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FOCUS Mediocene

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Editorial

This issue, following an international conference held at the IKKM in September 2017, is devoted to what may very well be the broadest media-related topic possible, even if it is accessible only through exemplary and experimental approaches: Under the title of the »Mediocene«, it presents contributions which discuss the operations and functions that intertwine media and Planet Earth. The specific relation of media and Planet Earth likely found its most striking and iconic formula in the images of the earth from outer space in 1968/69, showing the earth—according to contemporaneous descriptions—in its brilliance and splendor as the »Blue Marble«, but also in its fragility and desperate loneliness against the black backdrop of the cosmic void. Not only the creation but also the incredible distribution of this image across the globe was already at the time clearly recognized as a media effect. In light of space flight and television technology, which had expanded the reach of observation, communication, and measurement beyond both the surface of the Earth and its atmosphere, it also became clearly evident that the Planet had been a product of the early telescope by the use of which Galileo found the visual proof for the Copernican world model. Nevertheless, the »Blue Marble« image of the planet conceives of Earth not only as a celestial body, but also as a global, ecological, and economic system. Satellite and spacecraft technology and imaging continue to move beyond Earth's orbit even as they enable precise, small-scale procedures of navigation and observation on the surface of the planet itself. These instruments of satellite navigation affect practices like agriculture, urban planning, and political decision-making. Most recently, three-dimensional images featuring the planet's surface (generated from space by Synthetic Aperture Radar) or pictures from space probes have been circulating on the Web, altering politico-geographical practices and popular and scientific knowledge of the cosmos. Today, media not only participate in the shaping of the planet, but also take place on a planetary scale. Communication systems have been installed that operate all over the globe.

Like the somewhat complementary idea of singularity, the designation of Earth as a celestial body seems to have been transferred to life on the planet's surface, mainly to describe biological and cultural diversity, thus replacing former ideas of universality. At the same time, however, the »Blue Marble« has given way to the »Red Marble«, the no less iconic computer-generated image of the overheated planet as subject to massive climate change, due not only to global carbon dioxide

emissions from power plants and devices such as cars, but also to energy-intensive practices like cloud-computing. Without technological interventions into the planet as an ecosphere, and without the operation of media, there simply would be no climate change, and there would be no Planet Earth. The enmeshment of media and the Planet includes technical media of the modern sphere such as the telegraph, television and the internet, as well as magical media which embody visions and conceptions of world and worldmaking, extending also to media that function in nature itself, such as physical media or DNA.

In a certain respect, this issue thus continues the debates on »Media of Nature« taken up in *Zeitschrift für Medien- und Kulturforschung* 7/2 (2016). It highlights the relationship between media and the shaping and modeling of Planet Earth as well as the diverse ways of living on Earth as an all-encompassing habitat. Moreover, as the Galileo example already indicates, according to the leading hypothesis, the interrelation of media and the Planet is by no means restricted to what we now call the Global age: Planet Earth has always-already been mediatized, even if this has perhaps only recently become observable, due to media conditions such as space flight or to more current media developments, mainly marked by the pervasiveness, omnipresence, and ubiquity of media on a worldwide scale. It is media that from the beginning made Planet Earth imaginable, perceptible, measurable, calculable, visible, navigable, conceivable, and (at least seemingly) manageable. And media continue to do so, from the sundial to the telescope, from cartography to the telegraph and satellite communication. Whether in the geosciences, popular culture, or artistic imagination, the knowledge and perception of the planet is and has always been processed by media. This is by no means restricted to highly engineered Western societies based on Western media technology but, in a comparative perspective, it is as true and as relevant for diverse and local forms of knowledge based on mythic, fetishist and ritualistic practices.

Historically, this process may have begun with the introduction of road systems, transoceanic seafaring and global mail communication; continued with the discovery and technological exploitation of electromagnetism and the attendant possibility of instant communication, which culminated in the construction of worldwide cable networks serving telegraphy, telephony, broadcast, and computer communication; and led to the present-day proliferation of satellites that populate Planet Earth's atmosphere. These developments were (and are) based on the widespread consumption of resources, workforce, capital, and on the production of waste that attends the creation and maintenance of these vast infrastructures. It is not only today that global communication networks of the most different kinds exert influence on the relations among various cultures and collectives on the planet, and have massive effects on global and regional economies. Equally important, in the realm of politics, are political processes of negotiating and establish-

ing global communication standards. Last but not least, the link between globally operating media and the conception and perception of the globe itself is apparent in the network of media needed for weather forecasts and climate models, which leaves its imprints on the very procedures and models it creates.

At the same time, it is media which enable the articulation and enmeshment of regional and particular practices and habits and thus transform the planet from a unified (stellar or geographic) object into a horizon of particularities and singularities. Media are thus deeply implicated in the conception and working of Planet Earth as a diversified unity or as a single complex system, like e. g. the »Earth System« hypothesis suggests. Similarly, practices relating to worldwide communication and a global economy, climate research, cross-cultural exchange, ecology, and science fiction rest upon the idea of a unitary planet—which, in turn, is a media product. Media inscribe themselves into global change, and, conversely, global change subjects media to its conditions. Yet media do more than simply pervade our perception, communication, and attempted control of the planetary. Depending on the region, they may also materially contribute to habitat modification, whether through energy consumption, the creation of a need for rare earth minerals and other raw materials, or the production of waste.

Media should not, however, be mistaken for planetary super-subjects or docile instruments fully controllable by human actors. As agencies they forge relations between entanglement and dissociation, media intertwine the technological with the symbolic, mediating between nature and culture, between the individual and society, on a global scale. In doing so, media have become constitutive of the coordination of distributed agencies, which have an impact on each other, on their respective environments, and above all on the planet itself, only through their cooperation and interaction. It is through these functionalities of binding and coupling (and dissolving) that media impose and imprint their conditions on the world in an abiding way.

The idea of the »Mediocene« advocated in the contributions of this ZMK issue serves as a complement and a corrective to the model of the »Anthropocene« that has been so remarkably developed and successful in recent years. The idea of the »Anthropocene« starts from geological stratigraphy and taxonomy and assumes that the impact of specifically human interventions in the global habitat has grown in scale. This then leads to a permanent alteration of the global habitat and, decisively, to a transformation of the geological shape of the planet to such a degree that it serves as justification for proclaiming a new geological epoch (succeeding the »Holocene«). Man-made phenomena like CO_2 emissions (and attendant climate change), accumulating sedimentation, and the rapid extinction or large-scale migration of species, for example, have begun to leave permanent, geologically detectable traces and effects on the planet. As a complement and a corrective to

these otherwise convincing observations and statements, the basic underlying assumption of the »Mediocene« concept is that these undeniable phenomena and, on a truly planetary scale, existential problems cannot be satisfyingly conceived of as long as they are ascribed—either exclusively or directly—to human agency, or to some other superactor like fossil fuels (»Oleocene«), plantational economies (»Plantatiocene«) or global capital (»Capitalocene«). The prevalent exclusive accounting of human agency (or any other equivalent potential super-agency, be it oil, money or the agrobusiness) has already been disputed in the debate about the Anthropocene. This one-sided viewpoint unwillingly continues and reinforces—willingly or not—the notion of human (or other) mastery, domination, and Western hegemony. It still seems to adhere to the idea of the need and the (more or less human) ability to control planetary processes, from nature to history, society, culture, and technology. Yet it is precisely the practices and politics of (mostly Western) human rule over all other forms of life that have produced the aforementioned problematic changes. These changes in themselves at the same time challenge the assumption of a primacy that is exclusively human.

Of course, as this comparison to the »Anthropocene« shows, the concept of the »Mediocene« has far-reaching implications which transcend the limitations of a single journal issue and thus cannot be sufficiently explored here. Nonetheless, these implications can be exposed: For instance, it is clear, among other demands, that the critical transition from the assumption of the »Anthropocene« to that of the »Mediocene« requires the development of a specific media anthropology. It invites a de-centered or symmetrical anthropological approach that will investigate the underlying mediations among the human, the technological, and the natural, in which agency is rooted. Such an anthropology will assume that the relation between media and humans is always-already given and precedes any of the operative separations between them.

In addition, and in a complementary way, the hypothesis of the »Mediocene« also calls for an appropriate understanding of media. Media can be identified as the blind spot in discussions of the »Anthropocene« where they figure at best as the compliant tools and subservient instruments of the supposed control and causation in human hands, extending the human contribution to planetary change. As we know, however, media can be understood precisely *not* as obedient tools controlled by human subjects or collectives. Rather, media have to be cast as sets of connecting elements that organize operative and cooperative practices, networking and co-evolution among a variety of agents, both human and non-human, including artifacts as well as natural objects and processes (if indeed this distinction remains at all possible). It is only through their mutual involvement in what we call media that these agents acquire some distributed agency, they even come into being only through their relationships of correlation and interconnec-

tion. Specifically, the mediality of the »Mediocene« forms the conceptual link between nature and culture, allowing for the investigation of phenomena like the relation of various forms of human existence to the functions of media processes, the anthropological intertwining of the human and the non-human, and the ontology of material media operating within physical and biological systems. This applies on a scale from the Planet as a whole (as a conceivable and perceptible object no less than as a horizon of different perspectives, as in perspectivism) to the most local and particular spheres. The concept of the »Mediocene« thus also enables an analysis of diverging media cultures in which different forms of existence may relate to nature, to human practices of different kinds and cultures, and to the most diverse artifacts in a multitude of ways.

Other consequences also have to be taken into consideration: As a historical and epistemic model, the »Mediocene« has two components. On the one hand, it marks out a precise era in historical time: The age of media in the sense of an irreversible, rapidly developing, and epoch-making spread of media across the planet, with implications even on the scale of deep time. As we have seen above, the »Mediocene«, like the »Anthropocene«, can be historically dated; either to the early nineteenth century with the rapid growth of new media technologies and practices in the industrialized world, from the steam press to photography to telegraphy, and others; or to the heroic era of space flight or to some other period. These apparatuses, which enabled or enforced instant distribution and automatic reproduction of information, facilitated and accelerated worldwide communication. As these media facilities spread across the globe, they also set the scene for local and regional forms of appropriation and idiosyncratic media practices. For instance, in the twentieth century, cinema and electronic mass media propelled the mediatization of the planet as well as the emergence and articulation of national and cultural specificity. Later, the expansion of computer technologies contributed to the (limited) calculability of the planet, turning it into the »earth system«. In this context, it is especially relevant to consider the ongoing process of digitization as a historical rupture in the evolution of the »Mediocene« itself.

On the other hand, however, it is impossible to conceive of history or evolution as frames in which the »Mediocene« can be located—or dated, since it is a framing of time—without media. All history and all evolution is constructed by media, since the past has to be mediated in order to be taken notice of and articulated, through myths, legends, and tales, through popular culture and vernacular knowledge, or through scholarly research that investigates historical documents, monuments, traces, and testimonies. In this sense, not only does the »Mediocene« inhabit (deep) time, but the inverse is also true: historical and deep times are themselves products of media operations and hence it is they that inhabit the »Mediocene«.

This leads to a further problem linked to time in the »Mediocene«: As mentioned previously, it turns out that, although the »Mediocene« is a precise and dateable period in history and in deep time, the planet has nevertheless been intertwined with media and mediatic operations from its very beginnings, long before the emergence of an »Age of Media« in the modernist sense. This seeming contradiction can be resolved nonetheless: For us (mostly westernized human researchers), the mediatic nature of the Planet has only been possible to grasp from a certain point in time which we now qualify as the beginning of the »Mediocene«; but once taken into consideration, the »Mediocene« must have necessarily also been there from the outset. Taken as an epistemic concept, the »Mediocene« is also a heuristic model applicable to situations beyond its particular historical frame—such as, for instance, prehistory or deep time. In very much the same way, it is equally true to say that the planet has been understood as a planet only since the Copernican Revolution, and that, nevertheless, it has always also been a planet since the time of its inception. In addition—to return once more to a truly planetary, comparative scale again—we must insist that non-western conceptions of the world and of the planet may have developed their own (implicit) practices and notions of the mediatic which have possibly always been linked to their understanding of the Planet and from which we could learn more about the »Mediocene«. Thorough study of non-Western and non-hegemonic epistemologies and ontologies, which independently conceive of this link between nature and culture, are hence especially helpful in the attempt to access the »Mediocene«.

Last but not least, the proposed concept of the »Mediocene« brings certain challenging aspects of political ecology to the fore. In this field, the shift towards a focus on media and the integration of concepts of the mediatic help clarify the complex interactions among natural, political, technological, and cultural forces, a nexus exemplified in events like Hurricane Katrina in 2005. In that setting, the mutual entanglement of various kinds of media, from racially conditioned architecture and transport systems to weather forecasts, produced a disaster that overwhelmed humanitarian and climatic registers. Born of the transatlantic slave trade, the seaport of New Orleans had modified the Mississippi River in a way that became a facilitating, if not causal, factor in the devastating flood. Furthermore, New Orleans is the locus of a hybrid post-slavery society, a pre-condition for the degree of damage and loss of life the city then suffered. Another example comes from the practice of deep sea mining and seabed mining. This cases makes it abundantly clear how geopolitics depend on media, a relationship which expresses itself in areas like cartography and the media of global law (like the International Seabed Authority or ISA). The exploration phase of seabed mining projects are heavily media based, involving operations like locating, sea-bottom scanning, and sampling, using technologies such as echo-sounders, side scan sonars, deep-

towed photography, remotely operated vehicles, data collection, etc. This deep involvement with media technology has a strong geopolitical impact as nations attempt to extend the parts of the seabed over which a maritime state exercises the sovereign right to explore and exploit natural resources.

Weimar, April 2018   *The Editors*

The Technological Fact of Counterfactuals

Jeffrey West Kirkwood

> *That secondly, the medium of the imaginary must be optical follows not only from the primacy of* gestalt *recognition, but also, and more elegantly, from Cartesian geometry.*[1]

IN 1946 THE PHILOSOPHER NELSON GOODMAN argued that if we lacked the »means for interpreting counterfactual conditionals« we could »hardly claim to have any adequate philosophy of science«.[2] On its face this is a troubling assertion. Intuitively, a philosophy of science is concerned with facts and the frameworks through which we understand the experimental settings that legitimize and structure those facts. In their most common construction as ›thought experiments,‹ however, which assume unobservable, impossible, or nonexistent conditions for the sake of exploring the outer limits of possible states, counterfactuals are closely tied to the materialities of experimentation from which they seem to depart. From Galileo to Werner Heisenberg, thought experiments may have worked counter-to-facts, but what made them ›experiments‹ rather than artifacts of the subjunctive case was their reliance on the standards and operations of real instruments. What is more, those instruments were historically optical technologies, defining legitimate spaces of counterfactual possibility as images.

Thought experiments have remained fixtures of philosophical and scientific reasoning since the Eleatics, but only acquired their name in an 1897 paper by the physicist, psychologist, and philosopher of science, Ernst Mach.[3] In his essay, Mach claimed that thought experiments were not only critical to the production of scientific knowledge, but that they were a »necessary *pre-condition* of physical experiments.«[4] There was, however, a seeming paradox in his insistence on the

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1 Friedrich Kittler: The World of the Symbolic—A World of the Machine, in: John Johnston (ed.): Literature, Media, Information Systems, New York 2012, p. 138.

2 Nelson Goodman: Fact, Fiction, and Forecast, Cambridge, MA 1983, p. 3.

3 Ernst Mach: Über Gedankenexperimente, in: Zeitschrift für den physikalischen und chemischen Unterricht 10 (1897), pp. 1–5. The revised and expanded version to which I refer is in Ernst Mach: Erkenntnis und Irrtum. Skizzen zur Psychologie der Forschung [EuI], Leipzig 1906, pp. 183–200.

