

Sven Lütticken
**Shattered
Matter,
Transformed
Forms: Notes
on Nuclear
Aesthetics, Part
1**

Those who today limit themselves to the
perception of whatever happens to be
visible at that moment miss reality.
– Günther Anders¹

01/11

As part of the Permanent Copernican Revolution that is modernity, the human senses were increasingly confronted with their limits from the late nineteenth century on, as technologies such as film and high-speed photography revealed an optical unconscious beyond human eyesight. X-rays, discovered by Wilhelm Röntgen in 1895, suggested that reality is traversed by invisible rays that can be revealed through media even while transforming those media in the process.² The radioactivity of uranium, too, was revealed through photography in 1896: Henri Becquerel exposed photo paper to uranium, and a form of radiation invisible to the human eye manifested itself in the dark.³ As Joseph Masco has argued, this disjunction between human perception and technical media has continued to widen in the postwar nuclear regime:

While the prosthetic devices that populate nuclear physics laboratories enable scientists to enter the subatomic realm and measure the material effects of plutonium and other radionuclides, most people in the nuclear age remain literally senseless to radiation, dependent in everyday life on biological, not machinic, insights.⁴

If we follow Our Literal Speed's suggestion that "the Cold War could perhaps be reinterpreted as, among many other things, a violent worldwide struggle between two competing imprecations: Capitalism's 'Just Look!' and Communism's 'Don't Believe Your Eyes!,'" and that "Communism has always been on the side of *The Unseen*: the subvisual, the infrastructural, the barely visible, that which resists being paraphrased in any already agreed-upon terms," then the Soviet Bloc's mirroring of the West's military and "peaceful" use of nuclear technology, shrouded in top-secrecy and imposed on a populace devoid of agency in the matter, is not the least damning aspect of "actually existing socialism."⁵ Both sides effectively told their populations: "Just look, there's nothing to see here!" One side had Harrisburg; the other Chernobyl.

The literal invisibility of harmful ionizing radiation is coated in political invisibility that is broken only intermittently, at moments of spectacular disaster. The problem, as aesthetic as it is social, remains, and would remain even after an improbable global abandonment of nuclear technology in the form of vast quantities of radioactive waste. The Copernican

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1



An X-ray operator's hand exhibiting dermatitis, London Hospital, early 20th century. Otherwise known as "Röntgen hands" this disease resulted from the calibration early radiologists would need to do to operate machines.

decentering of human vision due to nuclear physics' descent into the fabric of matter itself is matched by dizzying time spans that appear to cast doubt on the possibility of meaningful social and political action, which tend to think in shorter terms. The nuclear regime, then, exacerbates a certain modern crisis of the aesthetic. The aesthetic pertains to the senses, to the sensible. What, then, if the modern "mastery" of matter penetrates the infra-sensible realm, with consequences for all living beings that are carefully kept abstract and hypothetical? To put it differently, the postwar nuclear regime confirms that the aesthetic is a practice and theory of crisis, of lack, of petrifying sublime expanses and decisions to work with whatever form or degree of concretion can be attained.

1. Atomic Aisthesis: Hyperobjects and Infra-Objects

The aesthetic can address and circle around the abstract, can become a negative theology of the insensate, but it still needs moments of concretion, of incarnation. This is precisely what puts it at odds with some of the object-oriented speculative realists. The fight against "correlationism" is ultimately a fight against the aesthetic mode. Correlationism is a loaded and problematic framing of philosophy since Kant, which is said to have wilfully reduced ontological questions to matters of epistemology – the "correlation" between object and subject. Kant's insistence that what we perceive as reality is the product of our mind's innate thought-forms led to an abandonment of ontology in favor of epistemology and the mind-world "correlation."⁶ The world, henceforth, was to be filtered through the human; the categories and schematisms of the mind structure reality as we perceive and know it, and the *Ding an Sich* remains outside the purview of thought.

