

Ana Teixeira Pinto
**Death Wall:
Extinction,
Entropy,
Singularity**

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e-flux journal #67 — november 2015 Ana Teixeira Pinto
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In 1796, upon observing a vast array of elephant fossils, paleontologist George Cuvier noticed a puzzling fact: the fossilized mammoths of Europe and Siberia were different from living elephant species. None of the specimens in his collection corresponded to present-day African or Indian exemplars; they were all remains of fauna now extinct. At length, it dawned on him that another world might have preceded our own, a world whose existence had suddenly come to a halt, possibly “destroyed by some kind of catastrophe.”¹ From that moment onwards Cuvier became an advocate of catastrophism, the geological school which claims that life has been subjected to sudden, yet periodic, violent natural events with fatal fallouts.

Inspired by Cuvier’s conjectures, Jean-Baptiste Xavier Cousin de Grainville introduced the trope of the last survivor on a dying Earth in what came to be called the “disaster genre,” in his novel *Le Dernier Homme* (The Last Man, 1805). The book describes a future in which overpopulation has outstripped the planet’s resources: on a ravaged and largely sterile planet mankind becomes unable to procreate. The last child to be born in Europe is urged to mate with the last fertile woman alive, yet God advises him otherwise. The story ends with the demise of humanity whilst the graves of the dead begin to open.

Le Dernier Homme is the first literary example of what we now know as a Malthusian catastrophe. Named after the English economist Thomas Malthus, who stated that the dangers of unabated demographic growth would preclude endless progress, a Malthusian catastrophe is any form of environmental collapse due to overconsumption.

Malthus introduced the principle of perpetual struggle, taking the form of competition for resources, into social exchange theory. His *Essay on the Principle of Population* (1798) also caught the attention of Charles Darwin, who extrapolated Malthus’s ever-present struggle for survival to an evolutionary schema. Members of the same species would compete for survival, the ill-adapted would die out, whilst the ones with a genetic edge would prosper. The political economist was instrumental for Darwin’s take on evolution, namely in the formulation of the two main principles the theory implies: a principle of fecundity, which leads to overabundant natality, and a principle of selection, which in effect culls the undesirable.²

Malthus was not in favor of social engineering. He saw natural competition as a divine incentive, inspiring men to be industrious, and he famously argued that “positive checks” – a euphemism for premature deaths – were needed to avert exponential growth, and that

these checks were provided by hunger, disease, and war. Fittingly, he was among the first to espouse a punitive approach to poverty: he opposed the “poor laws” – a system of poor relief which anticipated the modern welfare state – on the grounds that they would allow the destitute to multiply beyond their means and place an undue burden on the state; and he and his followers defended the idea that workers wages could never exceed the cost of subsistence long-term. Though Darwin did not assign moral value to evolution, Herbert Spencer, who popularized social Darwinism and coined the phrase “survival of the fittest,” also considered the division of labor in the political economy to be “the social analog of physiological divergence and speciation in biology.”³

Unlike Darwin, Cuvier did not believe species could evolve. For him, organisms were integrated wholes whose parts couldn’t be selectively modified—he spoke only of extinction and creation. However, having established extinction as a scientific fact, he unwittingly introduced the notion of a linear temporality into the natural sciences.

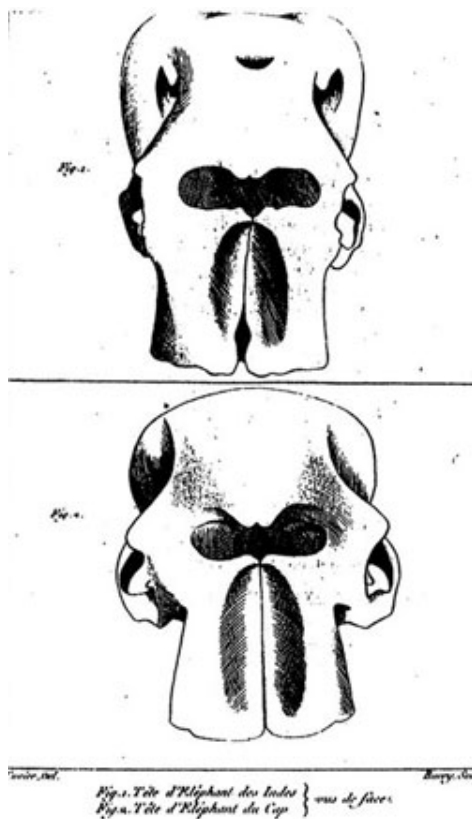
In the nineteenth century, nature, “traditionally seen as cyclic or timeless, became increasingly temporal, or progressive,”