4 Ibid., p. 187.

importance of thought experiments. Mach was deemed a »positivist«—a designation that implied an investment in empirical evidence as the be–all–end–all of the knowable world. And not only was he seen as a positivist, he was equally exalted and reviled as the high priest of positivism. Georg Lukács denounced impoverished forms of realism as »Neo–Machism,« the logical positivists of the Vienna Circle named an extension of their group the »Ernst Mach Society,« and his reputation became bound to the losing side of a debate in which he criticized Max Planck and others for granting the atom »a reality outside of thought.«[5] Mach's legacy was inseparably, if mistakenly, linked to a bloody-minded belief in direct observation as the final standard in the legitimacy of scientific claims.
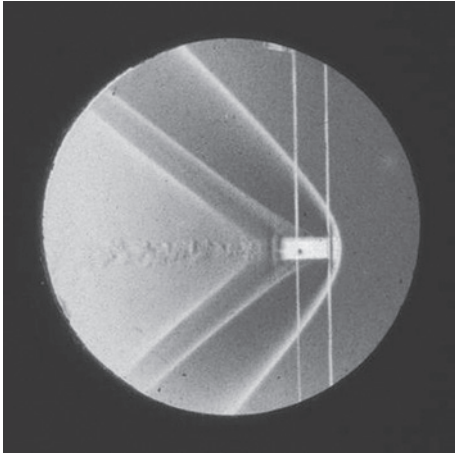

Fig. 1: Ernst Mach, supersonic projectile, Schlieren image, 1888

This is what makes his interest in thought experiments so remarkable. How could a figure who dismissed all supra-empirical concepts in physics as »mere thought-things« (EuI, p. 418) or »means of thinking«[6] also believe that in certain cases counterfactual thought experiments could be »so certain and decisive« (EuI, p. 188) that they required no further experimentation?[7] How could counterfactuals—assumptions that were definitionally outside of the realm of direct observation—be squared with the demand for empirical, and ideally optical, verification? The answer turns out not to arise despite his positivism, but because of it.

Mach is perhaps best known for the iconic photographs he made with Peter Salcher beginning in 1886 depicting shockwaves dramatically arcing from the tips of supersonic projectiles. These photographs and similar images he made later with his son Ludwig Mach received broad international attention in scientific publications well into the twentieth century and contributed to a general cultural enthusiasm about the ability of imaging technologies to reveal objects and events beyond the threshold of human perception. For Futurists like Giacomo Balla, the photographs

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5   Georg Lukács: Reportage oder Gestaltung? (1932), in: Probleme des Realismus I: Essays über Realismus. Georg Lukács Werke, vol. 4, Neuwied 1971, p. 62; Ernst Mach: Die Mechanik in ihrer Entwicklung (1883), Leipzig 1908, pp. 552f.

6   Mach: Die Mechanik in ihrer Entwicklung (as note 5), p. 552.

7   On this point Mach agrees with Pierre Duhem, who warned in his *La Théorie physique: Son objet et sa structure* (1906) against treating thought experiments as if they were physical experiments and their »*postulates* as *facts*.«

offered a visual vocabulary for articulating the extra-sensory speed of modern machinery and they have been subsequently canonized alongside the work of Eadweard Muybridge, Étienne-Jules Marey, and Arthur Mason Worthington as part of a larger revolution in vision.[8] As the apotheosis of a machine-driven technological regime that began in the second half of the nineteenth century, the photographs have been credited with »radical rearrangements of perceptual ›truths‹ made possible by machinic speeds.«[9] As such they have been historicized according to their participation in an epochal transformation in modes of seeing that rendered »invisible things visible.«[10]

On their own, however, the individual, turbid, 9mm images did not show very much. Mach commented in a January 1886 letter to Salcher that he wanted to »optically verify« the air compression at the tip of a supersonic projectile in order to test a hypothesis presented by Henri-Frédéric Melsens's, but the significance of the images was not in their visual affirmation of an object or event.[11] Prior to his work with Salcher, Mach had already made images that »visualized« both shock-waves and bullets using experimental methods similar to those they would use in 1886. The real revelation made possible by the later photographs concerned general principles governing supersonic fluid dynamics that were enabled by optics, not vision. *Seeing* the bullets was not the issue, as slow bullets were also too fast to view unaided. Positioning these photographs within an upheaval in visuality, even where its transformation was »radical,« obscures the degree to which optical tech-

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[8]   For more on this and issues related to the visual vocabulary instated by Mach, see Christoph Asendorf: Parabeln und Hyperbeln. Über die Kodierung von Kurven, in: Christoph Hoffmann and Peter Berz (eds.): Über Schall. Ernst Machs und Peter Salchers Geschoß-fotografien, Göttingen 2001, pp. 357-380; cf. Peter Weibel: Beyond Art. A Third Culture. A Comparative Study in Cultures, Art, and Science in 20th Century Austria and Hungary, Vienna 2005.

[9]   Jonathan Crary: Suspensions of Perception. Attention, Spectacle, and Modern Culture, Cambridge, MA 2001, p. 142.

[10]   Klaus Hentschel: Visual Cultures in Science and Technology. A Comparative History, New York 2014, p. 385.

[11]   Ernst Mach to Peter Salcher, Prague (January 25, 1886), republished in Hoffmann and Berz (eds.): Über Schall (as note 8), p. 21. On this see John Blackmore: Ernst Mach: His Work, Life, and Influence, Berkeley 1972. The experiments were designed to explain why two reports were often heard when high-velocity guns were fired and, relatedly, to refute Melsens's hypothesis that the crater-like wounds from French Chassepôt-bullets during the Franco-Prussian War were not caused by exploding munitions, which were illegal after the 1868 Treaty of St. Petersburg, but were instead the result of compressed air. Nearly ten years before Mach heard Melsens's presentation in Paris, the results had been published in *Sur les plaies produites par les armes a feu, sur quelques effets de la pénétration des projectiles dans divers milieux et sur l'impossibilité de la fusion des balles de plomb qui frappent les hommes ou les chevaux,* Brussels 1872.
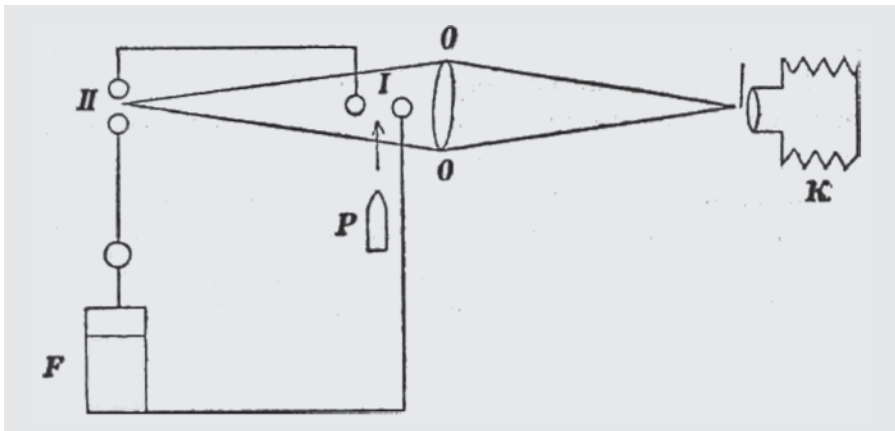
Fig. 2: Ernst Mach and Peter Salcher, Experimental diagram

nologies opened a space of modality as distinct from vision—a space concerned with the world of all possible states rather than merely observable ones.

Mach himself was never present for the execution of the experiments that yielded the initial photographs.[12] Through a mail correspondence with Mach, Salcher designed and implemented the experimental setup at the Naval Academy in Fiume in which, as the projectile passed in front of a lens that focused an image on a small silver bromide plate, it tripped wires that activated a flash battery whose spark provided the illumination. Unlike typical photographs that might depict the fluid medium as uniform or transparent, the images were made using the Schlieren method that inserted a knife-edge between the lens and the image plane, which caused differences in density to be expressed as areas of relative darkness or lightness.[13] The resulting images flattened the world into empirical abstractions that could be analyzed mathematically. They reduced the ostensible wonders of photography to an angle calculated in relation to the projectile's velocity and the speed of sound. Strictly speaking, the two-dimensional shapes that Mach used to perform a trigonometric analysis did not exist in the world. The bowed form of the shockwave propagating ahead of the bullet that would be used to derive the »Mach Angle« and the famous »Mach Number« were largely the result of an experimental photographic setting that was based on a comparison of differences between photographs, not on indexical affirmation of objects in the world. It was

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[12] Ernst Mach: Bemerkungen über wissenschaftliche Anwendung der Photographie, in: Ernst Mach: Populär-Wissenschaftliche Vorlesungen, Leipzig 1903, p. 131.

[13] Schlieren photography was developed by August Toepler, Salcher's professor at the University of Graz.
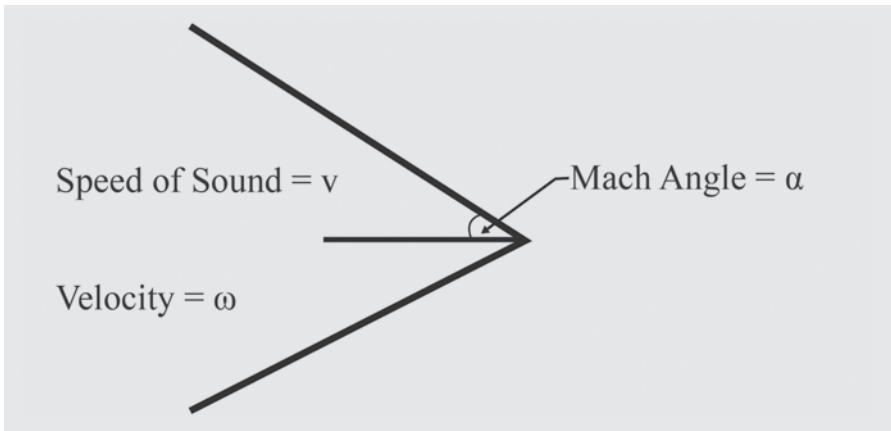
Fig. 3: Mach Angle

an artifact of an optical process whose value was less about showing what *was* (the bullet at supersonic speeds), and more about creating empirically valid conditions of abstraction for understanding what *could be.*

The empirical image-making technologies so critical to the understanding of »facts« from the seventeenth century through the nineteenth century were equally important to conceiving of states that did not or could not exist. Technologies that helped inaugurate what Lorrain Daston and Peter Galison have referred to as the »regulative« ideal of »mechanical objectivity« in the nineteenth century, in which machines seemed to »offer images uncontaminated by interpretation,« also introduced material operations that regulated the imagination of possible states.[14] Mach's contributions straddled the distinction between a »mechanical objectivity« that was wedded to impassive images and »structural objectivity,« which abandoned the conceit of representation and »empirical images« altogether.[15] Mechanical images for Mach were also structural, offering a template for conceiving of states that were not observable.

Mach's engagement with the matter of counterfactual thought experiments demonstrates that, rather than treating reality as reducible to our observations, as is so often assumed of so-called positivists, the technologies that grant images of the world offer standards for assessing the validity of states that have no objects. In general, scientific photographs exacerbated the tendency towards ontological

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[14] Lorraine Daston and Peter Galison: Objectivity, New York 2007, p. 171. Daston and Galison are unambiguous in claiming that the various notions of objectivity they detail are not about revealing »unvarnished facts,« but about eliminating »a common enemy: subjectivity,« p. 257.

[15] Ibid., p. 317.

thinking through a seduction to a belief in the power of images to reveal the existence of properties, states, or objects that would otherwise remain unseen. In this techno-progressive model, the instruments get better and the objects get more abundant. For Mach and Salcher, however, photography did not serve »as a tool for recording the ›invisible,‹« but instead offered a methodology for detecting »differences between the pictures due to adjustments in the setup.«[16] By establishing a logic of pictorial relations these images did define the real, but in such a way that it could account for modalities that had not yet and might never come into existence.

Counterfactuality emerged as an essential figure of scientific thinking alongside the proliferation of optical instruments at the end of the sixteenth and beginning of the seventeenth centuries. As the story goes, Euclid had put forth an extramission theory of vision in his *Optica*, believing that vision was the result of rays emitted from the eyes. This was only refuted by Alhazen in the eleventh century, although the appearance of objects would continue to be attributed to perpendicular rays entering the eye throughout the medieval period.[17] For all of their advances, the reception of Alhazen by perspectivists like Roger Bacon, John Peckam, and Witelo could not account for the »focusing properties of lenses,« which made the resolution of a coherent image appear on a single plane.[18] In other words, vision continued to be understood as the interaction between an object and an observer until its understanding was displaced to the study of lenses following Johannes Kepler.[19] Lenses fundamentally changed subject-object relations by relocating the principles of observation from the inherent properties of either an object or the observer to the regularities of light passing through a medium. While this may have contributed to a new theory of vision, the core insight for my purposes was not about how humans see, but about how the operations of external devices revolutionized the nature of ›observation.‹

The divergence of vision and optics based on optical technologies corresponded with the rise of counterfactual modes of scientific exploration. In one of the most famous cases, Galileo revised the longstanding Aristotelian theory of falling bodies using a thought experiment whose theoretical »optic« was closely related to the telescope. The telescope did not allow falling objects to be seen better, but instead initiated the possibility of counterfactual abstractions that privileged gen-

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[16]   Christoph Hoffmann: Representing Difference. Ernst Mach and Peter Salcher's Ballistic-photographic Experiments, in: Endeavor 33/1 (2009), pp. 21f.

[17]   Cf. David C. Lindberg: Theories of Vision from Al-Kindi to Kepler, Chicago 1976.

[18]   Ibid., p. 194.

[19]   Ibid., p. 195. Kepler's role in the various lineages stemming from Alhazen is a source of dispute. See A. Mark Smith: From Sight to Light: The Passage from Ancient to Modern Optics, Chicago 2015.

eral principles over concrete particulars. The explosion of optical instrumentation that began in the Renaissance, while often connected to a triumph in the powers of vision, is the ligature that unites the history of counterfactual exploration. This extends from Galileo to Mach's various meditations on thought experiments, which themselves borrowed heavily from the logic of his photographic experiments on ballistics. For Mach, the mental images that got arranged and recombined to explore counterfactual modalities were »images of the facts [*Abbilder der Tatsachen*]« in the sense of mechanical copies, invoking the language of his photographic experiments as a template for drawing the contours of the knowable, but perhaps not yet extant world (EuI, p. 187).

In the early twentieth century, the nature of the image would also become a shibboleth for a distinctly modern commitment to a probabilistic, »structural,« and anti-positivistic »*Weltbild*« that placed Mach at odds with the winning side of theoretical physics. While Max Planck and others critical of Mach spoke actively of the need for a unifying »world picture,« it was no longer a picture based on optics, which created imaginary, geometric spaces of possibility linked to the production of two-dimensional images. Planck's world picture was radically anti-imagistic, even while it appropriated the concepts of optics to account for its own understanding of possibility, modality, and contingency. In this way, it seems that Mach's commitments to images may not have been so wrong, recognizing at some level that notions of counterfactuality were historically inseparable from the optical technologies that propelled them.