No matter that post-Kantian idealist and materialist philosophy goes from correlation to a dialectic of subject and object; this is still unacceptable for neo-ontologists such as Graham Harman, who seek to defines objects not in relation to any shared reality with human perception and life, as "sensual objects," but "by their autonomous reality. They must be autonomous in two separate directions: emerging as something over and above their pieces, while also partly withholding themselves from relations with other entities."⁷ These objects of thought are strangely like fetishized, auratic artworks – except that they don't share any white-cube space with other fetishes, which would incorporate them into a structural game of signification through difference. The modern "autonomous artwork" in fact always

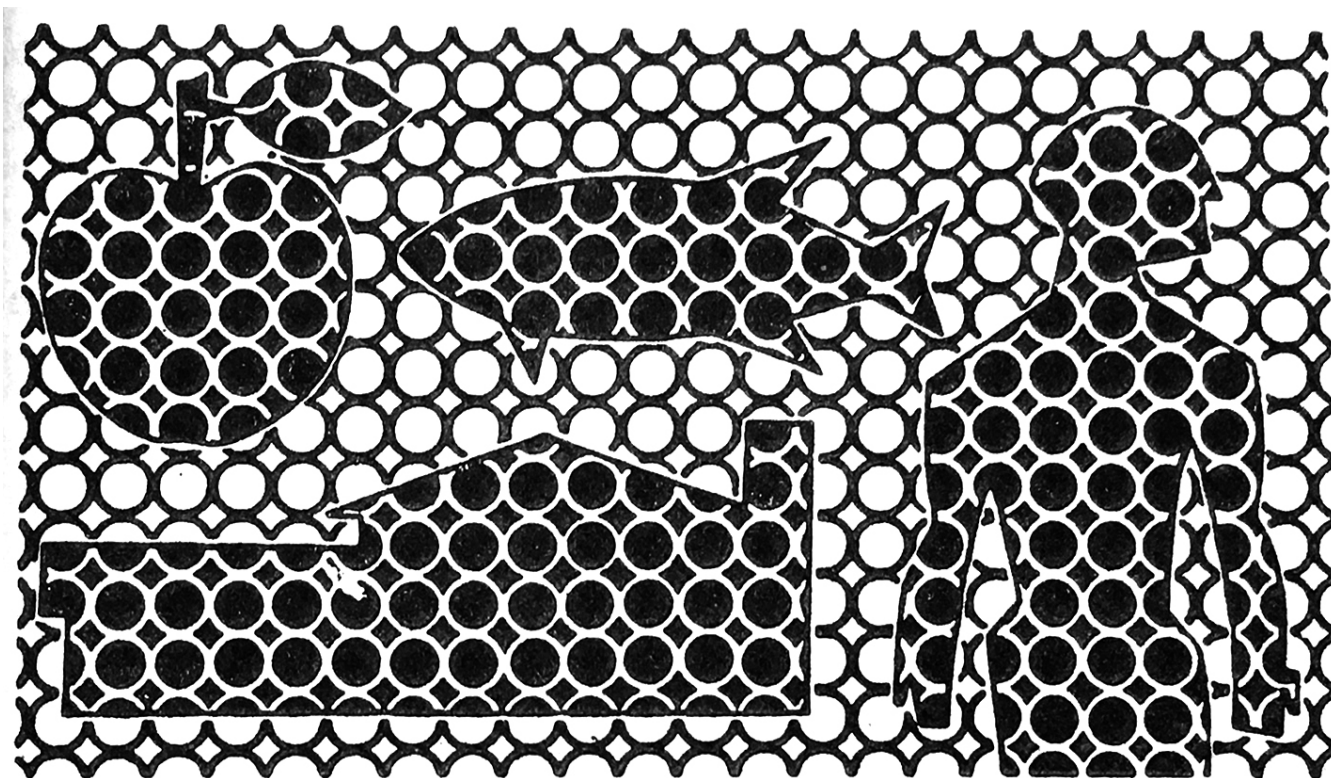
complicated any neat distinction between object and subject by presenting the viewer (or listener, or reader) with an external entity possessed with an oneiric logic whose grasp lies forever behind the next corner of the aesthetic experience. Hegel famously defined the beautiful as "das sinnliche Scheinen der Idee" – the sensuous appearance or "shining" of the idea.⁸ For idealist aesthetics, the artwork was a challenge and promise precisely because it was in the artwork, in "alienated" form, that subjectivity could truly manifest itself; later, materialist aesthetics homed in on the artwork's materiality or thingness precisely because it could serve as a corrective to the lordship of the idealist subject. With Harman, none of this seems to matter much.