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represented either as an upward motion (progress) or as a downward spiral (decay). It was this linear representation of time that “became synonymous with history.”⁴

The future is a function of linear time. As Susan Buck-Morss notes, within history, time signifies social change and the uniqueness and irreversibility of political events. Nature is, in this sense, the opposite of history, for within nature, time signifies only cyclical repetition. Can nature have a history? From an evolutionary perspective, nature becomes history: a panorama of progress in which the passage of time is represented as an improvement. Yet nature and history are hard to fuse into a harmonizing whole. Within nature, the potential for extinction and oblivion remains in dialectical tension with the possibility of renewal and creation.⁵ The notion of history, on the other hand, implies an arrow of time, a unidirectional movement which can only lead to one of two outcomes: harmony or tragedy. Either social change will lead to a state of perpetual equilibrium, or collapse will ensue.

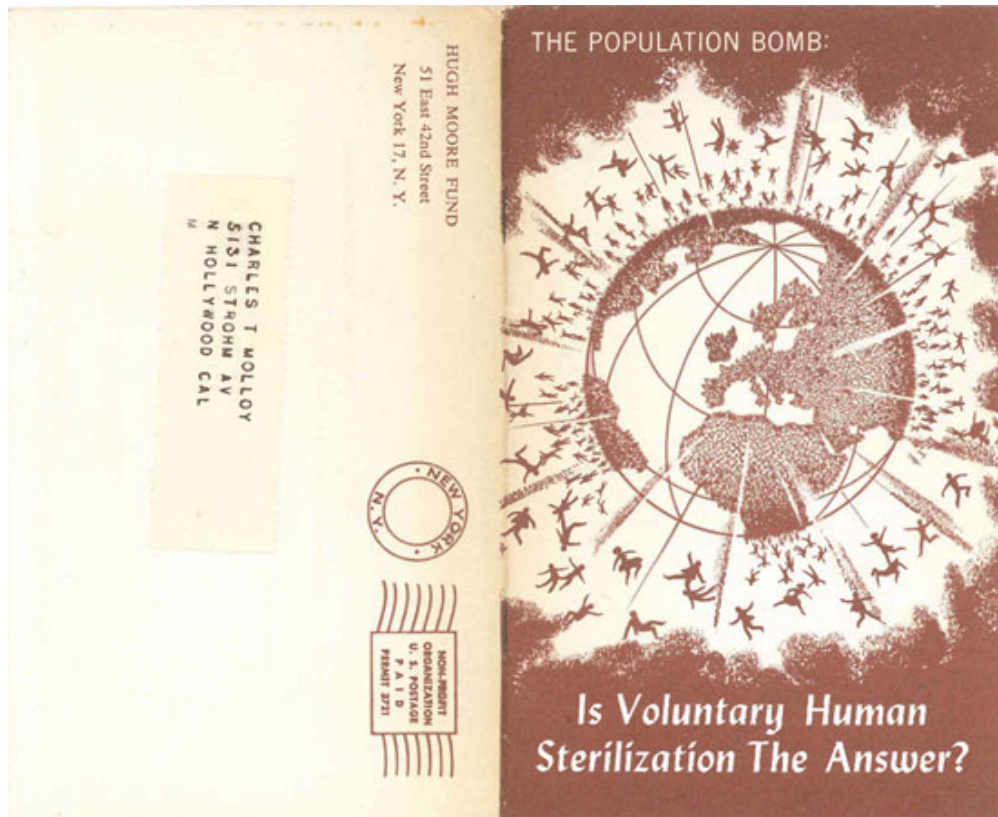
Communism is an answer to the problem of equilibrium: the communist society to come entails a return to the primitive communism of the distant past, coupled with a much higher



Elephant skulls from Sri Lanka (top), south of the Indian mainland, and South Africa (bottom), engraved from Cuvier's drawings, were published in 1799.