1. From Vision to Optics

What Galileo's telescope enforced was not an enhanced supremacy of the human powers of observation as one of many »visual prostheses,« but a necessity for leaving the confines of empirical observation, precisely through empirical instrumentation.[20] Hans Blumenberg deals with this beautifully when he notes the Galilean telescope's impact on the »reversal of the postulate of visibility.«[21] The revelation of four of Jupiter's moons, additional stars in the Pleiades, and the general expansion of the field of observable celestial objects did as much to underscore the limitations of visibility as it did to magnify the powers of vision. Optical instruments in this outlook had the effect of undermining faith in the powers of vision for capturing the real, which fled farther away from the searchlight of our gaze with each revela-

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[20] Paul Virilio: The Vision Machine, translated by Julie Rose, Bloomington 1994, p. 4.
[21] Hans Blumenberg: The Genesis of the Copernican World, translated by Robert M. Wallace, Cambridge, MA 1987, p. 621.

tion. With the disappointments of vision, however, came expanded fields of optical possibility informed by geometries that no one could witness.

In one of the most discussed thought experiments from his *Discorsi* (1638), Galileo is credited with decisively upending Aristotelian mechanics, »without further experiment«—that is, through counterfactual thought experiment.[22] The Aristotelian dogma that heavy bodies fall faster than lighter ones, as found in the *Physics*, against contemporary intuitions, was actually »based on sense-perception« and was »decidedly ›non-mathematical.‹«[23] In this view, the appearance of motion was a process of change in the *object* itself rather than the more abstract notion of a change in the relative position of bodies with respect to one another. As Alexandre Koyré commented, »Aristotelian physics does not admit the right, or even the possibility, of identifying the concrete world-space of its well ordered and finite Cosmos with the ›space‹ of geometry,« and it is therefore »impossible to try to subject these different realms to the same laws—and perhaps especially—to the same laws of motion.«[24] Common sense »is—as it always was—medieval and Aristotelian.«[25] This means that the conditions necessary for the revised Galilean vision of space and movement must be attributed to artificial, even counterintuitive presuppositions that forced one out of the realm of common sense.

Galileo's attack on the standing Aristotelian framework required a counterfactual imaginary. The telescope, with its simple arrangement of a convex and a concave lens in a tube, was the vehicle for just such an imaginary precisely because it erased »the coordinates of natural vision, the natural view, the natural eye.«[26] This was confirmed in a letter to his sister's husband, Benedetto Landucci, in his report to the Doge of Venice in the summer of 1609, in which he wrote that his new instrument was built upon the »most recondite speculations in perspective.«[27]

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[22] Galileo Galilei: Dialogues Concerning Two New Sciences, translated by Henry Crew and Alfonso de Salvio, New York 2010, p. 62.

[23] Alexandre Koyré: Metaphysics and Measurement, translated by R.E.W. Madison, Langhorne, PA 1992, p. 5. Perhaps the best description of »natural« motion occurs in Book 8, Part 4 of Aristotle's *Physics*.

[24] Koyré: Metaphysics and Measurement (as note 23), p. 6.

[25] Ibid., p. 5.

[26] Joseph Vogl: Becoming-media: Galileo's Telescope, translated by Brian Hanrahan, in: Grey Room 29 (Winter 2008), pp. 17f. For a more complete history of the politics and discourse surrounding the development and circulation of early telescopes see Massimo Bucciantini, Michele Camerota, and Franco Giudice: Galileo's Telescope: A European Story, translated by Catherine Bolton, Turin 2015; Mario Biagioli: Galileo's Instrument of Credit: Telescopes, Images, Secrecy, Chicago 2006.
Galileo Galilei: Opere di Galileo Galilei, vol. 2, Milan 1832, p. 126. The larger context for this incredible comment is discussed in Eileen Reeves: Galileo's Glassworks: The Telescope and the Mirror, Cambridge, UK 2008.

[27] Galilei: Opere di Galileo Galilei (as note 26), p. 126.

The telescope was not so much an instrument of vision as a perspective constructed by an artificial apparatus (»*artifizio*«) that defied rather than supported natural vision.[28] Moreover, it was based on speculations (»*recondite speculazioni*«), and was therefore not a mere re-presentation of the world in its present state, but in all of its possibility.[29]

In *De Motu*, the early manuscripts on motion he began writing around 1590, there is no »discussion of uniform motion […] or related topics« that get elaborated in his later work and which represented the coup against Aristotle.[30] Despite already conducting physical experiments with inclined planes in 1591, and attacking the Aristotelian position on motion, *De Motu* »generally adheres to Aristotelian explanatory principles,« such as the tendency of bodies to seek out their »natural« place.[31] A counterfactual expression of what was already right in front of him was only articulated after his 1610 *Sidereus Nuncius* documenting his observations with the telescope, but it was not on account of more exhaustive physical experimentation.[32] The »*thought experiment*« from which the radically divergent concept of space-time emerged, as Jacques Lacan noted of Huygens and the isochronic clock, was »a hypothesis embodied in an instrument.«[33] Consequently, »if the instrument is constructed to confirm the hypothesis, there is no need whatever to do the experiments which confirms it, since the very fact that it works confirms the hypothesis.«[34] The reciprocal dependence between the material operations of medium and the symbolic realm of theory that made sense of those operations delimited spaces of possibility and actuality, but in such a way that they were ultimately inseparable. Everything that could exist could also signify. But a state's ability to signify (and thus be imagined) did not necessarily mean that it existed, just that it accorded with and could be made sense of with the instrumentation.

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[28] Ibid., p. 126.

[29] Ibid.

[30] Stillman Drake: Essays on Galileo and the History and Philosophy of Science, vol. 1, Toronto 1999, p. 213.

[31] David Marshall Miller: Representing Space in the Scientific Revolution, Cambridge, UK 2014, p. 11. See also W.C. Humphreys: Galileo, Falling Bodies and Inclined Planes. An Attempt at Reconstructing Galileo's Discovery of the Law of Squares, in: The British Society for the History of Science 3/3 (June 1967), pp. 225-244.

[32] Stillman Drake: Galileo at Work. His Scientific Biography, Mineola, NY 1978, p. 55; Galileo Galilei: Sidereus Nuncius, Venice 1610, translated by Albert Van Helden, Chicago 1981.

[33] Jacques Lacan: Seminar of Jacques Lacan, Book II: The Ego in Freud's Theory and in the Technique of Psychoanalysis, 1954–1955, translated by Jacques-Alain Miller, New York 1988, p. 298.

[34] Ibid.

For Galileo as for Mach 250 years later, the transition from facts to counterfactuals was built upon the move from *real* bodies and dynamic analysis to abstract geometries and kinematic analysis that emphasized an idealized set of spatial relationships. This had a number of ramifications, the first of which was that it privileged possible states over existing ones. And secondly, it constituted those relationships as images. The turn to kinematic analysis, concerned with pure geometries of motion, seems to reappear wherever the epistemic boundary between the actual and the possible reasserts itself. Possibility was a picture, which created a pressure to broaden the epistemic scope of images to encompass states that could be judged true without being seen. In his philosophical-historical examination of the relationship between the possible and the actual, Ernst Cassirer built a bridge from Galileo to Mach regarding exactly this question:

»Even in this plurality of possible starting-points, it is evident that the ›picture‹ [*Bild*] that we form of the reality of nature is not dependent on the data of sense perception alone, but upon the intellectual views and postulates that we bring to it […] It is the task of physical investigation to advance from these sensuous measures, which are satisfactory for practical purposes, to the *realities* indicated and expressed through them.«[35]

He continues, specifically addressing what he takes to be Mach's ideas about the relationship between laws and observation:

»In this solution to the problem offered by Mach, the consequences of the empiristic view is drawn with great energy. According to this view, every scientifically valid judgment gains its meaning only as an assertion concerning a concrete, factually present existence. […] The fundamental theoretical laws of physics throughout speak of cases that are never given in experience, nor can be given in it; for in the formula of the law the real object of perception is replaced by its ideal limit. The insight gained through them never issues from consideration of the real alone, but from the possible conditions and circumstances; it includes not only the actual, but also the ›virtual‹ process. […] Galileo, at least, leaves no doubt that the principle [of inertia], in the sense that he takes it, has not arisen from the consideration of a particular class of empirically real movements.«[36]

Cassirer powerfully acknowledges that the empirically observable and the possible are inseparable from a pictorial mode of reasoning, but he seems to misrecognize the nature of Mach's positivistic leanings. Placing »picture« in quotation marks,

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[35] Ernst Cassirer: Substance and Function and Einstein's Relativity, translated by William Curtis Swabey and Marie Collins Swabey, Mineola, NY 2015, pp. 170f.

[36] Ibid., pp. 230–231, 232.

Cassirer points to the fact that the vision one achieves through kinematic analysis is not of actual movements. But nevertheless the principles at work are constituted pictorially and, as Ernst Mach himself notes of the route Galileo took to »fully grasp the law of inertia,« he arrived at his position through »abstraction.«[37]

This view onto the evolution of thought experiments links them rather closely to the history of linear perspective. Like other images, the »reality« of counterfactual thought experiments has been judged according to historically specific conditions of verisimilitude. Thomas Kuhn writes, »the new understanding produced by thought experiments is not an understanding of *nature* but rather of the scientist's *conceptual apparatus*« involving »one condition of verisimilitude.«[38] What is realistic (as opposed to »real«) in science, as in art, is not so much a matter of what the world looks like, as it is of how instruments allow the world to become seen. Similarly, what the world *could* look like is a function of the possibilities for depicting it. The question of an image's veracity is largely one of perspective.

Not only was the geometric function of Galileo's telescope »essentially based on the same Euclidean optical model as Alberti's perspective,« but the standards for the judgment of beauty and knowledge were equally governed by optical instruments.[39] Devices, both real and heuristic, including Leon Battista Alberti's *fenestra aperta*, the *camera obscura*, Dürer's perspective apparatuses, peepholes, and Brunelleschi's mirror, have been credited with initiating and governing the explosion of linear perspective in the *Quattrocento* by mathematically regulating the organization of pictorial space. As just one example, Friedrich Kittler argues that the »*camera obscura* made the revolutionary concept of a perfect perspective« painting possible« by calculating »trigonometrical functions completely automatically, simply because it focused light into a single bundle of straight lines and then allowed them to follow their course.«[40] Likewise, the »trigonometrical functions« revealed

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37 Ernst Mach: Der Begriff, in: Mach: Erkenntnis und Irrtum (as note 3), p. 138.

38 Thomas Kuhn: A Function for Thought Experiments, in: The Essential Tension. Selected Studies in Scientific Tradition and Change, Chicago 1977, p. 242.

39 Samuel Y. Edgerton: The Mirror, the Window, and the Telescope. How Renaissance Linear Perspective Changed Our Vision of the Universe, Ithaca 2009, p. 9. Martin Kemp argues that Galileo's interpretation of what he saw in his »perspective tube« (telescope) was structured by his familiarity with visual analysis and Renaissance treatises on perspective in addition to his training in perspective by Ostilio Ricci, cf. Martin Kemp: Seen/Unseen. Art, Science, and Intuition from Leonardo to the Hubble Telescope, Oxford 2006. Samuel Edgerton also notes Galileo's familiarity with perspective literature like Wenzel Jamnitzer's *Perspectiva corporum regularum* (Nuremburg 1568). See Samuel Edgerton: Galileo, Florentine »Disegno,« and the »Strange Spottednesse« of the Moon, in: Art Journal 44/3 (Autumn 1984), pp. 225-232.

40 Friedrich Kittler: Optical Media. Berlin Lectures 1999, translated by Anthony Enns, Cambridge, UK 2010, p. 52.

through Mach and Salcher's Schlieren photographs, not the supposed indexical properties of those images, were what would define the realities of fluid dynamics.

The properties of individual objects that lead the human observer to treat them as distinct and autonomous were therefore submitted to a higher representational force—that of light as projected on a two-dimensional plane by an optical device. Objects were no longer depicted in their idiosyncratic relations to other autonomous objects. They emerged as coordinates in »an infinite, mathematically homogenous space« that manufactured a pictorial and representational unity in which objects appeared.[41] The totalizing force of abstraction put into action with linear perspective negated the real, empirical differences between objects as pre-constituted entities, supplanting them with an infinite number of coordinates on a seemingly infinite grid. But this also meant that the truth conditions and standards of verisimilitude no longer hinged exclusively on the details of empirical observation, something that would be even more fully realized at the end of the nineteenth century.

2. Ernst Mach: Learning Not to See

Prior to Mach and Salcher's ballistics photographs, Mach had produced images of all of the objects and events that their images were celebrated for depicting—both bullets and shockwaves. Beginning in 1875 he undertook a series of experiments on shockwaves, theorizing their irregular interference patterns recorded on soot covered glass plates as what are now called »Mach reflections.«[42] Similarly, in 1885 he and his student Josef Wentzel also recorded the propagation of shockwaves photographically using the Schlieren method.[43] Mach had thus already achieved »very delicate pictures« of shock waves and a »picture of a projectile« from a »target pistol« with a velocity of around 240 m/s »without any difficulties.«[44] However, it became clear to him that the phenomena in which he was interested could only appear with a »projectile speed exceeding 340 m/s.«[45] It may be »less spectacular«

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[41] John White: The Birth and Rebirth of Pictorial Space, Cambridge, MA 1987, p. 124. For more on differences between competing methodologies in the history of geometric perspective see Filippo Camerota: Renaissance Descriptive Geometry. The Codification of Drawing Methods, in: Wolfgang Lefevre (ed.): Picturing Machines 1400-1700, Cambridge, MA 2004, pp. 175-208.

[42] Ernst Mach and Josef Wentzel: Ein Beitrag zur Mechanik der Explosionen, in: Sitzungsberichte der Kaiserlichen Akademie der Wissenschaft zu Wien 92 (1885), pp. 625-638.

[43] Ibid.

[44] Ernst Mach: Über Erscheinungen an fliegenden Projektilen, in: Ernst Mach: Populär-Wissenschaftliche Vorlesungen, Leipzig 1903, p. 359.

[45] Ibid.

than the idea of visualizing something too fast to catch a glimpse of unaided, but the more important result of the photographs was the »observation that the speed of sound is a fundamental threshold for all dynamical processes in gases,« and that the relative values of these processes could be understood geometrically.[46]

The early miniature photographs did not offer a gateway into a realm of things hitherto unseen.[47] The high-speed photographs optically transformed the projectile's triggering of the flash battery and passing of the lens into a series of relationships that could only be understood trigonometrically, that is to say, as relationships between idealized shapes.[48] As a projectile approaches and exceeds the speed of sound a shockwave forms in a cone shape extending from the head of the object out and towards its rear. From his previous work on blast waves, acoustics, and owing to his familiarity with the Schlieren method, Mach was able to recognize the form as a shockwave rather than the compressed air mass suggested by the Belgian physicist and chemist Louis Melsens. However, an individual photograph was not sufficient on its own to produce a scientific ground shift. The photographs had to be idealized and compared.

The lasting impacts of these images was the formalization of a series of relationships between the speed of sound, which is relative to the elasticity of the medium through which it travels, the velocity of the projectile, and the angle of the shockwave relative to the imagined flight path of the projectile. Mach expressed this relationship using the equation $\sin \alpha = v/\omega$ where α was the angle of the shockwave relative to the axis of the flight path, v was the speed of sound in a given medium, and ω stood for the velocity of the projectile.[49] Unlike the tendency to understand these photographs as showing us some *thing* (a bullet or a shockwave), what they really show us is a relationship brought about through optics.