Consequently, some proselytizers of object-oriented speculation try to "rescue" art from the aesthetic: since "contemporary art as the aesthetic experience of sense and value-making, as the co-constitution of the art object and subject, assumes correlationism and reproduces it," art must become post-contemporary by becoming post-aesthetic and poetic – for the aesthetic, which is conveniently defined in narrow Kantian terms, is said to remain correlationist by limiting experience to "the conditions of the possibility of our thinking," whereas poetics "refers to a making of something in which the boundary from non-being to being is crossed."⁹ Such theory memes take away all tools for cognitive mapping, for navigating the networked real abstractions and their overdetermined articulations. On the other hand, there are some positions within the speculato-objective field that provide pointers for such an orientation.

While Timothy Morton goes along with the critique of correlationism, he proposes what one might term a *disjunctivist* rather than a correlationist reading of Kant: Morton stresses that Kant, in positing that the "thing in itself" is unknowable and all we can access is what has been produced by our own mind, opened up a "phenomenon-thing gap" that foreshadows Morton's own account of what he terms "hyperobjects." The Kantian gap becomes "the rift between weather, which I can feel falling on my head, and global climate, not the older idea of local patterns of weather, but the entire system."¹⁰ Hyperobjects are "massively distributed in time and space" and could be anything from a black hole to an oil field, the Everglades, the biosphere, or "the sum total of all the nuclear materials on Earth; or just the plutonium, or the uranium."¹¹ They are so distributed that they are never fully concrete, fully sensate; however, in keeping with object-oriented ontology, Morton stresses that

03/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1



"Atoms everywhere," illustration from the paperback *The Walt Disney Story of Our Friend the Atom* (1956).

hyperobjects are not necessarily “hyper” only or primarily in relation to humans: “A thing is just a rift between what it is and how it appears, for any entity whatsoever, not just for that special entity called the (human) subject.” His relative focus on “hyperobjects as they pertain to humans” is presented as a concession of sorts.¹² Since Morton writes as “one of the entities caught in the hyperobject I here call global warming,” this is clearly a more pressing hyperobject for him than black holes.¹³

However, does climate change instantiate the “Kantian gap” between phenomenon and thing-in-itself, or rather actualize the Kantian correlation between mind and world, of which the thing-in-itself is the irrelevant remainder? As Déborah Danowski and Eduardo Viveiros de Castro have argued, “We can see the irony of our predicament as that of a catastrophic *terrestrial objectivation of the correlation*” – in other words, “human thought, materialized as a giant technological machine of planetary impact, effectively and destructively *correlates the world*.”¹⁴ If the productive abstractions of modern technoscience – this weaponized, transformative, operative logos – have remade the world, they have done so through the “actually existing linearity” of GDPs and CO2 levels.

A refrain throughout Morton’s work, especially when it comes to the nonlocal nature of hyperobjects, is radiation:

Nuclear radiation is not visible to humans. The nuclear accidents at Chernobyl and Fukushima bathed beings thousands of miles away in unseen alpha, beta, and gamma particles, as radioactive specks floated in air currents across Europe and the Pacific. Days, weeks, months, or years later, some humans die of radiation sickness. Strange mutagenic flowers grow.¹⁵

Morton is thus the latest of a number of theorists, writers, and artists to address the crisis of the human sensory apparatus in the age of nuclear technology – in a frequently mystificatory register, and without seeing or acknowledging the connection to a very different strand of theory. His dictum that “locality is always a false immediacy” recalls the Marxian critique of pseudo-concretion.¹⁶ In fact, Marxian theory has long analyzed capitalism as a hyperobject – without using this exact term, to be sure. However, notions such as commodity fetishism and pseudo-concretion are so many ways of articulating the point made by the post-situationist polemicist Jaime Semprun: there is a sensory void at the heart of capitalism as an

economy of real abstraction, in which the productive relations do not “show up” in the commodity.