A mother and her children work at assembling match-boxes at home, c. 1900.



A pamphlet published by the Hugh Moore Foundation promoted urgent action on “the population problem.”

stage of technological development; but so is Adam Smith's description of free-market interaction as a horizontal, self-regulating order in which supply and demand reach equilibrium at the "natural price," and Fukuyama's notion of the "end of history" in which an iterative liberal economy appears as the final form of human government. All of the above lead to an exit from the turmoil of the historical process. But the stationary state achieved by the natural price (the price for a good or service that is equivalent to the cost of production) was closely linked to what became known as a Malthusian equilibrium – a stationary state "maintained by the opposing forces of reproduction and starvation"⁶—just as Adam Smith's twin blades of "supply" and "demand" are the economic analog for Darwin's concepts of "fecundity" and "selection," and for the dual principles of "work" and "waste" in William Thomson's formulation of the second law of thermodynamics, concerning the dissipation of energy, i.e., entropy.

In Newtonian physics all mechanical forces are time-reversible. At the molecular level, there is no preferred direction in time, and in classical dynamics, motion is "the sole parameter of change."⁷ The first law of thermodynamics states that within a closed system the sum of energy is conserved throughout its transformations; the sum of energy in the universe is thus constant. The first law—the law of energy conservation—marks the continuity between classical mechanics and thermodynamics.⁸

The second law of thermodynamics, however, introduces an irreversible time-arrow into physics, just as evolution had done for biology.

While studying the cycle of a steam engine's operation, William Thomson (Lord Kelvin) came to the conclusion that whereas work may be completely converted into heat, the reverse does not hold true: in the process of harvesting heat back onto the production cycle, there is always a remainder, some percentage which remains as heat, and is thus lost for industry. This observation led Thomson to conclude that there was a universal tendency for mechanical energy to dissipate, which he saw as an irreversible process leading to an inevitable "increment of inefficiency."⁹

This was a seemingly trivial conclusion, concerning a practical—engineering—problem about the optimization of the production process. Thomson, however, extrapolated his findings to a universal process entailing the dramatic conclusion that the universe would inexorably meet its end in what Hermann Helmholtz came to call a "heat death":

1. There is at present in the material world a

universal tendency to the dissipation of mechanical energy.

2. Any restoration of mechanical energy, without more than an equivalent of dissipation, is impossible in inanimate material processes, and is probably never effected by means of organized matter, either endowed with vegetable life or subject to the will of an animated creature.

3. *Within a finite period of time past, the earth must have been, and within a finite period of time to come the earth must again be, unfit for the habitation of man as at present constituted, unless operations have been, or are to be performed, which are impossible under the laws to which the known operations going on at present in the material world are subject.*¹⁰

The term "entropy" was introduced in 1865 by Rudolf Clausius, who had noticed that a certain ratio was constant in reversible heat cycles—the ratio of heat exchanged to absolute temperature—which he thought must correspond to a real, physical quantity. He termed this quantity "entropy." In thermodynamics, entropy provides a measure of the energy unavailable for work: entropy is a negative kind of quantity, the opposite of available energy.

In the physical sciences entropy is the only movement that seems to imply a particular direction, something like an arrow of time. As energy is more easily lost than obtained, all isolated systems will eventually deteriorate and start to break apart: in a closed system, available energy can never increase. According to the second law of thermodynamics – the law concerning the dissipation of mechanical energy—the entropy of the universe tends to a maximum. In the scientific description of physics, this is when the universe reaches thermodynamic equilibrium. In other words: in a energy-depleted universe, unfit for the habitation of man as at present constituted, "the stable state of a living organism is to be dead."¹¹

To quote Bruce Clarke, "energy had no sooner been delivered to the world of science as a primary physical concept on a par with matter than it was shadowed by its evil twin entropy, the demonic underside of energy's divine potency."¹² While railroads and steamships carried the promise of unlimited economic expansion, this seemingly unbridled industrial development went hand in hand with deteriorating social conditions for the urban masses, marked by poverty, malnutrition, delinquency, and disease.

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The Aitik open pit mine, currently 430 meters deep, is located about 60 km north of the Arctic Circle in Northern Sweden.