With the help of a Leeson double refraction goniometer, a device employing a prism to measure angles often used in the assessment of gemstones, Mach measured the difference in the angles of the shockwaves.[50] While one could claim that these relationships exist in nature, they do not exist as a trigonometric function, which requires the optical abstraction instituted by the Schlieren apparatus. Strictly

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[46]   Christoph Hoffmann: The Pocket Schedule: Note-Taking as a Research Technique. Ernst Mach's Ballistic-Photographic Experiments, in: Frederic L. Holmes, Jürgen Renn, and Hans-Jörg Rheinberger (eds.): Reworking the Bench: Research Notebooks in the History of Science, Dordrecht 2003, p. 183.

[47]   Hoffmann: Representing Difference (as note 16), p. 18.

[48]   Ernst Mach and Peter Salcher. Photographische Fixirung der durch Projectile in der Luft eingeleiteten Vorgänge, in: Sitzungsberichte der Kaiserlichen Akademie der Wissenschaft zu Wien 95 (April 21, 1887), pp. 277-291.

[49]   Ibid., p. 282.

[50]   Ibid., pp. 284f.

speaking, *there is no Mach Angle*. It is an effect of a two-dimensional rendering of density differences that are transformed into simple geometries that are then compared among multiple images. There is no doubt that the images showed something that could not be seen, but their main effect was also bound to something that was not shown. The geometries governing the actual and the possible emerged from interstices between images to define the real.

One experimental image on its own is not a picture of the world. As Christoph Hoffmann notes, a single image did not »provide the central insight.«[51] The technological implements of ›positivist‹ experimentation in the case of Mach did not amass facts in the hopes of building a world model to scale. They were difference engines—producing distinctions between the images themselves, the images and what was observed, and between what was depicted and what was assumed. As he argued in his essay on thought experiments, it was only through the »reproduction of facts« [*Nachbildung der Tatsachen*] (EuI, p. 187) that an order could be established among individual images that could define, but should not to be confused with, the world itself.[52] Image machines systemized differences such that proof was a process of reproduction, using the gaps between images as the quantifiable measure of the real. These were images that disaggregated objects into an endless series of differences. In this way the »bullet frozen in the moment of the experiment is a knot in the network of a wild metonymy« that is tamed, consolidated, and distributed »among experimentally relative hybridities.«[53] In one of several reflections on the function of photography in scientific experiments Mach recognized the optical displacement of the truth conditions from objects to continuities of shape:

»If we have collected a great quantity of physical observational data such that we have nevertheless exhausted them with the conception [*Anschauung*] taken from direct sensation, such data must remain bound to those points. How great by contrast is the abundance, the breadth, the concentration of the conception, when we depict [*darstellen*] the totality of the observational data through a diagram [*Kurve*]! And how greatly the intellectual use is facilitated. Registering apparatuses and registering methods are used in physics, in meteorology, indeed in all natural sciences and in this way photography finds its many applications.«[54]

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51 Hoffmann: Representing Difference (as note 16), p. 22.
52 Mach frequently played on the term »image« (*Bild*) when thinking about evidence and experimentation. The term »*Nachbildung*« here frames reproduction as a process for creating an »after« (*nach*) »image« (*Bild*).
53 Anselm Haverkamp: Chaos by Design. The Light-Sound Constellation, in: MLN 118/3 (2003), pp. 688–703: 699.
54 Mach: Bemerkungen über wissenschaftliche Anwendung der Photographie (as note 12), p. 131.

The German »*Kurve*« captures something more than just »diagram« or »graph« in that it also means »curve«—the word Mach uses to describe the shock arc visible in his projectile photographs. The graph or line becomes a metonymic expression of the sum relations among the points and likewise delimits areas or directions of infinite possibility in the interstices between those points. For Mach, photographs did not magnify, fix, or copy objects in space-time, but participated in the construction of space-time itself. The emergence of objects against the seemingly stable background of their measure was actually a part of the definition of that background as determined by the experimental order. Any sense of potentiality, contingency, or modality was thus tied at a deep level to operations of the optical and mechanical devices that established a space within which ›things‹ emerged.

By the time that Mach first visited Salcher in Fiume in April of 1887, the experimental arrangement responsible for the first photos had already been disassembled.[55] What remained of the initial events were pictures—pictures that had been fully divorced from a fantasy of verification through reference or correspondence. If one can speak of objects at all in such a situation, the objects were the photographs themselves, although their meaning resided between rather than within their frames. Mach explicitly locates difference as the engine that drives scientific discovery and the principle that allows one to move between factuality, theory, and possibility. »For a theory,« he writes, »always puts in the place of a fact something *different*, something more simple, which is qualified to represent it in some *certain* aspect, but for the very reason that it is different does *not* represent it in other aspects.«[56] This is anything but a reductionistic theory of science, offering a dynamic epistemology of permanently shifting relationships that sees facts as generative rather than conclusive. Moreover, his truth model is an optical one, taking explicit cues from the relationships between geometry and optics:

»No one will seriously imagine for a moment that a real circle with angles and sines actually performs functions in the refraction of light. Everyone, on the contrary, regards the formula $\sin\alpha/\sin\beta=n$ as a kind of geometrical model that *imitates in form* the refraction of light and *takes its place* in our mind.«[57]

The same trigonometric devices made possible by the materialities of high-speed photography are separate from the »real« they define, even as they are treated as having been derived from it. In this optokinetic understanding of the approxima-

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55 Christoph Hoffmann and Peter Berz: Mach/ Salchers Versuch: Anordnung, Durchführung, in: Hoffmann and Berz (eds.): Über Schall (as note 8), p. 23.

56 Ernst Mach: Facts and Mental Symbols, in: The Monist 2/2 (January, 1892), p. 201.

57 Ibid., pp. 201–202.

tions of mind that offer conceptual and intellectual continuities where there would otherwise be an infinite series of possible points, theoretical sense is derived from the relationship that optical instruments bear to the perfect shapes of geometry.[58] The difference between the image and what it was presumed to depict were insuperable. The regularities that allowed one to move from the discrete points of empirical observation to a smooth picture of the world could only be found in the operations of the optical media through which pictures of the world came into focus.

3. Optical versus Statistical Pictures

Among the many things for which Ernst Mach is famous, one of the most notable was his role in an acrimonious standoff with Max Planck between 1908 and 1911.[59] Mach was vehemently criticized by Planck and others for being a positivist, an epithet as nebulous as it was derogatory. The term was intended to characterize the position of Mach and his sympathizers as a retrograde movement against the tide of theoretical physics around 1900, which no longer relied on ›appearances‹ for the verification of things like atoms.[60] At its core, the contest between the worldviews represented by Planck and Mach was one about the nature of pictures as the essential mark of epistemological legitimacy. For Planck it would be a »*Weltbild*« (world picture) where, as we have seen, for Mach it was the arrangement of »*Abbilder*« (images in the sense of mechanical copies).

The first exchange in the volley, issued by Planck in his 1908 lecture in Leiden, entitled *The Unity of the Physical World Picture* (*Die Einheit des physikalischen Weltbildes*), highlights the stakes of this clash about the physical world as pictorial in nature.[61] Planck took aim at Mach and precisely on the matter of the image's function

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58   Kittler too associates this optokinetic thinking with the episteme around 1900 and relates it particularly to Edmund Husserl's phenomenology in Friedrich Kittler: Aufschreibesysteme 1800/1900, Munich ³1995, p. 283.

59   John Blackmore offers a comprehensive view of the exchanges between Mach, Planck, and Einstein in John Blackmore: Ernst Mach Leaves »The Church of Physics,« in: The British Journal for the Philosophy of Science 40/4 (December 1989), pp. 519-540.

60   Einstein was deeply influenced by Mach's 1883 *Mechanik* and in his obituary for Mach in 1916 he wrote »Mach clearly recognized the weak sides of classical mechanics and was not far from postulating a general theory of relativity; and already a half century in advance!« Albert Einstein: Ernst Mach, in: Physikalische Zeitschrift 17/7 (1916), pp. 101-104: 103.

61   Max Planck: The Unity of the Physical World Picture – Section 4 (1908/1909), in: John Blackmore (ed.): Ernst Mach—A Deeper Look: Documents and New Perspectives, Dordrecht 1992, pp. 127-132.

for defining scientific knowledge. In place of the images that had defined the positivistic worldview, theoretical physics offered »nothing other than *unity*, unity in reference to all individual parts of the picture« that could only be achieved by embracing a »physical world picture« that allowed physicists to make »conclusions going *beyond direct observation* which can *never be tested by human observation*.«[62] Here Planck identified an internal distinction between two kinds of picture—one that was a mathematical model whose legitimacy rested on its internal coherence defining both the actual and the possible, and the other an empirical image, defining only the actual.

Planck then exaggerated Mach's epistemology into a kind of naïve realism, in which »there are no other realities than one's own perceptions.«[63] This relegated Mach to an impoverished form of empiricism. »Machian positivism,« as Planck describes, was the »philosophical result« of an »unavoidable disillusionment« with the coupling of »the discovery of the energy principle« and a »mechanistic world view.«[64] This acted as a counterpoint to the eruption of statistics, which made the potential position and momentum of atoms and electrons something that it was not just unnecessary to organize and imagine geometrically, but *impossible* to visualize. This was an epochal conflict that would be indirectly theorized soon after by Martin Heidegger in his essay *Die Zeit des Weltbildes* (*The Age of the World Picture*).[65] The modern age, as he argued, is distinguished from the medieval period through the »projection« (*Entwurf*) of a »circumscribed object-sphere« (*umgrenzter Gegenstandsbezirk*) in which everything that is—everything that is *objec*tive—stands in a systematic relation to everything else; it is framed, as a picture.[66] The totality of these existing and possible relationships, which define human's difference from and view onto the world for the first time *as subjects*, is a »worldview« or »view onto the world« (*Weltanschauung*). The *Weltanschauung* is a picture (*Bild*), not in the sense of »replica« (*Abklatsch*) or copy, but instead the »world itself, the world as such,« the world as a single realm, adhering to universal rules by which objects emerge as part of a coherent system that allows them to be »grasped.«[67] It is the fact of the world becoming an image that makes way for this development.

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62   Ibid., p. 128 [Emphasis mine].
63   Ibid., p. 129.
64   Ibid., p. 130.
65   Martin Heidegger: Die Zeit des Weltbildes (1938), in: Martin Heidegger: Holzwege. Gesamtausgabe, vol. 5, Frankfurt am Main 1977, pp. 75-96; Martin Heidegger: The Age of the World Picture, translated by William Lovitt, in: Martin Heidegger: The Question Concerning Technology and Other Essays, New York 1980, pp. 115-154.
66   Ibid., p. 83.
67   Ibid., p. 89.

That is to say, it is the principles of optics that forced the world of splendid, irreconcilable textures into a single perspectival relationship that could be called objective.

This same reasoning informs Planck's idea of the »*Weltbild,*« even though or precisely because the objects and phenomena his conception is meant to validate *cannot be seen*. For Planck »the Real« that was the object of his statistical world picture was entirely independent of the possibility for being visualized.[68] Yet the issue for Mach was also not about seeing or sensing. It was a resistance to the hypostatization of objects, all of which were provisional. For Mach »there is no immutable thing [*Ding*] in nature.«[69] A »thing« is rather »an abstraction, the name of which is a symbol for a complex of elements, whose changes we disregard.«[70] Mach's positivism was not *object*ive. Objects were temporary constellations composed of material processes not essentially different from those according to which they were registered. For Mach truth resided in the picture one composed, even where such a picture depicted no existing objects. The stabilizing principle that allowed him to associate one observed event with similar observed events required the »reproduction of facts.«[71] This is underscored by the fact that Mach uses undeniably similar language to describe counterfactuals, calling them »copies of the facts [*Abbilder der Tatsachen*],« (EuI, p. 187) suggesting that facts and counterfactuals derived equally from the operations of the instruments that (re)produced them.

Planck's world picture of »colorless particles« did not have a perspective, as it required no observer and no »lens,« optical or otherwise.[72] This was a »perversity [*Verkehrtheit*]« for Mach, as it was both probabilistic and simultaneously invested in the existence of »hypothetico–fictive« entities on which the tentative coherence of its mathematical model depended.[73] While Mach claimed that »no one has any objection« to these provisional, »unifying systems in physics« he could also not »deny [his] aversion to hypothetico–fictive physics.«[74] Part of the confusion in interpreting Mach's well-developed epistemology is that his opposition to the ob-

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68   Planck: The Unity of the Physical World Picture (as note 61), p. 131.
69   Mach: Die Mechanik in ihrer Entwicklung (as note 5), p. 473.
70   Ibid.
71   Ibid., p. 474.
72   Ernst Mach: Die Leitgedanken meiner naturwissenschaftlichen Erkenntnislehre und ihre Aufnahme durch die Zeitgenossen, in: Physikalische Zeitschrift 11 (1910), pp. 599–606: 602. The partial English translation of this article and Planck's response on Mach's theory of physical knowledge can be found in Blackmore (ed.): Ernst Mach Leaves »The Church of Physics« (as note 59), pp. 133–146.
73   Mach: Die Leitgedanken meiner naturwissenschaftlichen Erkenntnislehre (as note 72), p. 602.
74   Ibid.

jects of Planck's objectivity was received as an expectation that one be able to see them as a condition of their existence.[75]

The new epistemological regime Mach rejected was a statistical one. Planck's reception of the work of J.W. Gibbs and Ludwig Boltzmann in statistical mechanics and thermodynamics was methodologically at odds with Mach's commitment to kinematic analysis. Where the behaviors of mechanical systems in kinematics were evaluated as idealized geometries—and thus tied to the evolution of optical devices—in statistical mechanics the state of a system was calculated probabilistically based on the measure of energy and temperature. At the same time, the probability of a certain state did assume the actual *existence* of individual atoms, which in the nineteenth and early twentieth century still could not be observed. In other words, one could not say for certain that a specific state was the case (something Mach could accept), but nevertheless required that one believe that unobservable entities existed (something Mach could not accept).

This was especially evident in Mach's vigorous and eventually reputation-damaging opposition to the atom. Where Mach seems to diverge from the vogue of early twentieth century physics is in the belief that a reality based on atoms, which categorically excluded certainty with respect to objects, could nevertheless demand that one affirm the existence of those objects. Clarifying his position as one that is anything but that of a naïve realist he wrote:

»I can only say that my ›Positivism‹ has not been rightly judged if it is viewed as a reaction to the failures of atomistic speculation. Even if the kinetic physical world picture, which in any case I consider hypothetical without intending thereby to degrade it, could ›explain‹ *all* physical appearances, I would still hold that the diversity of the world has not been exhausted…«[76]

Mach and Planck were in fact closer to one another in their *Weltbild* than either admitted publically, which is perhaps why Einstein commented in a letter to Mach with a somewhat elegiac regard for an old master:

»You have had such an influence on the epistemological views of the younger generation of physicists that even your current opponents, such as, e.g., Herr Planck, would un-

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[75] Paul Feyerabend for example defends Mach from mischaracterizations of his epistemology in the »transition from a critical *philosophy* to a *sense-data dogmatism*,« remarking that »Mach was either not read at all or read with little care.« Paul K. Feyerabend: Knowledge, Science and Relativism. Philosophical Papers, vol. 3, edited by John Preston, Cambridge, UK 1999, p. 133.

[76] Mach: Die Leitgedanken meiner naturwissenschaftlichen Erkenntnislehre (as note 72), p. 605.

doubtedly have been declared to be ›Machists‹ by the kind of physicists that prevailed a few decades ago.«[77]

The ostensible source of friction was the nature of the image each understood as defining the *Weltbild*. That is, the technologically informed structures according to which an image could be understood as defining both the actual and the possible—the factual and counterfactual. This was the point at which possibility became probability instead of geometry. And it was here that the ›world picture‹ was divorced with finality from the technological regimes imposed by optical technologies.

