organisations – to a critique of Hardt and Negri.[236] Parisi observes that in conceiving of the multitude as a naturally creative, communicative, networked intelligence of humans and machines and Empire as its parasitical and destructive web of capture, Hardt and Negri re-impose the binarism of organic and inorganic, life and death, which the singular plane of nature of Spinoza's monistic ethology rejects. As Deleuze writes, Spinoza's single plane of immanence distributes affects to 'all bodies, all minds, and all individuals' without distinguishing between 'artificial' or 'natural' arrangements.[237] Characterising capital as monopolistic and exhaustive of potential for invention and production, Hardt and Negri miss the 'fluctuating coexistence' on the single plane of consistency of, not an individual body, but the collective desire (*conatus*) which 'expands its infinite potential through encounters.'[238] By focusing on the molar (Empire, multitude) they ignore the molecular mutations which constitute the hierarchical organisation within, Parisi argues. She borrows her concept of hierarchy from Manuel DeLanda[239] for whom markets and unplanned cities constitute instances of 'self-organized *meshworks* of diverse elements'; and for whom bureaucracies and planned cities constitute 'hierarchies of uniform elements'.[240] Not only do meshworks and hierarchies coexist and intermingle, DeLanda argues, but they give rise rise to each other and are in constant interaction. It is not that hierarchy is parasitic: it is that hierarchies and meshworks are *mutually* symbiotic. This is, effectively, DeLanda and Parisi's non-agonistic conceptual alternative to heterarchy. Parisi argues that Hardt and Negri therefore miss the 'endosymbiotic merging of heterogeneous machines of connection parasiting *onto each other*.'[241]

235. Kelly, 'Out of Control,' 26. Emphasis added.
236. Parisi, 'Abstract Sex,' 154–55; This critique is expanded upon in the related book, Luciana Parisi, *Abstract Sex: Philosophy, Bio-Technology and the Mutations of Desire* (London: Continuum, 2004), 143–45.
237. Deleuze, *Spinoza: Practical Philosophy*, 122-30.
238. Parisi, *Abstract Sex*, 145.
239. Ibid., 104, 124, 144.
240. Manuel DeLanda, *A Thousand Years of Nonlinear History* (New York: Zone Books, 2000), 32–33.
241. Parisi, *Abstract Sex*, 104. Emphasis added.

I agree with Parisi that Empire and multitude constitute a substantive dualism and that such a dualism need be rejected in order to differentiate the many pluralities within, but it seems to me that she inadequately describes the nature of hierarchies of control within heterarchies, how they can be identified, why they function as they do, and how to strategically act with them. Not only does she naturalise power itself, which is fine by me, but she too naturalises the real instantiations of power. She leaves us trapped within the hierarchies that are anyway becoming networks and the networks which are anyway becoming hierarchies. Along with DeLanda, she precludes all exteriorities.

5.8 Caught in the web

Parisi's critique of Hardt and Negri's take on the society of control intimates another reading of the contemporary *dispositif* premised on immanent networks of communication: Ewald's welfare state capitalism which 'we do not have the choice *not* to play.'[242] Another theory of games. Foucault's student, assistant and executor, Ewald has been characterised by Negri as a 'Right Foucaultian' for his rejection of Marx and his intellectual defence of the French insurance industry and France's major employer's association, Medef.[243] According to Ewald's reading, our *dispositif* constitutes an 'absolute communication' network which cannot be resisted precisely because it is not merely disciplinary but '*inter*disciplinary', a network of networks, 'homogenising social space even if it does not unify it.'[244] Our society is defined by a 'power without exterior', a description of a network which evokes Hesiod's depiction of Pandora as 'a sudden trap from which there can be no escape'.[245] Ewald, and perhaps Parisi too, depicts a network in which resistance is impossible.

Why is this so? Disciplinary society, Ewald argues, pertains to a diffusion of disciplines, 'ubiquitous and liberated', which create a society by means of 'a sort of common language between all sorts of institutions'.[246] Describing this as only a *sort of* common language emphasises that the network is *heterogeneous*, its elements not exactly self-same. This heterogeneous language is one of 'absolute communication' which makes it possible 'for everything to communicate with everything else according to an interplay of redundant elements and infinite homologies.'[247] It is a distributed full-matrix network.