Although William Thomson did not develop the analogy between the degraded state of the laboring poor and the deterioration of energy under the actions of a mechanical engine, the second law of thermodynamics is an apt social metaphor: "Production of work rides on the back of wasting the sources of work, the workers."¹³

Consensus is an inherent feature in scientific discourse; it naturally derives from the intersubjective experience forged by scientific objectivism. But one could also say that what appears as scientific objectivity is always made of finely congealed subjectivity. Entropy, the key concept of the second law, is an empirical description—not every conserved ratio corresponds to a real, physical quantity, and to be clear, "no known formulation [of entropy] applies to *all* possible thermodynamic regimes."¹⁴ Conjectures about catastrophic extinction betray an anxiety about the life cycle of industrial products and the boom-and-bust structure of budding financial markets. Whereas energy functions as an analog for the commodity, entropy could be construed as the obverse of the market economy: value is lost, not gained, throughout the sum total of its transactions.¹⁵

As Eugene McCarragher notes, capitalism is an eschatological tale as well as a form of political economy, offering its own story of human fulfillment. For capitalist eschatology, salvation implies inclusion in a worldwide marketplace.¹⁶ Below the threshold of consciousness, however, darker visions are at play. The extraction of labor from the swelling ranks of the proletariat is predicated on the production of a surplus workforce (unemployed and underemployed). Simply put, just as there is a certain percentage of heat that cannot be redeemed back to production, there is a certain percentage of the population that cannot be redeemed back to the social. The accumulation of such a remainder—a festering underclass, or the so-called "social problem"—would threaten to, at any moment, burst into an orgy of violence able to engulf the whole of society. The triangulation of energy, capital, and catastrophe in Victorian science, together with the "heat death" of the universe and other fantasies of thermodynamic apocalypse, distort and displace the harsh realities of material history, ultimately functioning as an engine for metaphorical substitution which masks fears of social instability, degeneracy, and upheaval.

The distinction between linear and cyclic time which Victorian science introduced into biology (evolution) and thermodynamics (entropy) was itself predicated on the distinction between productive and unproductive labor. Productive labor was labor invested in industry, whose end result was a product or commodity.

Unproductive labor was labor which did not generate a product, typically domestic labor.¹⁷ Only productive labor was remunerated, while unproductive labor was simply appropriated, pointing to a hidden gender dimension which presided over the organization of social roles. Progress made by improving the means of production masks a state of stasis or decline at the level of the relations of production. But it is harder to conceive of these disjunctive motions than to reduce the whole of the social to the simple formulaic clarity of an integrated temporality.

In the 1940s, entropy was grafted onto information theory, after the physicist Erwin Schrödinger reconceptualized it as a measure of disorder. Thomson's twin blades of "work" and "waste" reappear as "signal" and "noise," while information – heretofore a concept with a vague meaning – was recast as the negation of entropy (negentropy). As biological and computational systems were treated as informationally equivalent, organisms came to be described as thermodynamic systems that extract "orderliness" from their environment in order to counteract increasing entropy. But this reasoning entailed a curious conclusion: the fundamental divide between living and nonliving is not to be found between organisms and mechanisms, but between order and chaos. As Norbert Wiener would put it, entropy is "nature's tendency to degrade the organized and destroy the meaningful"¹⁸; the negation of order is the negation of life. Echoing fears of communist contagion and the urge to halt the Red Tide, Wiener would later describe a chaotic, deteriorating universe in which small enclaves of orderly life, increasingly under siege, fight against all odds to preserve order and increase organization.¹⁹

Whereas thermodynamic entropy is typically measured in joules, to measure informational entropy an arbitrary convention must be imposed, of which no unit of measure was ever specified.²⁰ When Claude Shannon's "Mathematical Theory of Communication" was translated into Russian and French, the editors, seeking to maintain "communications engineering as an ideologically neutral technical field," poured over his writings to purge the text of all "anthropomorphic" terminology, such as the controversial usage of the term "entropy."²¹ The continuity between thermodynamic entropy and information as the negation of entropy in information theory is simply a matter of analogy—a "purely superficial similarity of mathematical formulae."²² Metaphorical flights notwithstanding, by suggesting that "everything in the universe can be modelled into a system of information," cybernetics and information theory