In his tract against the nuclear regime, *La Nucléarisation du monde*, written in the guise of an ironic, Swiftian defense of nuclear technology, Semprun notes that “nothing is more discreet than radiation.”¹⁷ As an infra-sensible phenomenon that can, however, result in very visible physical consequences, the nuclear is an aesthetic-political problem of the first order. Semprun, whose text originally appeared in 1980, but was republished after the Chernobyl disaster at Guy Debord’s behest, stresses that in this respect the nuclear should be seen as an exacerbation of capitalist commodity fetishes, which already claim an “autonomy” from the human and relegate the labor and the productive relations that brought them forth to invisibility:

Because nuclear fission acts on the very structure of inorganic matter (just as genetic engineering – the indispensable complement for the construction of a nuclearized human being – acts on the very structure of organic matter), from now on there is no longer anything to see. We understand that this might be somewhat disconcerting in a world where sight is the sense that instructs all the other senses; what is not so easy to understand, however, is the fact that while people rebel against a power that escapes their senses, they nonetheless do not seem to have noticed that all of their activities are subjected to a power that is just as impalpable and invisible as nuclear power, a power whose reach is so generalized that nuclearization itself is merely one of its consequences, among others. It was undoubtedly necessary for the boundless social power constituted by the existence of market relations to boldly proclaim its autonomy in the form of nuclear power, so that people should become aware of the necessity of submitting to its imperatives. In this sense, nuclear power is, for the social question, a discovery that is just as important as the discovery of the unconscious was for individual psychology.¹⁸

Tongue firmly in cheek, Semprun asks, “What person with even the least degree of respect for materialism would deny that our environment is much less aquatic than social?” Today, of course, the rhetoric would have to be different, as much anthropocenic discourse is predicated precisely on the realization that our environment is natural as well as cultural and social – a realization triggered by the drastic effects human activity

05/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1

06/11



A film still from Disney's TV film *Our Friend, the Atom* (1957).

has on the planetary ecosystem. However, critics of the notion of the Anthropocene have argued that it effectively naturalizes the new geological era and the catastrophic symptoms it generates – by ascribing it to the “anthropos,” to the human race as such. Should we not rather use the term “Capitalocene,” for instance? And should an analysis of hyperobjects such as global warming and radiation not include economic hyperobjects such as the financial system, and capitalism as such? We can never see capitalism as such, before our eyes like an object. All the commodities are mere epiphenomena of the hyperobject; as is our own experience as workers, or as unemployed, or as refugees; as are signs of ecological and social destruction we may witness. How to use personal experience – or the failure of experience, the missed encounter with the hyperobject – as a point of departure?

2. Ontological, Scientific and Monetary Atomism

Intriguingly, Karl Marx’s 1841 doctoral dissertation was on an atomic subject: the difference between Democritus’s and Epicurus’s philosophy of nature, both of which were atomistic. Greek atomism had been rediscovered in the Renaissance, largely through the Roman poet Lucretius’s poem *De rerum natura*. With its denial of the creation and of a divine plan, its assertion of infinite time and space and insistence that everything consists of minute particles, as well as its ethical privileging of pleasure over self-abnegation and suffering, atomism was anathema to a Catholic church that could make peace with various elements from Platonism and Aristotelianism. Atomism, as a seventeenth-century Latin prayer for young Jesuits quoted by Stephen Greenblatt stresses, denied the divine *form* of creation:

Nothing comes from atoms.
All the bodies of the world shine with the
beauty of their forms.
Without these the globe would only be an
intense chaos.¹⁹

Marx, who makes extensive use of Lucretius, notes that for Democritus the atomistic principle can be

perceived only through reason, since [atoms] are inaccessible to the sensuous eye if only because of their smallness. For this reason they are even called ideas. The sensuous appearance is, on the other hand, the only true object, and the aisthesis [sensuous perception] is the phronesis [that which is rational]; this true thing

however is the changing, the unstable, the phenomenon.