The mechanism of the common language through which absolute communication

242. Michael C. Behrent, 'Accidents Happen: François Ewald, the 'Antirevolutionary' Foucault, and the Intellectual Politics of the French Welfare State,' *The Journal of Modern Histor*, 82 2010, 623.
243. Ibid., 585–86.
244. Ewald, 'A power without an exterior,' 170-1.
245. Marcel Detienne and Jean-Pierre Vernant, *Cunning Intelligence in Greek Culture and Society*, trans. Janet Lloyd (Chicago & London: University of Chicago Press, 1978), 295.
246. Ewald, 'A power without an exterior,' 169–70.
247. Ibid., 170.

takes place, according to Ewald, is the *norm*: 'The norm is precisely that by means of which and through which society, when it becomes a disciplinary society, communicates with itself.'[248] It 'presented to modern society its true picture of itself'[249] – a true picture which, following Foucault, is grounded not in ontology but in the production of power. The norm links disciplinary institutions of production, of knowledge [*savoir*], wealth and finance and makes them *interdisciplinary*, homogenising social space even if it does not unify it.'[250] It grounds the possibility of communication between the heterogeneous elements of the network whilst preserving their difference.

The norm, that through which a society communicates with itself, functions not through repression, forbidding or blockades but through producing, intensifying, raising value and such positive 'mechanisms'. What it produces are *individuals*. But this 'individualisation' is not an absolute process, rather, the norm is simultaneously 'the link, the principle of unity – of communication – between these individualities.'[251] At the centre of disciplinary society is no longer the king but the norm.

This is not the same kind of centre of a network as in Baran, Arquilla and Ronfeldt, it is not a centre which can be 'knocked out'; rather, this is the kind of topological centre that Vernant shows Anaximander attributed to Greece in the Earth and Earth in the universe: the dominating 'common mediator … through which all elements are related' which institutes an order of equality and equilibrium upon all beings.[252]

The throne of the 'Sun King' around which revolved the entire sovereign society, lit only by their living God's reflection, is taken over by the norm which, in Foucault's words, 'inverts economy and visibility into the exercise of power'.[253] In the sovereign's absence, the objectivity through which the self can judge themselves in respect of their individualisation becomes *architecture*. Architecture cedes being just an expression of power, now 'it *is* the power itself.'[254] It gives meaning to meaning, value to value, communication to communication. The architecture of normative space brings everything to visibility *but the norm itself*. 'The shade becomes the light', the negative becomes positive, hence the norm's productivity. The exterior becomes the interior: 'the norm makes ceaseless individualisation possible and creates comparability.'[255] The only relationship the group has is to itself, without an exterior, without the otherness of an above or below. 'The norm integrates anything which might attempt to go beyond it – nothing, nobody, whatever difference it might display, can ever claim to be exterior, or claim to possess an otherness which would actually make it other.'[256]

248. Ewald, 'A power without an exterior,' 170–71.
249. Ibid., 170.
250. Ibid., 171.
251. Ibid.
252. Vernant, *Myth and Thought among the Greeks*, 206–07.
253. Ewald, 'A power without an exterior,' 177.
254. Ibid.
255. Ibid., 173.
256. Ibid.

'The exception is within the rule.'[257] Ewald refers to the influence upon Foucault of Canguilhem's division of the normal and abnormal (or pathological), a 'special kind' of difference which bears not division but rather a difference which manifests the possibility of an enriched interior formulated by productive thresholds and boundaries.[258] In the disciplinary society the treatment of the individualised 'criminal' is isomorphic to that of the individualised 'good citizen' merely with redoubled effort, and so the architecture of the prison reflects that of the school. *There is no outside*.

Specifically, the norm as that nexus of communication amongst communications is 'a measure' through which the 'common measure' is produced. It allows for comparability since it is power, it is the centre. It is not the disciplines which target and train bodies that characterise modernity, but the norm; confinement is not what characterises modernity but, finally, 'a *space*: interchangeable, without segregation, indefinitely redundant and without exterior.'[259]

Ewald conceives of the disciplinary *dispositif* as a kind of internetwork which, precisely because it interfaces everything without exception, precludes exteriority. The only choice, then, is to play the game of capitalism, since any difference will be assimilated by it. As Parisi might put it, there is a 'fluctuating coexistence'. Again, there is no escape from this internet.