This image from *Dr. Cyclops* (1940), a science fiction film starring Janice Logan, was appropriated for anti-communist propaganda c. 1953. The added caption read: "If Russia and the Communists should win the next world war, many American men would be sterilized. In case the Communists should conquer, our women would be helpless beneath the boots of the Asiatic Russians."

entailed a “powerful metaphysics, whose essence ... always remained elusive.”²³

The time-honored answer to the question concerning existence and the human condition is that humanity, born into an indifferent world, always creates a vast array of aspirational endeavors with the aim of surpassing its base condition. Hegel presupposed the successive dissolution of aesthetic forms into the higher form of History, the absolute limit, which signals the moment when reason finds its completion and Mind and Matter are fused into a harmonizing whole. Once nature disappears everything becomes a human sign: that’s what we call the Anthropocene or the technosphere. But whereas Hegel believed that the labor of reason transformed nature into man’s manifest image (i.e. into culture), in the Anthropocene material culture appears as a negative totality—according to Dipesh Chakrabarty, a “negative universal” that “arises from a shared sense of a catastrophe.”²⁴

As Susan Buck-Morss noted while commenting on Walter Benjamin, “when temporality is conceived under the mythic sign of predetermination, people are convinced that the present course of events cannot be resisted.”²⁵ The theories that have emerged in recent years—most notably speculative realism and object-oriented ontology—do not have an adequate grasp on the social. By limiting its scope of inquiry to questions of ontology and whether or not we can have access to the external world, these new strains of philosophical realism have ceased to think about social categories, electing as sole concerns questions of survival and extinction.²⁶

The diffuse world which emerges out of the conflation of globally consolidated financial vectors with the opacity of cyber-surveillance, underground economies, supranational cartels, corporate conglomerates, and clandestine insurgency is sublated into an evolutionary (or devolutionary) schema, whose future emerges simply as either ecological catastrophe or technological singularity. Whereas the former is, roughly put, the actualization of a Malthusian catastrophe on a planetary scale, for the latter carbon-based life will soon become altogether obsolete.

A term originally used by John van Neumann, later popularized by Vernor Vinge in the 1990s, the notion of a coming technological singularity posits that there is no necessary identity between mankind and Mind (also known as Reason or Spirit but more accurately defined as the processing of formal symbols and logical inferences), just a temporary correlation, soon to be overhauled by a qualitative leap in technological development.

The sources of the theory can be traced back to the 1950s. Equating the ontology of Mind with the functionality of programming, cognitivism (an offshoot of cybernetics) began to describe mental functions as information processing models, operating under the assumption that the brain is analogous to computer hardware and that the mind is analogous to computer software. Molecular and evolutionary biology also treat genetic information as an essential code, the body being but its carrier, while science fiction brims with fantasies of personal immortality as informational code. But the logical corollary of the idea that brain functions can be decoupled from the brain is the belief that it is only a matter of time until Mind sheds its human surrogate and embraces the higher evolutionary promise of AI.

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Steven Spielberg's *A.I. Artificial Intelligence* (2001) is based on Brian Aldiss's short story "Super-Toys Last All Summer Long."

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Endowing technological forms with a similar but higher form of consciousness to that found in individual men, the coming singularity represents the ultimate subsumption of the historical onto the logical. But whilst reason labors to convert noise into signal, humans irretrievably fall on the side of waste. In short: humanity will soon cease to be the optimal vehicle for Mind’s comprehension of its own essence. For singularity theorists, the universal subject of capitalism is the machine; and technology, not class struggle, is the motor of history.

But the question concerning technology cannot be answered by technology: socioeconomic conditions always determine the forms and functions technology undertakes, which potential usages are developed and which fall through the crevices of history. The algorithmic architectures of deep learning are geared towards commercially trivial purposes, and within an economy no longer predicated on production, capital accumulation has emancipated itself from technological development. Likewise, the machine that

operates the distinction between science and non-science is not a scientific construction, it's a institutional one.