Picture Credits:

Fig. 1. Ernst Mach, supersonic projectile, Schlieren image, 1888.

Fig. 2. Ernst Mach and Peter Salcher, Experimental diagram, in: Photographische Fixirung der durch Projectile in der Luft eingeleiteten Vorgänge, in: Sitzungsberichte der Kaiserlichen Akademie der Wissenschaft zu Wien, vol. 95 (April 21, 1887).

Fig. 3. Mach Angle

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[77] Cited from a letter from Einstein to Mach on August 9, 1909, cf. Don Howard: Point Coincidences and Pointer Coincidences. Einstein on the Invariant Content of Space-Time Theories, in: Hubert Goenner, Jürgen Renn, Jim Ritter and Tilman Sauer (eds.): The Expanding Worlds of General Relativity, Boston/Basel/Berlin 1999, pp. 463–500: 474.

Parallel Editing, Double Time

Mad Men's Time Machine

Elisabeth Bronfen

In order to discuss the intricate play with temporality at work in the prestige TV series Mad Men (USA, 2007-2015, Matthew Weiner), it is first worth recalling that Matthew Weiner garnered much critical praise for what was an apparently pitch perfect reconstruction of a particular historical moment: the decade that began with the bid for the presidency on the part of J. F. Kennedy and that ended with the Coca-Cola hilltop advertisement, marking the end of counter culture and its appropriation by mass market commercialism. Much research and loving care went into the recreation of the sets, costumes, objects, books, movies, and TV shows within the show, as well as the choice of music, the latter of which often serves as a commentary on the film narrative. This obsession with historic verisimilitude led critics and viewers alike to compare Mad Men to a time machine, upon which Weiner asked us to join him on a nostalgic journey into the past. Indeed, the 1960s, the decade in which he was born, were supposed to be resuscitated on the TV screen not only for an audience that had lived through this watershed cultural moment but also for an audience born later, which knows of this period only through precisely the representations cited and recycled in Mad Men itself. At the same time, it was always clear that, insofar as Weiner is taking us back into the American past, he is doing so through the lens of cultural concerns of the early 21st century. As with all historical re-imaginations for the screen, we are thus dealing with a double time. While the actors and actresses (particularly in their appearance, gestures, and in the way they deliver their lines) draw our attention to the contemporary moment when the prestige TV drama was filmed and aired, the world referenced by Mad Men's overall narration as well as the individual storylines brings into focus a different historical time.

This double vision raises two important issues. Firstly, the past events invoked—from the election of John F. Kennedy (in the first season) to the moon landing (in the last) —had specific political, social and cultural consequences and, given that we are called upon to revisit these events through media images that have subsequently been recycled, refigured and remediated, we are aware that ours is a belated gaze. Indeed, we (which is to say the culturally informed viewers) are meant to take these well known representations and mediations of the past as our point

of reference. We are meant to note how Weiner has chosen to deploy them in his attempt to *look back at* the past and to *look into* this particular moment in American history. While the individual characters we come to empathize with over seven seasons—Don Draper and his family, as well as the men and women who work with him at the advertisement agency Sterling, Cooper, Draper & Price—do not know how their lives or how the political and social changes that so profoundly impact them will develop, we, the spectators, do know what the outcomes of the civil rights movement, the war in southeast Asia and, indeed, Madison Avenue advertisement were and what their impact in the following decades will have been.

The double vision at issue in Weiner's re-imagination of this historical period consists, then, in the following: we are engaging with these personal stories in retrospect. Even though we are seeing the world through the eyes of fictional characters, we are also viewing it through our own vision of the present and the way it relates to this past. One of the issues of temporality that MAD MEN thus raises is that there is no direct, unmediated gaze back into history. As is the case for all historical re-imaginations of the past on screen, we are, instead, compelled to ask ourselves: why are we concerned with this particular period again, today? How has it influenced us? What similarities can we discern between the past and present? And what differences emerge as we embark on revisiting the past? In other words, the time travel Weiner takes us on is also a voyage of return to the present. So it is a question not only of what is rendered visible and comprehensible, perhaps for the first time, once we look back at the past retrospectively, which is to say through the lens of the consequences we know it to have had. Rather, at issue is also what we can learn from the past for the present and about the present through the past. What do we come to realize about ourselves, and the world we live in today, once we look at a moment in recent history which we know to have been a cultural turning point, and one that, to boot, continues to haunt and affect us? What comes into focus once we return to a world initially dominated by a hegemony that is white, male, upper bourgeois? And how do we re-evaluate the shift that occurred in the course of the 1960s for a far more diverse public sphere, with all the contradictions and complexities this change has brought with it? What does MAD MEN remember and what does it forget? What does it uncover, what does it relegate back into invisibility and illegibility? What legacy is at issue here?[1]

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1   For a discussion of MAD MEN and the American cultural imaginary, see Elisabeth Bronfen: Mad Men, Death and the American Dream, Berlin/Zürich 2016, as well as M. Keith Booker and Bob Batchelor: Mad Men. A Cultural History, Lantham/Boulder/New York/London 2017.

Alternative Endings

Double time, however, concerns not only the question of how to re-imagine history on screen, but it also concerns Weiner's manner of depicting the development of his characters and the trajectory of their storylines. All personal issues—the choices characters are confronted with, the decisions they are compelled to make, and the responsibility they are ultimately forced to assume—are also represented on the level of the overall narrative as a matter of double time. For Don Draper, the character around whom the TV show revolves, this entails the fact that although, on the outside, he is the most aggressively optimistic pursuer of the American dream that the show portrays. Insisting that one must forget the past, move on and always look towards the future, he is also the one who is most profoundly haunted by the past. Since a case of identity theft on the Korean war front that resulted in the burial of his CO under a false name, Dick Whitman has been living a double life. Even after he has succeeded in becoming a celebrity in the Madison Avenue advertising world, this secret past continues to have a hold on him. To illuminate the backstory of his hero, and with it the fact that Don is troubled by his former self, Dick Whitman, Mad Men repeatedly uses flashbacks, rendered in a gothic mode quite different from the clear light usually deployed for the scenes in the Manhattan offices of the advertisement agency. Visually performing a disturbance in Don's ordinary everyday existence, these flashbacks speak to the psychological consequences of his duplicitous existence.

In contrast to the way Don recalls his war experiences, an ominous mood permeates those flashbacks pertaining to the destitution and moral depravity of his childhood and adolescence: such as the death of his mother and the stillborn child of Abigail Whitman, whose place he assumes in the family of his biological father, or the fatal wounding of his father by his horse while attempting to mount it one night in a drunken stupor. While the dark colors in which these memory scenes are cast underscore the contrast to Don's apparent good fortune, his imaginary resuscitation of these phantoms of the past seeps into the places he currently inhabits, rendering this ordinary world uncanny. As the editing cuts between these two temporal moments, the past sense of foreboding not only displaces all sense of security, it also renders Don's present a ghostly space, a backdrop for his affectively far more powerful and uncontainable recollections. Self-reflexivity comes into play as Don assumes in these re-imagined scenes a spectral presence that is neither fully in the past nor in the present but rather hovers between the two. In conjunction with the camera as the device producing these hallucinations, his remembering eye/I is the point of interconnection between actual experience and spectral recollection.

Living a life that straddles these two identities, however, Don finds not only that his past repeatedly catches up with him, but also that this personal double time is often negotiated in relation to the emotional ambivalence he entertains towards his family. On the one hand, he repeatedly tells himself that he wants to be a loving husband to his wife Betty and a responsible father to his children while, on the other hand, something keeps drawing him away from this seemingly perfect suburban home. In part, this double life involves his extramarital affairs, which often compel him to lie to his wife either about having to stay in the city overnight for work, or about suddenly leaving home in the middle of the night for work. His actual obsession with his job as creative director is in part also a reason why he prefers not to come home.

In the last episode of the first season, The Wheel (W: Matthew Weiner and Robin Veith / D: Matthew Weiner), we find the double time Draper lives in underscored by the dramaturgic inclusion of a double ending that is predicated on the question: what if I had arrived home a few minutes sooner? Initially, Don tells his wife, Betty, that, owing to an important project at the office, he will have to stay in town for the Thanksgiving holidays, entailing that she will drive to her parents' house alone with their children. Then, however, Don gives his magisterial pitch for the Kodak carousel. To illustrate the sentimental bond with the product for which he develops his advertising strategy, he has plundered his personal archive of family snapshots. The story he tries to sell to his clients during the pitch, in turn, is predicated on the claim that the device they had come up with, namely a round slide projector, »isn't a space ship, it's a time machine, it goes backwards and forwards. It takes us to a place where we ache to go again.« The snapshots Don chooses to support this claim all revolve around the idea of a happy, intact, and safe home. Although this pitch is conceived, first and foremost, as a clever sales tactic, Don himself is gradually overwhelmed by nostalgia for his family life as he watches the sequence of images he has assembled; so much so that, after the emphatic praise he receives for his presentation from clients and colleagues alike, he boards the commuter train home in Ossining still under the influence of the fantasy he has spun.

Now, leaning his head against the window, he falls into a daydream that offers a correction to his unsatisfied reality. On the soundtrack we hear sentimental music to signal the family romance he is imagining for himself. This music affectively underscores the first half of the final sequence of the last episode, which, in fact, consists of two narrative outcomes for the risk Don took when he told his wife he wouldn't be home before she left for her parents' house with the children. In the first part, Don enters his home hesitatingly, as though unsure what he will find. The front hall is dark, yet there is still light in the living room and he soon recognizes that his family has not yet left. Betty's puzzled response is meant to

signal to the dreamer (and to us, sharing his dream vision) that while she has not expected him home so soon, she is pleased with the change in events. Reminiscent of many 1950s comedies, we become privy to a reconciliation between the couple, with both acknowledging each other in mutual sympathy. Following the obligatory kiss that always serves as the Hollywood insignia for a happy resolution of family troubles, Don turns towards his children, takes them both into his arms, fondly hugs them while Betty looks on smiling. The Draper family seems reunited again.

It is worth recalling that in his discussion of dream-work, Sigmund Freud argues that fantasy hovers between three temporal moments. While a fantasy is »linked to some current impression, some provoking occasion in the present« involving one of the daydreamer's major wishes, it also »harks back to a memory of an earlier experience,« namely one in which this wish seemed to have been fulfilled. At the same time, it also »creates a situation relating to the future which represents a fulfillment of the wish.« Freud's conclusion is that in the work of fantasy, »past, present and future are strung together, as it were, on the thread of the wish that runs through them«.² Applied to the first part of the final sequence of The Wheel, we might surmise: the photographic images Don uses in his Kodak-pitch invoke a past happiness he once felt with his family, and, as these snapshots reverberate in his mind, they allow him to imagine a future reconciliation with his family. This first part of the closing sequence thus involves virtual time in two senses. The restorative fantasy occurs in a train, taking him from New York City to his home in Upstate New York, which is to say in the suspended time of his travel between the two sites that are constantly competing for his attention. Virtuality is also underscored in that his daydream speaks to a future he can now imagine for himself, rather than to an actually realized time.

The second half of the final sequence in The Wheel seamlessly follows the exuberant embrace between Don and his children, making visible that the sequence up to now has been nothing but a fantasy, an embellished outcome no longer open to him. Once more, Don opens the door to his home, finding the entrance hall dark. The reality he is compelled to confront involves the sobering consequences of his previous decision not to join his family for the Thanksgiving feast. This time, there is no one to answer as he calls out into the darkened space. Instead, we get a shot from the top of the staircase that frames his isolation. He then sits wearily down on the stairs, as though deeply exhausted, the rug a visual continuation of his upper body. An expression of anxious sadness spreads across his face. The editing cuts back and forth between a view of Don's back, framed by

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2   Sigmund Freud: Creative Writers and Day-Dreaming (1908), in: The Standard Edition of the Complete Psychological Works of Sigmund Freud, vol. 9, London 1959, p. 148.

Fig. 1: Mad Men. The Wheel S01E13. Don Alone at Home

the stairs, and a frontal shot of his seated figure, staring out forlornly into space. In contrast to the daydream on the train, the pensive thoughts now occupying him are not ones Wiener seeks to share with his audience. And while sentimental music had underscored his fantasy of family reconciliation in the first half of the sequence, the sober reality of his solitude is now accompanied by silence. Only once the camera begins to pan away from him, sitting alone on the bottom of the stairs, thus leaving Don visually behind, do we begin to hear Bob Dylan on the soundtrack singing »Don't think twice, it's alright.« His song, invoking as it does a lonely dawn, serves as a comment on the reality of our hero's solitude. As the camera moves back further, Don visually fades into the empty spaces of his home before the screen goes completely black. This second ending draws its affective power from the way it is so markedly different from the alternative temporal moment of the daydream. If the second part of the closing sequence proves the impossibility of the first, this can also be read as Matthew Weiner's comment on the way his TV series is itself a time machine. Tapping into nostalgia even while debunking it as a sentimental journey reveals the latter as an impossible historical dream.

Parallel Editing

Another dislocation of unified time can be found in the powerful montage sequences with which many episodes in MAD MEN come to a close. In all cases, parallel editing is employed in these closing narrative moments so as to underscore the connection between a set of characters at the same time that they highlight the very different attitudes they assume. Each performs simultaneity with a difference. While the characters depicted share a point in time, they inhabit different emotional spaces. Which is to say, even though they are connected, they are also deeply severed from each other. As such, Weiner's deployment of parallel editing picks up on modernism's multiperspectival narration and the aesthetic premise that there is no single coherent view of the world, but rather only a conglomerate of many, different, competing and sometimes even contradictory perspectives *on* and views *of* the world. While these closing montage vignettes all perform simultaneity, the mood they transmit varies.

The montage sequence at the end of A NIGHT TO REMEMBER, for example, foregrounds the sense of quiet despair that haunts all of the characters, even though—or precisely because—they pursue their ambitions. Betty has learned of her husband's extramarital affairs, and, though still lacking concrete proof, she calls Don in his office to tell him not to come home because she does not want him there. The editing moves to Joan, alone in her apartment, sitting on her bed, massaging her tense shoulder muscles as well as the wound which the strap from her uncomfortable dress has left there; a corporeal mark of the price she pays for insistently putting her sexual attractions on display at the office. Peggy, in turn, is shown sitting in her bathtub. For a brief moment, she covers her face with both of her hands before dropping them and looking out in front of her. The distraught expression on her face along with this gesture signifies how alone she is with her sense of uncertainty regarding her position as Don's favorite assistant. The young priest from her parish, meanwhile, moves around in his small bedroom and puts out his cigarette. Then he slowly takes off his habit to reveal another person beneath his symbolic role. He picks up his guitar and begins to sing »Early in the Morning.« With gusto, we hear him appealing to his Lord: »let me find the way to the promised land, this lonely body needs a helping hand.« As his rendition of the song morphs into the familiar voices of Peter, Paul and Mary, we realize that this music is what forges a community between the different characters. Each isolated from all the others, they are all caught in an emotional conflict. The montage editing ends with Don, now confined to his Manhattan office. First, he fetches himself a Heineken from the refrigerator in the office kitchen, then, having sat down at the table there, he quietly sips his beer, annoyed and puzzled at his predicament. Once more the camera tracks back to underscore that he is dwarfed by the architecture

of the otherwise completely empty office space. What the montage renders visible is that these characters, as if united together, are all in need of guidance.