This reading of the contemporary *dispositif* is distinct from Hardt and Negri's in that there is no Empire outside of the multitude, or rather, it conceptualises internet from the situation of 'Empire' who cannot imagine an outside to itself because 'multitude' is already within it – whereas from the situation of multitude, as Hardt and Negri depict it, Empire is a superfluous parasite. Where every conflict in Ewald's network is therefore internal to the subject of production (the norm), it is always outside for Hardt and Negri's subject of production (multitude). Ewald is as incapable of conceiving of the kind of conflict through which an outside is constituted as Hardt and Negri are unable to conceive of the myriadic heterarchical conflicts which take place *throughout* the internet.

Cybernetics advances a single plane of consistency in which all conflicts, all productions can take place: the Internet. There may not be an outside to this ontology and therefor, like Ewald, it may provide the single game that can be played, but – since not all pieces are known to each player – there are real distinctions, real outsides, real possibilities for conflicting networks and ruptures therein.

These can be instantiated through collective – and not only individual – embodiment, while remaining a single network. The number of bodies or machines does

257. Ibid.
258. Ibid., 174.
259. Ibid.

not matter. What matters is the unity of the dividual's purposive determination. But this is never just one purpose, as Hardt and Negri insist. Every network is overlapped by a myriad of others, and to each, a degree of conflict. Networks always determine internets as internets determine networks.

Writing of being 'caught in the mesh of a circular net which reduces [men] to a state of impotence', Vernant, a communist and distinguished partisan, has something to say about such traps.[260] He objects: Men are not tuna. As the encircled Greek navy depicted by Herodotus who suddenly surged forward into and through their Persian trap, humans are capable of making decisive, bold action to escape their network trap.[261]

260. Detienne and Vernant, *Cunning Intelligence in Greek Culture and Society*, 299.
261. Ibid., 297.

Conclusion

The belief that society may be innately homeostatic remains concomitant all the way into Hardt and Negri's publications, but it has not been contemporary in the sense of speaking to the operative image of the age since before the 1940s. Wiener's concept of homeostasis decisively breaks with Cannon's, yet the image of human society as a vast steam engine with all its organs working in general unison prevails. This forgets that Wiener took a hammer to the old mirror, and our operative image is the pile of shards which remain. Social homeostasis today operates through irreducible relations of heterarchical agonism.

I have attempted to develop an account of the contemporary age opposed to any based on Spinoza's ontology, and instead on Wiener's Leibniz, naming it *internet*. According to this, immanence is not a quality shared across an entire internet but only on the level of an dividual network since, as Leibniz says, immanence is a force residing *in* every substance but not *between* it and another. An internet is ordered by relations of equivocity, for want of a more agonistic term, not merely because of differences in signification and the problem of translation but because the differences that rule out univocity and the plane of immanence are differences of actualising determinations, or 'control'. That is, an internet is stratified according to the strategies, both defensive and aggressive, of networks whose existence and liberty depends on their holding a greater degree of determination than other networks do of them. Life and freedom no longer necessarily correlate to truth, love, wisdom or the good, but the strategic fact of control.

This is precisely the decoupling of right from wisdom which Leibniz feared in Hobbes' philosophy, where the sovereign, mortal or divine, 'has the right to do everything, because he is all powerful.'[262] In its political modality the monadology is an attempt to foreclose the coupling of right with the contingent fact of power and bind it forever to the necessity of universal justice. 'It is power which gives and maintains law; and if this power lacks wisdom or good will, it can give and maintain quite evil laws: but happily for the universe, the laws of God are always just, and he is in a position to maintain them'.[263] Unhappily, today harmony is '*post*established

262. Leibniz, 'Meditation on the Common Concept of Justice', *Political Writings*, 47.
263. Ibid., 50.

locally' on the field of battle, as Latour says.[264] The 'prodigious Leviathan' is indeed no joke, as Wiener says, for by means of his post-Leibnizian cybernetic ontology actualised in the internet, the degrees of determination which a network can accrue are in theory infinite, as are the degrees of indetermination in its opponents.

But the game is never settled – this is where the chess metaphor breaks down. There is always a degree of indetermination to every power. As Burroughs says, control is never complete. A network may tend towards becoming a mere homostatic tool, but there is a limit to control. Indeed, there is always an infinity of further indetermination possible – the network can always be further dividuated – just as there is an infinity of determination to gain. This is not cause to be naive, but a call to strategise.

264. Latour, *The Pasteurization of France*, 164.

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