Subjectivity without political history is just fantasy. Visions of machinic becoming, as well as phantasms of ecological panic and apothotic extinction, dabble in—to paraphrase Fredric Jameson – the “thematization of the reified features of a much more complicated social totality.”²⁷ Rather than seeing social systems as open to restructuring and reconstruction, apocalyptical strains of thinking always seem to presuppose “some structural permanence to capitalism,” its “identity threatened only by extrinsic factors.”²⁸

Capitalism will not fold, all at once. There is, however, an uncanny continuity between Malthus's insistence on having workers earn less than a living wage and the Chicago school's policies, be it through the implementation of “sacrifice zones” or allowing just enough unemployment in the economy to prevent inflation from rising above a given target figure (NAIRU).²⁹ The notion of an oblivious universe where life is born into extinction is its allegorical correlate, a social anxiety elevated into a theory. Because we can hardly afford to live, we imagine that life itself will wither. Rather more difficult is to conceptualize a radically different mode of production, and how to represent the sociopolitical transition required to take us there.

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Ana Teixeira Pinto is a writer from Lisbon currently living in Berlin. She is currently a lecturer at the UdK (Universität der Künste) Berlin and her writings have appeared in publications such as *e-flux journal*, *Art-Agenda*, *Mousse*, *Frieze/de*, *Domus*, *Inaesthetics*, *Manifesta Journal*, and *Texte zur Kunst*.

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- 1
From a 1796 paper by Georges Cuvier on living and fossil elephants, presented before the National Institute of Sciences and Arts in Paris.
- 2
Norton Wise, "Time in Victorian Science and Culture," in *From Energy to Information: Representation in Science and Technology, Art, and Literature*, ed. Bruce Clarke and Linda Dalrymple Henderson (Stanford: Stanford University Press, 2002), 55.
- 3
Ibid., 57.
- 4
Ibid., 41.
- 5
Susan Buck-Morss, *The Dialectics of Seeing* (Cambridge, MA: MIT Press, 1999), 58.
- 6
Wise, "Time in Victorian Science and Culture," 45.
- 7
Bruce Clarke, "From Thermodynamics to Virtuality," in *From Energy to Information*, 18.
- 8
Ibid., 15.
- 9
Ibid., 19.
- 10
William Thomson, "On a Universal Tendency in Nature to the Dissipation of Mechanical Energy," *Proceedings of the Royal Society of Edinburgh*, April 19, 1852. Emphasis added.
- 11
Norbert Wiener, *Cybernetics: or Control and Communication in the Animal and the Machine* (Boston, MA: MIT Press, 1961), 58.
- 12
Bruce Clarke, "From Thermodynamics to Virtuality," 20.
- 13
Norton Wise, "Time in Victorian Science and Culture," 51.
- 14
Vladislav Čápek and Daniel Sheehan, *Challenges to the Second Law of Thermodynamics: Theory and Experiment* (Dordrecht: Springer, 2005), 26.
- 15
Bruce Clarke, "Dark Star Crashes," in *From Energy to Information*, 62.
- 16
Eugene McCarragher, in *The Short American Century*, ed. Andrew Bacevich (Cambridge, MA: Harvard University Press, 2012), 189.
- 17
Norton Wise, "Time in Victorian Science and Culture," 45.
- 18
Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society*, rev. ed. (1954; repr., Cambridge, MA: Da Capo Press, 1988), 158.
- 19
Wiener, *Cybernetics: or Control and Communication in the Animal and the Machine*.
- 20
Myron Tribus and Edward C. McIrvine, "Energy and Information," *Scientific American* 225, (September 1971): 179–88.
- 21
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), 67.
- 22
In the words of Shannon's Russian editor, quoted in ibid.
- 23
Ibid.
- 24
Daniel Hartley, "Against the Anthropocene," quoted in <http://salvage.zone/in-print/against-the-anthropocene/>
- 25
Buck-Morss, *The Dialectics of Seeing*, 79.
- 26
In his recent book *Nihil Unbound*, Ray Brassier states that extinction is the inexorable fate of existence: "The earth will be incinerated by the sun 4 billion years hence; all the stars in the universe will stop shining in 100 trillion years; and eventually, one trillion, trillion, trillion years from now, all matter in the cosmos will disintegrate."
- 27
Fredric Jameson, "The Aesthetics of Singularity," *New Left Review* 92 (March–April 2015).
- 28
Ibid.
- 29
"Non-Accelerating Inflation Rate of Unemployment," that is, the level of unemployment below which inflation rises.