In Democritus’ philosophy, “the concept of the atom and sensuous perception face each other as enemies,” with sensuous reality playing the role of “subjective semblance” vis-à-vis the philosophical concept (of the atom).²⁰ By contrast, Epicurus stresses the objectivity of sense appearances: “While Democritus turns the sensuous world into *subjective semblance*, Epicurus turns it into *objective* appearance. And here he differs quite consciously, since he claims that he shares *the same principles* but that he does not reduce the sensuous qualities to things of mere opinion.”²¹ Here we begin to see why these seemingly arcane philosophical issues would be of interest to the young Marx, who was working his way through Hegel and who was already moving beyond idealism.

Concerning the actual theory of the atom, both thinkers assume that atoms share two types of motion: falling in a straight line in the void, and a mutual repulsion among each other. Epicurus adds an extra element: the atom’s ability to deviate from the straight line. “The atoms are purely self-sufficient bodies or rather bodies conceived in absolute self-sufficiency, like the heavenly bodies. Hence, again like the heavenly bodies, they move not in straight, but in oblique lines. The motion of failing is the motion of non-self-sufficiency.” The “declination” from the straight line introduced by Epicurus was said by Lucretius to have broken “the *fati foedera*, [bonds of fate].”²² In a further approving reference to Lucretius, Marx notes that “if the atoms were not to decline, neither their repulsion nor their meeting would have taken place, and the world would never have been created.”²³ Epicurus, then, comes to be identified for Marx with materialism – with a materialism that is not ahistorical and deterministic but places emphasis on development and on contingency. Whereas for Democritus, the atom remains “a pure and abstract category, a hypothesis, the result of experience, not its active [*energisches*] principle,” in Epicurus “atomistics with all its contradictions has been carried through and completed as the natural science of self-consciousness. This self-consciousness under the form of abstract individuality is an absolute principle.”²⁴

This abstract individuality is the limit of Epicurianism:

The purpose of action is to be found therefore in abstracting, swerving away from pain and confusion, in ataraxy. Hence the good is the flight from evil, pleasure the swerving away from suffering. Finally,

07/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1

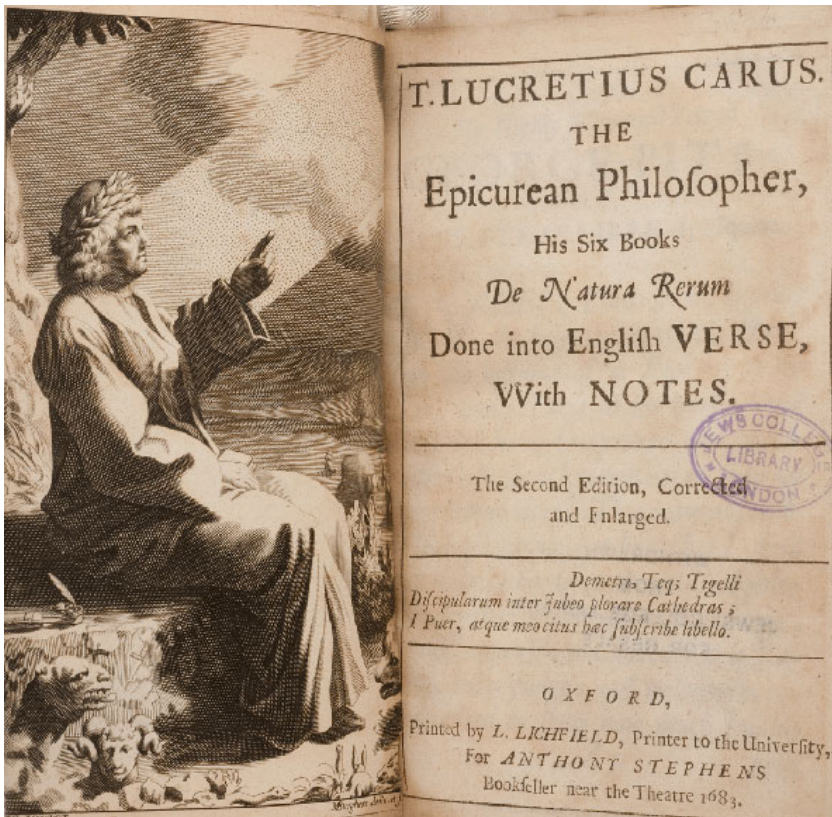
where abstract individuality appears in its highest freedom and independence, in its totality, there it follows that the being which is swerved away from, is all being, for this reason, the gods swerve away from the world, do not bother with it and live outside it.²⁵