The last episode of the third season, Shut the Door. Have a Seat (W: Matthew Weiner and Erin Levy / D: Matthew Weiner), in turn, brings closure to the intersecting storylines of personal solitude, confused misunderstandings, and lack in communication among the characters. What is depicted is not the mood of waiting for something to happen but rather a decisive turning point. At this point in Mad Men, Don's marriage to Betty has definitively fallen apart. So, too, the advertisement agency Sterling Cooper, where Don emerged as a genius creative director, has come to an unequivocal end. Because of a merger with a British agency, Don— along with the other partners, Roger, Burt and Lane, as well as Pete (accounts), Peggy (copy writer), Joan (office manager) and Harry (media)— have lured away some of the most lucrative clients to a new company they are about to form. They have moved into a hotel suite where they intend to conduct business until they find new office space. The montage sequence begins with Don leaving the bedroom where he has just said goodbye to Betty on the telephone. He returns to the others, who are cheerfully having lunch in the adjoining living room. When Lane assures him that this morning has been very productive, Don begins to smile although his thoughts seem to be elsewhere. The montage editing connects him to Betty, on a plane to Reno. She is holding their baby son on her lap, while the man she is about to marry sits next to her, focused, however, on the papers he is reading. In the Draper home in Ossining, Don's other two children are watching television in the living room. Their African-American maid, Carla, brings them some hot chocolate before sitting down on the couch to join them. The final shot shows Don leaving a taxi with two suitcases, entering the building in Greenwich Village where he has rented a new apartment. This montage sequence is a classic example of narrative bifurcation. For all of the characters, a particular episode in their personal or professional lives has come to an end and a new episode is about to begin. At the end of this season, however, we are left in suspense not knowing exactly what shape these new beginnings will take. While this, too, is a risky moment, it is less so compared to the alternative endings in The Wheel, because one choice is contrasted with another that could not be taken. Nevertheless, this is a risky moment in the overall narrative of Mad Men because at this point the future of the main characters is completely open. No one yet knows what the consequences of the decisions made—to form a new advertising agency, to get a divorce, to move into a new apartment alone—will be. Instead, what connects all these characters is an attitude of expectation.

At the end of Lady Lazarus (W: Matthew Weiner / D: Phil Abraham), the montage performs a different mode of suspended time. We are shown four of the main characters in vignettes that place them outside their ordinary circumstances.

Don's second wife, Megan, has chosen to leave her job at the advertisement agency in order to pursue a career as an actress, while Peggy is slowly advancing there as a copy writer. Pete, having fallen in love with the psychically unbalanced wife of a man he keeps meeting on the commuter train, is forced to recognize that she has decided to end their affair. Don, who wants to remain perfectly in tune with the »sound« of contemporary culture, realizes that in order to get a sense of what the new generation is all about, he must ask his significantly younger second wife for help. Megan, leaving for her acting class, suggests that, in her absence, he might listen to »Tomorrow Never Knows.« What follows is a series of nocturnal vignettes, all revolving around the unsolvable antagonism between the sexes. Don, having put on the record, sits down on his Eames lounge chair, a whiskey glass in his hand, relaxing to the modern sounds of the Beatles' *Revolver* album. As the music continues on the soundtrack, we move to Peggy and Stan, who are busy working together in the office at night. Although focusing on their separate tasks, they pass a joint back and forth without looking at each other. Pete, having arrived at the train station with Beth's husband, goes to his own car but keeps looking over at his rival. Beth has been waiting for both of them, and, after ceding the driver's seat to her husband, she looks out through the window at her clandestine lover. The heart she surreptitiously draws and then quickly erases on the misty window pane is her signal that their affair is over. Megan, in turn, is completely immersed in a relaxation exercise. Lying with her back on the ground, her arms extended to both sides and her eyes closed, she is looking inwards. The montage editing returns to Don, who has been trying to fathom the unfamiliar sounds emanating from his loudspeakers. Then he turns off the music, and walks in silence alone to his bedroom, a glass of whisky in hand. With the final credits, the music begins again, and we once more hear the refrain: »it is not dying.« Given that in hindsight we know how significant the appearance of *Revolver* was for popular culture in the 1960s, the temporal suspension celebrated in this montage sequence not only uses this music to forge a connection between four singular experiences on this one single night. It also gestures to the way the personal time of each of the characters (alone after work, working together without speaking, ending an affair, training for a new job) is invariably interlocked with a particular historical time and the upheaval it has since come to stand for.

Finally, in THE PHANTOM (W: Jonathan Igla and Matthew Weiner / D: Matthew Weiner), we have come, once again, to the end of a marriage. Megan has gotten her first part in a TV show and, on set, the make-up artist is putting the final touches on her appearance before the shooting will begin. Don has turned his back on her and is walking away through the dark hall of the studio. In explicit reference to the ending of King Vidor's melodrama STELLA DALLAS (USA 1937), in which Barbara Stanwyck turns her back on the window through which

she had been allowed to watch her daughter's marriage ceremony, the camera tracks back to stay for a few moments with Don as he leaves the scene which fulfills his wife's ambition to be an actress but which also undermines his notion of marriage. Like Stanwyck at the end of STELLA DALLAS, he too, ultimately passes by the camera, signaling that a new episode in his life is about to begin as well. The montage seamlessly moves to him, sitting down at a bar and ordering an Old Fashioned. He is once again alone, now open to a new romantic adventure, and, indeed, at the end of the montage sequence, two women will try to pick him up. In the narrative interval we see Peggy, getting ready to go to bed with some unfinished work. Briefly, she looks out at two dogs copulating on the lawn in front of her window. Then, she, too, turns her back on this scene and enjoys the glass of whiskey that she, as Don's doppelgänger, is now holding in her left hand in bed. Pete, also enjoying himself at home that night, has put on earphones to listen to one of his classical records. This allows him, in turn, to turn his back serenely on Trudy and his children, asleep in the adjoining rooms. Roger, also alone in his bedroom that night, is standing, stark naked, in front of the window. He is on an LSD trip, and, as he enjoys his solitary pleasure, his gaze is focused on the glittering nocturnal cityscape unfolding beneath. In contrast to the final montage sequence in A NIGHT TO REMEMBER, the solitude that connects these characters no longer signifies loneliness and quiet despair. Instead, what this sequence foregrounds is intoxication as a visual trope for the movement from an ordinary to an altered state. Even while they experience this night differently from normal time, by virtue of the montage they implicitly do so together, while allowing us to partake by proxy in their moments of self-enjoyment.

Historical Events and Fictional Time

There is yet another aspect to the performance of double time in MAD MEN since throughout the series, TV newscasts, newspaper articles, and radio broadcasts bring actual current events of the 1960s into the fictional timeline of the show's overall narrative. The pinnacle of this splicing together of historical events and Weiner's fictional re-imagination of history is, of course, the Moon landing in the final season. In this case, a visual connection is again forged between the main characters by virtue of montage editing. To watch this epochal event, they have all come together, albeit in different constellations. Double time, in this case, intersects with the simultaneity of an experience of community. What connects the various characters is the news broadcast—the flickering black-and-white images on different TV screens along with Walter Cronkite's voice-over commentary—of what they, along with the rest of the world, are watching. The affective climax is

the moment when Neil Armstrong, taking his first steps on the surface of the moon, asserts: »That's one small step for [a] man, one giant leap for mankind.«

The shot/reverse shot editing keeps moving from TV screen to those sitting in front of it, which is to say, oscillating between the iconic new images and the group portraits of fictional characters watching them. We find Don, sitting in front of the TV set in a sparse hotel room in Indiana, along with three other members of the advertisement agency, Peggy, Pete and Harry, who intend to pitch their strategy for Burger Chef the next day. Roger, in turn, is at his first wife's house. Sitting on a couch next to her, with his grandson on his lap and his son-in-law in a chair to the other side, he is as enthralled by what they are viewing on the TV screen. As is Bert and his African-American housekeeper, who are watching the news transmission while sitting on a sofa in his living room. In the back, we see an enormous Jackson Pollock painting. After the montage editing has interwoven these three locations, moving back and forth between them, it finally moves to Betty, who is with her children, her second husband Francis, and his family in their stately home.

The affective power of these vignettes of collective wonder and national pride is, of course, also indebted to the unfamiliar view of the planet Earth, now suddenly made possible from the position of the moon. This implicitly offers a new perspective on the people who inhabit the planet as well, which is to say the many players in Mad Men sharing in this experience. At the same time, given the shot/reverse shot editing, the characters are implicitly also looking at us, the audience. We are occupying the same space as the historic news images these characters, but also the actors and actresses playing them, are looking at. We are where the astronauts are—in the past, outside fictional space-time. We are in the place from which this past looks both back at them and out at us, which is to say that as spectators, we are located in an impossible position. This rapt involvement in the incredible event, in turn, attests to a collectively shared fantasy that consolidates all the main characters into a series of static group portraits, even if this achieved unity will only be sustained for a short moment. Soon, the individual characters will turn back to other matters and once more confront their everyday lives. Indeed, on the diegetic level of Waterloo (W: Carly Wray and Matthew Weiner / D: Matthew Weiner), the actual historical moon landing is overshadowed by the sudden death of Bert, prompting yet a final turn of intrigue and struggle for power, and with it the sale of the advertisement agency to McCann Erikson.

The prestige TV series Mad Men itself ends on a final montage sequence which deftly blends together fictional time, historical time, and real time, beginning with Don's anagnorisis during a group therapy session at the Esalen Institute in Big Sur and ending with an actual hilltop Coca-Cola commercial, produced by McCann Erikson that aired in 1971. After Don has tearfully embraced the man who has just

shared his story about how insignificant he feels with other members of the group, the editing moves to a series of closing vignettes. Pete, together with his radiant wife Trudy and their young daughter, is about to board a private jet. Reunited with his family, he will begin a new life as chief executive of Learjet in Wichita, Kansas. Equally cheerful, Joan hands over her son to her mother, who will take him for a walk in the park so that she, having founded her own production company called Holloway-Harris, can work undisturbed. She has turned her living room into a home office. The pin board on the wall separating it from the kitchen, covered with scribbled notes, shows us that November 1970, is already heavily booked. Roger, meanwhile, is spending a honeymoon in Paris with Marie, the mother of Don's second ex-wife Megan. They are sitting in a bistro and he orders champagne and lobsters. The intimate camaraderie shared by this mature couple suggests that this marriage may actually work. Don's daughter, Sally, has assumed the position of her mother in the kitchen of their home, since Betty, having come to terms with the fact that she is dying of cancer, is now no longer fit to take care of the domestic chores by herself. Sally is wearing her mother's yellow rubber gloves while she washes the dishes. Betty, seated behind her, a cigarette elegantly poised in her hand, quietly reads a newspaper. Finally, the editing moves to Peggy, who is once again working in her office at night. At first, she is typing up something in a frenzy, her gaze concentrated on the words that are emerging on the paper in front of her. Then Stan, now her steady boyfriend, joins her and, as she looks up at him, he kisses her gently on the forehead before they both look at what

Fig. 2: MAD MEN. Waterloo S07E07. Lap Dissolve Connecting Peggy's Writing and Don's Anagnorisis

Fig. 3: MAD MEN. Waterloo S07E07. Don's Reverie at Dusk

she has just written. It is this gaze that leads to the lap dissolve, which reveals the silhouette of their former creative director, Don, standing in the sunset behind the Esalen Institute in California.

For one final time, the parallel editing connects individual characters who have already gone their separate ways, splicing them together into an affective community. Yet it is important to note that the final episode of MAD MEN does not end with this sequence of redemptive vignettes. Instead, along with the lap dissolve that blends together the two coasts of America into one superimposed image, we return once more to Don. This lap dissolve, however, also fuses Peggy's nocturnal work with Don's awakening from his own melancholia. While it is nighttime in New York, it is dusk in California, where he stands above a cliff, looking out over the Pacific Ocean, where the vision of the hilltop ad will subsequently appear to him during an early morning meditation class. It remains open, of course, whether we are to take his inspiration as the result of Peggy's suggestion, or whether we are to imagine her mentally coaxing him back to Midtown Manhattan. Or perhaps the Coca-Cola commercial is an idea they have worked out together? In any case, we are dealing with a vision that no longer takes place on the same diegetic level of the narrative where Don comes to experience self-knowledge. We are in a different time zone. Not only do the vignettes, function-

ing like an extended subordinate clause, separate this moment of anagnorisis from the meditation the next morning. As the only lap dissolve in the entire interpolated series of closing images, Stan and Peggy's gaze at the copy she has written, superimposed on Don's ecstatic awakening, also draws our attention to a narrative break. At work in Don's final vision is a metafictional ploy. The scene, performing the reawakening of his creative genius in double time, serves as our point of exit from the fictional world in which we were allowed to participate over seven previous seasons.

   With his eyes closed, Don looks forward into a future, which, in the shape of an actual commercial from the year 1971, at once draws us back into the force field of the past. Owing to his memory work, the double time that keeps resurfacing in Mad Men is carried through to the end. With this iconic commercial, real history enters into the past of a fictional world that Matthew Weiner historically re-imagined from the position of his own present, even as it leads us back into our contemporary moment. Young men and women from all over the world stand on a hilltop and, with their song, proclaim a collective desire for a global sentimental bond, achievable at a future moment in time. The fact that everyone is holding a Coca-Cola bottle in their hand further serves as the corporeal testimony of this wish for shared community: »I'd like to buy the world a home and furnish it with love.« Deployed as metafictional closure, this commercial offers its own comment

Fig. 4. Mad Men. Waterloo S07E07. Don's Vision at Dawn

on the very promise of happiness, on which the string of short vignettes of Pete, Joan, Betty and Roger (serving as the transition between Don's self-recognition and his vision) are predicated. Cutting to this iconic commercial at the conclusion of the series signals, on the one hand, that this particular soft drink is »the real thing.« On the other hand, the commercial also entails that within the visual history of America, reference to the real itself endures. Weiner's choice to use the hilltop Coca-Cola ad (a decision which he claims was already made when he began filming season 4) also puts closure on the many instances in MAD MEN during which news broadcasts from the 1960s—such as the moon landing— were inserted into the narrative diegesis so as to draw attention to and affectively incorporate a politically charged event into the fictional storylines of his characters. If, however, this commercial performs an intrusion of real time into the temporality of the fictional world, it also serves to replace the historically re-imagined world. It dissolves the fictional time of the show, MAD MEN, into the transhistoric time of a commercial that really was aired worldwide.

In contrast to the montage sequence involving the moon landing, the real does not break into and disrupt the fiction as a news broadcast but rather as a carefully designed image formula, which—as we know in hindsight—was not only able to contain the pathos of this transition into the 1970s but, when recycled, is also able to resuscitate collective emotions that pertain to this historical turning point. Precisely as a mediated representation, the past adheres to the colors of the old film stock, to the timbre of the voices of the young people singing, to the movement of their bodies as they come together, coke bottle in hand. In contrast to MAD MEN's time machine, the Coca-Cola commercial is a time *capsule* in the strict sense of the word. Indeed, by perfectly encapsulating the *zeitgeist* of 1971, this advertisement affects us—once again—as it did its target audience then, even while it allows us to belatedly understand this historical moment. For one final time, an ambivalent logic of double time is at play. Conceived with the war in South-East Asia as its implicit backdrop, the choreographed community of young men and women of different ethnicities, each holding a Coca-Cola bottle while making their appeal to world peace, speaks perfectly to the end of an era of cultural promise, upheaval and disappointment—as a fantasy of what could have been but also what might still be achieved.