Thus Marx, steeped in idealist aesthetic theory, almost accidentally provides an “atomistic” basis for classical Greek art, as these Gods who “are unconcerned with us and the world, are honoured because of their beauty, their majesty and their superior nature ... are no fiction of Epicurus. They did exist. They are the Elastic gods of Greek art.”²⁶ This represents progress against an earlier moment in which the Gods were held in awe. Marx cites a line from Aeschylus’s *Prometheus Bound* that he associates with Epicurus: “Better be the servant of this rock / Than to be faithful boy to father Zeus.”²⁷ This familiar Young Hegelian critique of religion remains Feuerbachian: Marx here theorizes the emancipation from superstition as an aestheticization of the gods. However, in a patrician slave society, this only results in a form of aristocratic critique and persona ethics of aloofness; the move from such a contemplative

critique to a collective and revolutionary praxis lies in the future.

Marx produced his dissertation at a moment when atomism in modern science was still largely a theoretical school, even if increasingly buttressed by experimental results, such as the chemical decomposition of water into oxygen and hydrogen. Speculative ontology was in the process of becoming operational science. The social dialectic becomes inextricably entangled with the metabolisms of nature. The paradoxical triumph of scientific atomism would come around 1900 with the realization that atoms were *not* the smallest, indivisible building blocks of reality. With Becquerel’s discovery of the radioactivity of uranium in 1896, it became evident that the fabric of material reality was not as solid as eighteenth-century materialism or nineteenth-century positivism had assumed. Frantic research into the inner structure of the atom culminated in the 1911 “planetary” Rutherford model of the atom, with a small nucleus around which electrons circle at a distance; this signaled the transformation of *atomic physics* into *nuclear physics*, which was accompanied by quantum-mechanical problematization of the fundamental distinction between particles and

08/11



Thomas Creech's English translation of Lucretius' *De rerum natura* (1683).

energy waves; subatomic particles and light could register as either. The discovery of the neutron and of nuclear fission and chain reactions during the 1930s laid the basis for the development of nuclear weapons during WWII. Hiroshima spells the death of atomism and the triumph of nuclearism.²⁸

Nonetheless, as military and “peaceful” nuclear power transformed the planet in the 1950s and ’60s, Greek atomism was revisited both in popular and more highbrow attempts to come to terms with the new (un)reality. As the creator of a new breed of “elastic gods,” Walt Disney produced both a mass-market paperback (1956) and a TV film (1957) called *Our Friend the Atom*.²⁹ In this teleological history, Democritus – but not Epicurus – is praised for his “prophetic” atomic theory, which was however soon lost and forgotten.³⁰ Old qualms about the alleged atheism and hedonism of the atomists, and about the “formlessness” of the worldview they promoted, have been put aside. The Disney staff and author Heinz Haber gave the distinctly nonclassical and orientalist form of a genie in a bottle to nuclear energy: a fisherman opens the vessel and unleashes the genie. However, so the lesson of this dialectical image goes, “man” can make the genie do his bidding and harness its power.³¹ In the 1960s, in a critical register, the German writer and activist Heinrich Schirmbeck claimed that “our era reaps what the Greek atomists have sown,” as they started a process of “*Entsinnlichung*” (desensualization) that ends with nuclear science and with biological science.³²

In his 1970 book *Intellectual and Manual Labour*, Alfred Sohn-Rethel references Marx’s distinction between the “natural form” of a useful object (use value) and the value-form of the commodity (exchange value), quoting from *Capital* to the effect that “[the] value of commodities is the very opposite of the coarse materiality of their substance, not an atom of matter enters into its composition.”³³ Sohn-Rethel stresses the “atomicity” of money, but this is not physical atomicity. Rather, it is mathematical divisibility; the “real abstraction” that is money must be “divisible in order to leave the commodities undivided.”³⁴ Sohn-Rethel’s book is an ambitious and somewhat eccentric attempt to demonstrate that the concepts of Kantian philosophy and modern science derive from exchange. For Sohn-Rethel, Kant’s categories of understanding are the classic formulation of modern epistemology, and can be used to illuminate modern philosophical and scientific thought. He notes that the Kantian “thought-form” (*Denkform*) arrives on the scene *preformed*, and that Kant himself situates this preformation in the “intellect” or the “mind.”³⁵ In

fact, however, the modern thought-form is preformed socially and historically, and derives from the *value-form*; the thought abstraction is grounded in real abstraction, but due to the division between manual and intellectual labor, philosophers and scientists disavow this link. Just as exchange imposes a value-form and hence pure equivalence on the world of matter and the senses, so modern thought abstracts from sensuous experience: it is shaped by quantifying concepts and principles that *subject* all that is perceived, all that is “qualitatively sensuous.”³⁶

Timothy Morton notes that between Kant and today’s anthropocenic theory lies the moment of 1900, when “quantum theory blew a huge hole in the idea of particles as little ping-pong balls” and “relativity theory destroyed the idea of consistent objects.” All of this amounted to a confirmation of the Kantian gap, and a prefiguration of hyperobjects. “What did the ‘discoveries’ have in common? Water, quanta, spacetime began to be seen. They were autonomous entities that had all kinds of strange, unexpected properties.”³⁷ In his very different register, Sohn-Rethel also notes the break with the modern-bourgeois scientific conception of material substance as consisting of minute, permanent particles.³⁸ Quantum physics insisted that events and not particles are the “matter” of physics, and that a particle can appear as either matter or as energy. For Sohn-Rethel, this was one indication of an impending breakthrough to socialism: as bourgeois science reflected the reign of the value-form under technocratic capitalism, so the revolutions in modern physics seemed to presage a social revolution.

Such crude and direct parallelism of the politico-economic and the scientific has its counterpart in parallels that are often drawn between modern science and modern art. Undeniably, some moments in art’s aesthetic revolution were informed by breakthroughs in physics, but this involved a complex process of translation – at times sloppy and hasty translation, riddled with projections and misconceptions, but producing the unprecedented in the process.

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To be continued ...

09/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1

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10/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1