The double time with which we, the audience, are called upon to leave the world of MAD MEN involves a *return to* and a *return of* the real of the past, at the same time that the fictional character, Don, who has been our guide throughout these time travels, dissolves into his own vision. Having dreamed up a commercial that really exists, he now vanishes into the surface of its moving images. By virtue of a series of lap dissolves, with the camera repeatedly panning back and forth along the beaming faces of the singers, the separate individuals that make up the

Fig. 5. Mad Men. Waterloo S07E07. A Late Capitalist Version of the Body Politic

chorus are in turn blended together into a multi-layered composite image. At the end of the hilltop commercial, once the camera has moved into a long shot, the close-up of an enraptured young woman is shown, superimposed over the crowd, to unite all the separate figures into one collective body. We might read this as a late capitalist version of the body politic. We have not only left behind the realm of fiction, but the advertisement image itself has also been depleted of all referentiality. The scene it puts on display—in order to encapsulate the affective intensities of this historical moment of cultural transition, which is to say the transformation of counterculture into the language of consumer capitalism—taps into the singularity of this past even while transcending its specificity. Matthew Weiner's creation, Mad Men, and the world his time traveling has evoked for us on screen each in turn dissolve into this temporal loop.

Fake News and the Complexity of Things

William E. Connolly

Everybody knows the basic story. During the 2016 electoral campaign in the United States a series of blogs spread Fake News. These are false items about a candidate or party designed either to convince the base that they had committed a horrible deed—such as the charge that Hillary Clinton supported a child trafficking ring—or to counter evidence based assertions with one manufactured out of thin air to make people doubt the first claim. These smears ran in tandem with endless repetitions of the Big Lie Scenario by Donald Trump: Barack Obama is an illegitimate president because he was born in Kenya; thousands of Muslims in New Jersey were seen on television cheering on as the two NYC high rise buildings burned and collapsed on 9/11; the Presidential election was polluted by three to five million fraudulent votes for Clinton; climate change is a Chinese hoax, etc., etc.

Neither Fake News nor Big Lies is based on solid evidence. The idea of both is either to smear a candidate or to confuse people by overwhelming evidence based assertions with evidence free accusations. Pundits, politicians, journalists, and academics began to ask how to avoid the proliferation of such corrupt and corrupting practices in the future. The integrity of democratic elections depends upon success in doing so.

Soon, however, the effort to counter Fake News and Big Lies faced a new counter attack: academic »postmodernism« and »social constructivism« it was said—because they say that facts are soaked in prior interpretations—are either purveyors of Fake News or set the cultural context in which it flourishes. They do so by undermining confidence in inquiry governed by simple facts. One essay from the Hoover Institute entitled »Fake News: Postmodernism By Another Name« takes this tack. And a *Guardian* article quotes Daniel Dennett, the deterministic philosopher of species evolution, to say that postmodernism is responsible for Fake News.[1] Often the Duke University scandal is invoked in these pieces, an

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[1] See Victor Davis Hanson: Fake News: Postmodernism By Another Name, under: https://www.hoover.org/research/fake-news-postmodernism-another-name (25 November 2017); Truman Chen: Is Postmodernism to Blame for Post-Truth?, under: https://www.philosophytalk.org/blog/postmodernism-blame-post-truth (25 November 2017).

instance a few years ago when Duke Lacrosse players were punished for a rape that did not occur. That instance, however, seems to speak to a tendency to believe the testimony of a woman over the Lacrosse players and other evidence, rather than expressing a denial of evidence and facticity. That example may have been invoked because it lumps together postmodernism and versions of »political correctness« that are at odds with it, perhaps because advocates of each stance often tend to identify with the political Left in a broad sense of that term. The Hoover Institute is an arm of the Right Wing.

The first thing to say about the counter-attack, of course, is to remind people that Fake News and the Big Lie Scenario preceded the advent of postmodernism. A second thing, perhaps, is to attend to differences in affective tone and purpose that inform the two traditions. Fascists assert Big Lies dogmatically and rancorously in order to smear opponents and to gain unquestioned power over a regime; postmodernists—who typically deny our ability to reduce competing metaphysical interpretations to one candidate alone—often probe alternative interpretations to open a plurality of views for wider consideration. The *ethos* conveyed by each is thus different from that conveyed by the other. The issue of dogmatism is seldom posed in essays that equate postmodernism and Fake News.

I do not identify myself as a postmodernist, though I have been called one a couple of times. It is essential to challenge the insertion of Fake News, Big Lies and authoritarian dogmatism into democratic processes today. It is also important not to allow our responses to this phenomenon to legitimize the automatic re-entry of positivist notions of fact, explanation, and objectivity that have been subjected to severe critique for a few generations. If positivism is to make a comeback, it must be based on good arguments rather than a fictive equation between postmodernism and Fake News. I will defend this case by supporting the complexity of factuality and objectivity rather than rejecting either.

Some facts are relatively simple. You don not allow either Fascists or wild eyed constructivists—if any constructivists are indeed that wild—to say that all facts are ghostly, subjective or »fake«. It is a fact that the United States invaded Iraq; it is also a fact that Iraq did not have weapons of mass destruction before that horribly destructive invasion despite what the Bush administration had asserted. Two well supported facts.

At a higher level of complexity, someone might insist either that the sun rotates around the earth or that the classical Newtonian theory fits the way of the world itself. In the first case a well-rounded theory grounded in evidence of multiple sorts can be invoked to correct that insistence, even though unaided perception does support the claim. Science is invoked here to correct unaided perception. In the second instance, tests guided by a quantum theory and test instruments unavailable to Newton can be invoked. They involve, first, electrons forming wave

patterns that collide (the two slit experiment) and, second, the simultaneous change of two previously entangled particles now separated by millions of miles (entanglement or nonlocality). Together quantum theory and the tests linked to it can be invoked to correct Newtonian theory.

To be objective in these latter instances means to conform to the most refined theory available in relation to tests that deploy the most sophisticated instruments. Thus to call C02-induced climate change a Chinese hoax today without advancing sophisticated evidence to overturn the evidence based consensus of climate scientists is to propagate Fake News.

This complexity does mean, however, that what was objective at one time, say Newtonian theory, may become less so at a later date through the combination of a paradigm shift in theory, new powers of perception, new tests with refined instruments, and changes in natural processes such as species evolution. The emergence of new theories and tests, as Lorraine Daston and Peter Galison emphasize in *Objectivity* (Boston 2007) does not reduce objectivity to subjective opinion. It is a false opinion that the sun revolves around earth, as Spinoza already knew when he corrected the common sense of his day grounded in everyday experience and Christian theology. In between these two alternatives resides the kind of *speculative* philosophy that identifies anomalies in an extant theory and poses an alternative to be subjected to new tests in the future.

Again, what counts as objective may shift, if and as a new theory joined to refined instruments and tests points to anomalies in an established theory that are somehow resolved in this one. But this shift involves a vast array of complex exchanges, theoretical formulations, and newly refined modes of observation. Moreover, a domain of inquiry may pass through a period in which two or more theories contend against each other for primacy, as we have seen recently with the debate in evolutionary biology between genocentric theory and the theory of epigenesis. Amidst these exchanges, however, partially shared standards of factuality and objectivity exceed radically the evidence free assertions embodied in Fake News and the Big Lie Scenario.

Let's now move onto a more complex and contestable terrain, the terrain, perhaps, that critics of postmodernism have in mind when they to hold it responsible for a culture of Fake News. The figures to be invoked now, however, would not call themselves postmodernists. They are speculative philosophers who respect the traditions of science and cultural studies as they also strive to challenge the consensus in them in this or that way. According to speculations advanced by Alfred North Whitehead and Gilles Deleuze, certain facts are both real and simmer with possibilities to become other than they are. Such facts are *more than themselves.* A genetic mutation may harbor diverse possibilities of gestation; one rather than others may attain expression when it encounters the specificity of an unfolding

embryo. Or a student may place two or three theoretical perspectives into play. One of those may become consolidated out of that simmering facticity as it drives others into obscurity. No Fake News here. But there is a process of *emergence* that renders facticity complex.

We can now add a final element to this brew. It might be unwise to cling to such a flat notion of factuality and objectivity that you rule out automatically the possibility that real uncertainty and real creativity periodically arise in this world. This is precisely the territory that Alfred North Whitehead and Gilles Deleuze explore, while retaining the notion that facts can *also* be simple in the senses adumbrated above. Does the drive to equate Fake News with postmodernism represent an attempt to rule this latter possibility out before it has been subjected to reflection and live experimentation?

Consider, then, Whitehead's notion of »the scars of the past«. Often enough, he says, two partially unformed possibilities may simmer in an individual or group. Then one becomes consolidated. However, the partially formed fork *not taken* may fester again in the future. He says »a feeling bears on itself the scars of its birth; it retains the impress of what might have been but is not. It is for this reason that what an actual entity has [in the past] avoided as a datum for feeling may be an important part of its equipment.«[2] So, you have selected this lover over that one; or you supported this claim to a right over that one. This, however, is the key: The festering fork not taken now subsists as a nodule of arrested thought-imbued energies. A new situation may arise that activates that incipience again. In something like the way a new event activates an old memory. But not exactly like that, since what is activated now is a pluripotentiality rather than a consolidated memory—though many neuroscientists now think that memory recall always involves some degree of subliminal reconstruction. Out of subliminal movements back and forth between a past that was never consolidated and a new situation of uncertainty a creative formation may emerge. A new work of art may be created. A new responsiveness to plants may be cultivated. It is too much to say that you *intended the new result* from scratch. That would not have been a creative formation—since the intention would have preceded the product. It also may be too *little* to say that it just emerged from nowhere by chance. No creativity would be in play in such a case.

What happens, Whitehead speculates, is that a previous fork not taken and a new situation resonate back and forth until something new is sometimes ushered into the world. The new entity might be a new concept to be explored further in

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2   Alfred North Whitehead: Process and Reality: An Essay in Cosmology (1929). Corrected Edition, edited by David Ray Griffin and Donald W. Sherburne, New York 1978, pp. 226–227.

relation to others, a new work of art, a new theme for a short story, a new political strategy, or a proposal to add a new right to the old roster of rights in liberal practice.

Whitehead's theory of how creativity unfolds does contain speculative dimensions. Not everyone will buy it, particularly those deeply invested in the prior view that everything must *in principle* be explicable all the way down. But his exploration is susceptible to a mix of philosophical explorations and live experiments. After absorbing it, for instance, you may attend more closely than heretofore to that threshold through which new ideas periodically bubble into life. Or you may ponder anew the uncanny sense many people share that we do sometimes participate in real creativity. His speculative philosophy breaks simultaneously with positivist notions of simple facticity, postmodern reservations about metaphysical speculation, and neofascist pursuits of Fake News and Big Lies. It sustains respect for factuality, appreciation of objectivity, and speculative support for the theme of real creativity. Your creative proposal to add a new right to the old register of rights, for instance, may now entice or incite others to respond to it.

Facts are real. Objectivity is important. The U.S. did invade Iraq. Hillary Clinton did not start a sex trafficking ring. Barack Obamas was born in Hawaii. Those rough guys at Duke were not guilty of rape. As you move up the scale of complexity with respect to facts and objectivity, however, it becomes clear that what was objective at one time given available intersections between theory, instruments and evidence may become subjective at another. Not because of Fake News or postmodernism. But because the complex relationships between theory, evidence and conduct periodically open up new thresholds.

A credible case can be made that sometimes something new emerges out of resonances back and forth between a previous fork that was not taken and a current situation posing a new challenge. This speculative philosophy can be contested, of course. But to make the case for real creativity speaks to the artistic and aesthetic dimensions of life without either reducing everything to mere interpretation or flattening objectivity into positivism. The latter two traditions fail to acknowledge the complexity and wonder of the world.

Garden-Variety Formalist

Colin Lang

In the world of art (the one I know best), postmodernism was marked by what the art historian Craig Owens called a turn toward »the discourse of others.« What does that mean? The great heritage of postmodernism is thus one of inclusion, where difference was honored on a human level, signaled by a greater representation in the arts by practitioners of color, women, and those who did not fit into the prior paradigm of the white male heteronormative artist subject (ideally, anyway). All of this sounds good; at the very least, progressive. So, what does this have to do with truth becoming an ever more embattled region of public discourse, if the idea of »public« still holds?

Included in the larger description of postmodernism—a term that many rejected or refused to adopt—were the seeds of a more radical relativism, one which threatened to do away with certainty and truth altogether; or, better said, the certainty *of* truth. This was nothing, new, though. Nietzsche heralded a similar crisis of truth more than a century before the pomo kids arrived on the scene to wave the flag of indeterminacy: »These are by no means *free* spirits, *for they still believe in truth*.« And after Nietzsche, Mikhail Bakhtin's celebration of the carnivalesque did just as much to take the air out of the truth balloon. For Bakhtin, »carnival celebrates temporary liberation from the prevailing truth and from the established order.« Are »fake news« and »alternative facts« the new carnival and Trump its dog and pony show?

The idea of »fake news« and »alternative facts« as a carnival would at least help us to see the constructedness of the media spectacle, just as long as we remember that the carnival is most important for Bakhtin as a cultural medium in which it becomes very hard to distinguish between the event and ourselves. Even with the help of the metaphor provided by Bakhtin, we're still a long way from figuring out how alternative facts appeared in the marquee. For in the putative falsehood of alternative facts there is the correlate, truth, which, despite the many things that one could accuse the pomo torch bearers of, proposing a fatuous notion of truth is certainly not one of them. And for that matter, let's just assume that radical relativism is ultimately a red herring in this saga, which started only a short while ago.

Trump is surely playing a particular role in this carnival (clown or otherwise), and that role is not one that any of us would describe as presidential (that much

seems beyond debate). So, how would we characterize the performance? Many in the popular press have assumed it is just what it looks like, an infantilized narcissist, a parody of some Regan-era New York real estate tycoon straight out of a Bret Easton Ellis novel whose most triumphant »deal« resulted in winning a seat in the oval office. These characterizations are no doubt verifiable, and so few have worked hard to argue against them, or for an alternative, because, how can you ignore the obvious? The problem is that it is all too obvious, and misses something fundamental about alternative facts, and the part that Trump is playing in this theater of the absurd. The attempts to draw parallels to populist regimes, both historical and present, negate contextual specificity, leveling complexity through simple comparison. This, above all, must be resisted. A central assumption is, then, that the creation of alternative facts is one symptom of a more structural, paradigmatic shift in the persona of a president, one which has few correlates in the annals of political history. I realize it is a rather perverse provocation, but the closest analogy for this kind of performance is actually hinted at in the title of Trump's greatest literary achievement, *The Art of the Deal*. Yes, Trump is playing the part of an artist, and a very specific one, at that.

If Trump is playing the part of an artist (and that's somewhat different than »being« an artist), it is because he's pilfering from the tactics of the avant-garde and putting them to very different ends (the critic Hal Foster recently developed this thesis). It's not so much the nightmare of relativized truth turned into alternative facts, as it is a metamorphosis of responsibility. Think of philosopher Stanley Cavell's momentous collection of essays on modernism, *Must We Mean What We Say?* Well, I guess that depends on whom you're talking about, doesn't it? Of course, that matters, but the response is one that, up until this point, has left little to the imagination. In the immediate aftermath of the swarm of bald face lies, the chorus of criticism becomes one of defending the »truth,« but that means that the positions in the debate have already been defined. Alternative facts are so effective because it creates a dichotomy of fact and fiction as the a priori conditions of any meaningful debate, and we turn to truth as a savior, when truth is not even in the equation. Did we manage to repress Hobbes' formulation of the logic of modern rule? *Auctoritas non veritas facit legem*. Veritas has been old hat for centuries now.