- 1
"We sich heute auf die Wahrnehmung dessen beschränkt, was der Augenblick gerade an Sichtbarem bietet, der verfehlt die Realität." Günther Anders, "Tagebuch aus Hiroshima und Nagasaki" (1958), in *Hiroshima ist überall* (München, 1982), 48. Translation by SL.
- 2
Akira Mizuta Lippit has insisted on the crucial importance of three interrelated "phenomenologies of the inside" that were launched in 1895: psychoanalysis, X-rays, and cinema. See *Atomic Light (Shadow Optics)* (University of Minnesota Press, 2005), 5.
- 3
See for instance Susan Schuppli, "Radical Contact Prints," in *Camera Atomica*, ed. John O'Brian (AGO/Black Dog Publishing, 2015), 284–87.
- 4
Joseph Masco, *The Nuclear Borderlands: The Manhattan Project in Post-Cold War New Mexico* (Princeton University Press, 2006), 31.
- 5
"Our Literal Speed presents Vision and Communism," in *Vision and Communism* (New Press, 2011), text available at <https://independent.academia.edu/OurLiteralSpeed>.
- 6
The notion was introduced by Quentin Meillassoux, who is critiqued by Graham Harman for remaining in thrall to correlationism; see Graham Harman, *The Quadruple Object* (Zero Books, 2011), 136–37.
- 7
Harman, *The Quadruple Object*, 19.
- 8
G. W. F. Hegel, *Vorlesungen über die Ästhetik I. Werke 13* (Suhrkamp, 1970), 151.
- 9
Armen Avanessian, "The Speculative End of the Aesthetic Regime," *Texte zur Kunst* 93 (March 2014) <https://www.textezurkunst.de/93/speculative-end-aesthetik-regime/>.
- 10
Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World* (University of Minnesota Press, 2013), 12–13.
- 11
Morton, *Hyperobjects*, 1.
- 12
Morton, *Hyperobjects*, 23, 81.
- 13
Morton, *Hyperobjects*, 3.
- 14
Déborah Danowski and Eduardo Viveiros de Castro, *The Ends of the World*, trans. Rodrigo Nunes (Polity, 2017), 36.
- 15
Morton, *Hyperobjects*, 38.
- 16
Morton, *Hyperobjects*, 48.
- 17
Jaime Sempun, *La Nucléarisation du monde* (Éditions Gérard Lebovici, 1986), 30. English translation <https://libcom.org/library/nuclearization-world-jaime-semprun>.
- 18
Semprun, *La Nucléarisation du monde*, 39.
- 19
Anonymous, "Exercitatio de formis substantialibus et de qualitatibus physicis," quoted in Stephen Greenblatt, *The Swerve: How the World Became Modern* (W. W. Norton, 2011), 250.
- 20
Karl Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature* (1841), Pt. 1, Ch. 3 <https://marxists.catbull.com/archive/marx/works/1841/differences/ch03.htm>.
- 21
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 1, Ch. 3.
- 22
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 2, Ch. 1 <https://marxists.catbull.com/archive/marx/works/1841/differences/ch04.htm>.
- 23
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 2, Ch. 1.
- 24
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 2, Ch. 5 <https://marxists.catbull.com/archive/marx/works/1841/differences/ch08.htm>.
- 25
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 2, Ch. 1.
- 26
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature*, Pt. 2, Ch. 1.
- 27
Marx, *The Difference Between the Democritean and Epicurean Philosophy of Nature* (draft of a new preface) <https://marxists.catbull.com/archive/marx/works/1841/differences/foreword.htm>.
- 28
With Peter Galison's *Image & Logic: A Material Culture of Microphysics* (University of

Chicago Press, 1997), one can add a third phase after atomic and nuclear physics: postwar particle physics, dedicated to the study of ever more arcane subatomic particles. Since I focus on techoscience that fundamentally derives from the nuclear physics of the 1930s and 1940s, this distinction is less relevant here.

29

The TV version of *Our Friend the Atom* was broadcast on January 23, 1957 as part of the *Disneyland* anthology series. In the show, a lavishly illustrated mock-up book of that title is shown that bears little relation to the actual paperback, which is fully titled *The Walt Disney Story of Our Friend the Atom*.

30

Heinz Haber, *The Walt Disney Story of Our Friend the Atom* (Dell Publishing, 1956), 20–23.

31

Haber, *The Walt Disney Story of Our Friend the Atom*, 9–13.

32

Heinrich Schirmbeck, *Die Formel und die Sinnlichkeit. Bausteine zu einer Poetik im Atomzeitalter* (List Verlag, 1964), 61, 9.

33

Marx, quoted by Alfred Sohn-Rethel, *Geistige und Körperliche Arbeit. Zur Theorie der gesellschaftlichen Synthesis* (Suhrkamp, revised second edition 1972), 47–48; English version from *Intellectual and Manual Labour: A Critique of Epistemology* (MacMillan, 1978), 27. Sohn-Rethel's book exists in rather different versions in German and English. I primarily use the second German edition (1972), using the English translation/reworking for occasional quotations.

34

Sohn-Rethel, *Intellectual and Manual Labour*, 54. The equivalent passage in *Geistige und Körperliche Arbeit* is on 82.

35

Sohn-Rethel, *Geistige und körperliche Arbeit*, 22.

36

“Diese abstrakte Natur beschreibt sich in reinen, alles Wahrgenommene, qualitative Sinnliche der Quantifizierung unterwerfenden Begriffen und Prinzipien.” Sohn-Rethel, *Geistige und körperliche Arbeit*, 89. Translation by SL.

37

Morton, *Hyperobjects*, 11.

38

Sohn-Rethel, *Geistige und körperliche Arbeit*, 208–10.

11/11

e-flux journal #94 — october 2018 Sven Lütticken
Shattered Matter, Transformed Forms: Notes on Nuclear Aesthetics, Part 1