If the notion of alternative facts is indeed the bastard child of postmodernism, the zombified enfant terrible of indeterminacy and relativized truth, we might try to trace our steps (culturally speaking) back to the onset of the movement that told us »everything is text.« Axiomatic or not, the promise of textuality was synonymous with a freedom from the tyranny of content: literary students waxing endlessly about characters, actions, and unexpected plot twists. It depends on whose postmodernism were talking about here, but if the progenitors (Derrida, De Man,

and others) are somehow to blame, then we managed to repress the lessons of those original moves. Or did we? Maybe the heritage of deconstruction in its alternative facts proclamations is also essentially a readerly project. »Just read what I say and you'll know the real story.« Alternative facts depend on us forgetting the formal structures of language (tweets, mostly, but others, too) in order to focus on the verifiable, producing as much content as we find. The problem is that we cannot ever really know or trust what is provided, so repeating this claim is stating the very obvious, to say the least. It also pulls us out of the discourse systems responsible for producing those mendacious streams of information.

I claimed that Trump was playing the part of a particular kind of artist (I didn't say he was doing a good job of it). The temptation would be to equate this performance with the figure of the artist as a rule-breaker, the kind who relishes in transgressive acts and moves freely between one rhetorical move and the next, never holding to a center, or core ethos. »We can't pin him down! He keeps changing his mind!« Such cries are the ones that have led so many to proclaim Trump as post-ideological, not committed to anything other than securing the best deal, at whatever cost, and for whichever gain. And yet, those same voices are the ones who keep beating back the twitter swarm with the truth stick, in the hopes that reason and good judgment will carry the day. The rule-breaking artist doesn't care about good judgment or reason. In fact, those criteria are the ones most directly thwarted in the service of an act that is designed to provoke. Even the best provocateurs can't tell us how to react, even if their transgressive behavior is only shocking against the backdrop of good taste.

Here we run up against an old notion of ideology, one which assumes a consistent, repeatable core of slogans and stances. In such a definition, clearly Trump is post-ideological. Seen differently, however, ideology names not just the *content* but the *form* of a system of symbolic production. Here, the fact of twitter as communicative medium is itself already the product of an ideology, one which behaves according to the anonymous execution of codes more than it does any flesh and blood agent or actor. There is ideology all right, it's just no longer tied to human brains. It is the ideology of self-reproducing machines and their sophisticated language of commands and tasks that are only connected to the body as an input device, a system of relay switches that operate like the peripheral nervous system of a networked brain. The failure to see this is a failure to mistake coding and language for content-driven systems and their attendant interpretations. Even your average coder knows the difference between the two. And we cannot forget the fact that in the language of code, content management systems are those interfaces designed specifically for the ineptest in the world of digital production, incapable of writing or reading sophisticated text. Lest we forget, that is the »archiécriture« of twitter, as so much else.

Does this mean that Trump is able to understand those complex systems that too many of us end users are unable to comprehend? No. Certainly not. That is not what I'm suggesting. Trump as a writer would lead in a very different direction indeed. Twitter's code is not equal to its form, and Trump is exploiting that potential to incredible effect. Twitter, like so much in the world of writing, is essentially a medium of transmission, as the novelist Tom McCarthy has reminded us. Twitter provides a platform for transmission, a poiesis; one that is only marginally tied to language, even less so to a reliable content. Each Presidential Twitter communiqué engenders, legitimizes and confirms the act of transmission. If George W. Bush was the president of the image war, where so much ideology was compressed into the circulation of a single picture—Abu Ghraib, 9/11, Katrina, you name it—Trump seems to work from the other end. According to Retort, a group of intellectuals who wrote a book on the language of the image war post-9/11, there was nothing essentially visual about the language of the new image campaigns, nothing that could have elicited a complex response from its viewers. Instead, Retort tell us that language is lurking behind the picture, the most vulgar and banal speech, informing how images both spectacularize and hide what they show.

With Trump, the twitter campaign is producing images, too, stand-ins for the living body behind a microphone (something Trump has only dared to subject himself to a few times since his presidency began). Instead of the face we get a proliferation of small little white boxes, each identical, a serialized stream projected and re-projected on screens everywhere. This is the image of the president, everything else is a mirage. There is no ideology lurking behind each miniature missive because the ideology has already been enforced every time we tune in to read. Yes, the widely heralded televisual age has come full circle, where images are produced for us to read, without ever having the option of quarreling with *how* we read them. This is the image par excellence. We discover it readymade, presented to us in all its finishedness, without requiring anything from us other than to see and behold. Even that most private act of reading has gone viral.

Back to the question, then: What kind of artist is Trump if he is not the rulebreaker (America's answer to Martin Kippenberger?)? What can be made of this perverse analogy other than to highlight the fact that we've managed to jump headfirst into a pool that none of us built? Let me return to W. (George W. Bush) for a moment, only to conclude my highly conjectural and unprovable thesis. If W. (in his role as painter) was fond of figuration, then Trump is more the abstract formalist. He sees the channels, that the art is in probing and constructing networks. Significance, meaning, is a product of those channels, not something we glean in spite of their existence. Who cares what we find there? Well, too many of us, I'm afraid. The idea of Trump as a formalist is almost as absurd as categorizing him as a performance artist, playing a part that many of us who operate be-

tween politics and history might recognize if given the chance. As with any argument, I propose this radical and racist brand of formalism as an operative condition so that we find a mode of resistance that does not accept the content management systems offered to us by the usual reactions. No one is to blame for having those reactions (they're often mine, too). While I cannot prescribe or predict how that mode of resistance will manifest itself, I do know this: one can only fight form with form (*Nemo contra deum nisi deus ipse*). Beneath the surface of our Mediocene, there is a vibrating, concatenating crust of code, a language without recourse to meaning, metaphor, or reference. It's there that alternative facts become something more than a depraved notion. It's there that the battles are waged. If you don't believe me, check your twitter feed.

Darwin Among the Machines

[To the Editor of the Press, Christchurch, New Zealand, 13 June, 1863.]

Samuel Butler

Sɪʀ—There are few things of which the present generation is more justly proud than of the wonderful improvements which are daily taking place in all sorts of mechanical appliances. And indeed it is matter for great congratulation on many grounds. It is unnecessary to mention these here, for they are sufficiently obvious; our present business lies with considerations which may somewhat tend to humble our pride and to make us think seriously of the future prospects of the human race. If we revert to the earliest primordial types of mechanical life, to the lever, the wedge, the inclined plane, the screw and the pulley, or (for analogy would lead us one step further) to that one primordial type from which all the mechanical kingdom has been developed, we mean to the lever itself, and if we then examine the machinery of the Great Eastern, we find ourselves almost awestruck at the vast development of the mechanical world, at the gigantic strides with which it has advanced in comparison with the slow progress of the animal and vegetable kingdom. We shall find it impossible to refrain from asking ourselves what the end of this mighty movement is to be. In what direction is it tending? What will be its upshot? To give a few imperfect hints towards a solution of these questions is the object of the present letter.

We have used the words »mechanical life,« »the mechanical kingdom,« »the mechanical world« and so forth, and we have done so advisedly, for as the vegetable kingdom was slowly developed from the mineral, and as in like manner the animal supervened upon the vegetable, so now in these last few ages an entirely new kingdom has sprung up, of which we as yet have only seen what will one day be considered the antediluvian prototypes of the race.

We regret deeply that our knowledge both of natural history and of machinery is too small to enable us to undertake the gigantic task of classifying machines into the genera and sub-genera, species, varieties and sub-varieties, and so forth, of tracing the connecting links between machines of widely different characters, of pointing out how subservience to the use of man has played that part among machines which natural selection has performed in the animal and vegetable king-

doms, of pointing out rudimentary organs[1] which exist in some few machines, feebly developed and perfectly useless, yet serving to mark descent from some ancestral type which has either perished or been modified into some new phase of mechanical existence. We can only point out this field for investigation; it must be followed by others whose education and talents have been of a much higher order than any which we can lay claim to.

Some few hints we have determined to venture upon, though we do so with the profoundest diffidence. Firstly, we would remark that as some of the lowest of the vertebrata attained a far greater size than has descended to their more highly organised living representatives, so a diminution in the size of machines has often attended their development and progress. Take the watch for instance. Examine the beautiful structure of the little animal, watch the intelligent play of the minute members which compose it; yet this little creature is but a development of the cumbrous clocks of the thirteenth century— it is no deterioration from them. The day may come when clocks, which certainly at the present day are not diminishing in bulk, may be entirely superseded by the universal use of watches, in which case clocks will become extinct like the earlier saurians, while the watch (whose tendency has for some years been rather to decrease in size than the contrary) will remain the only existing type of an extinct race.

The views of machinery which we are thus feebly indicating will suggest the solution of one of the greatest and most mysterious questions of the day. We refer to the question: What sort of creature man's next successor in the supremacy of the earth is likely to be. We have often heard this debated; but it appears to us that we are ourselves creating our own successors; we are daily adding to the beauty and delicacy of their physical organisation; we are daily giving them greater power and supplying by all sorts of ingenious contrivances that self-regulating, self-acting power which will be to them what intellect has been to the human race. In the

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[1]   We were asked by a learned brother philosopher who saw this article in MS. what we meant by alluding to rudimentary organs in machines. Could we, he asked, give any example of such organs? We pointed to the little protuberance at the bottom of the bowl of our tobacco pipe. This organ was originally designed for the same purpose as the rim at the bottom of a tea-cup, which is but another form of the same function. Its purpose was to keep the heat of the pipe from marking the table on which it rested. Originally, as we have seen in very early tobacco pipes, this protuberance was of a very different shape to what it is now. It was broad at the bottom and flat, so that while the pipe was being smoked the bowl might rest upon the table. Use and disuse have here come into play and served to reduce the function to its present rudimentary condition. That these rudimentary organs are rarer in machinery than in animal life is owing to the more prompt action of the human selection as compared with the slower but even surer operation of natural selection. Man may make mistakes; in the long run nature never does so. We have only given an imperfect example, but the intelligent reader will supply himself with illustrations.

course of ages we shall find ourselves the inferior race. Inferior in power, inferior in that moral quality of self–control, we shall look up to them as the acme of all that the best and wisest man can ever dare to aim at. No evil passions, no jealousy, no avarice, no impure desires will disturb the serene might of those glorious creatures. Sin, shame, and sorrow will have no place among them. Their minds will be in a state of perpetual calm, the contentment of a spirit that knows no wants, is disturbed by no regrets. Ambition will never torture them. Ingratitude will never cause them the uneasiness of a moment. The guilty conscience, the hope deferred, the pains of exile, the insolence of office, and the spurns that patient merit of the unworthy takes—these will be entirely unknown to them. If they want »feeding« (by the use of which very word we betray our recognition of them as living organism) they will be attended by patient slaves whose business and interest it will be to see that they shall want for nothing. If they are out of order they will be promptly attended to by physicians who are thoroughly acquainted with their constitutions; if they die, for even these glorious animals will not be exempt from that necessary and universal consummation, they will immediately enter into a new phase of existence, for what machine dies entirely in every part at one and the same instant?

We take it that when the state of things shall have arrived which we have been above attempting to describe, man will have become to the machine what the horse and the dog are to man. He will continue to exist, nay even to improve, and will be probably better off in his state of domestication under the beneficent rule of the machines than he is in his present wild state. We treat our horses, dogs, cattle, and sheep, on the whole, with great kindness; we give them whatever experience teaches us to be best for them, and there can be no doubt that our use of meat has added to the happiness of the lower animals far more than it has detracted from it; in like manner it is reasonable to suppose that the machines will treat us kindly, for their existence is as dependent upon ours as ours is upon the lower animals. They cannot kill us and eat us as we do sheep; they will not only require our services in the parturition of their young (which branch of their economy will remain always in our hands), but also in feeding them, in setting them right when they are sick, and burying their dead or working up their corpses into new machines. It is obvious that if all the animals in Great Britain save man alone were to die, and if at the same time all intercourse with foreign countries were by some sudden catastrophe to be rendered perfectly impossible, it is obvious that under such circumstances the loss of human life would be something fearful to contemplate—in like manner were mankind to cease, the machines would be as badly off or even worse. The fact is that our interests are inseparable from theirs, and theirs from ours. Each race is dependent upon the other for innumerable benefits, and, until the reproductive organs of the machines have been developed in a manner which we are hardly yet

able to conceive, they are entirely dependent upon man for even the continuance of their species. It is true that these organs may be ultimately developed, inasmuch as man's interest lies in that direction; there is nothing which our infatuated race would desire more than to see a fertile union between two steam engines; it is true that machinery is even at this present time employed in begetting machinery, in becoming the parent of machines often after its own kind, but the days of flirtation, courtship, and matrimony appear to be very remote, and indeed can hardly be realised by our feeble and imperfect imagination.

Day by day, however, the machines are gaining ground upon us; day by day we are becoming more subservient to them; more men are daily bound down as slaves to tend them, more men are daily devoting the energies of their whole lives to the development of mechanical life. The upshot is simply a question of time, but that the time will come when the machines will hold the real supremacy over the world and its inhabitants is what no person of a truly philosophic mind can for a moment question.

Our opinion is that war to the death should be instantly proclaimed against them. Every machine of every sort should be destroyed by the well-wisher of his species. Let there be no exceptions made, no quarter shown; let us at once go back to the primeval condition of the race. If it be urged that this is impossible under the present condition of human affairs, this at once proves that the mischief is already done, that our servitude has commenced in good earnest, that we have raised a race of beings whom it is beyond our power to destroy, and that we are not only enslaved but are absolutely acquiescent in our bondage.

For the present we shall leave this subject, which we present gratis to the members of the Philosophical Society. Should they consent to avail themselves of the vast field which we have pointed out, we shall endeavour to labour in it ourselves at some future and indefinite period.

I am, Sir, etc.,

CELLARIUS

[*Darwin Among the Machines* originally appeared in *The Press*, a daily broadsheet newspaper published in Christchurch (New Zealand), 13 June, 1863. It was reprinted by Henry Festing Jones in his edition of *The Note-Books of Samuel Butler* (London 1912), with a prefatory note pointing out its connection with the genesis of *Erewhon*, to which readers desirous of further information may be referred. The text printed here was taken from Samuel Butler: A First Year in Canterbury Settlement. With Other Early Essays, edited by R. A. Streatfeild, London 1914, pp. 179-185.]

A Community of Limbs

Samuel Butler's Co-Evolution of Man, Media, and Culture

Niels Werber

1. The Anthropocene as *The* Epoch of Man?

Three years ago, the *Zeitschrift für Medien- und Kulturforschung* (ZMK) turned to the *Anthropocene* in its *Debate* section. Christian Schwägerl and Reinhold Leinfelder started with an account containing many statistics and facts, demonstrating the epochal impact of human activity on the earth. Referring to Paul Crutzen and Eugen Stoermer,[1] the Anthropocene is regarded as an *age* in the geological sense,[2] which must be distinguished from other ages like the Holocene, Pleistocene, or Pliocene, because mankind has developed the ability to cause geo-historical change and appears as a significant and sometimes dominating environmental force. Schwägerl and Leinfelder assert: »A man deposits more than thirty times more sediment and rock through agriculture and building activity than was the case in the past 500 million years, without his intervention. He transforms entire water systems and dries up the interior of the Aral Sea« (MgE, p. 238). Phenomena such as this can be detected stratigraphically a thousand years in the future. Bruno Latour has quoted Crutzen as well. He argues that, for the first time, humans have to be regarded as the most important agents of sustainable change.[3]

However, in these contributions to the *Anthropocene* it is mentioned that it *cannot be humans* alone who, in their anthropological imperfection, have begun the epochal change, but Man as part of a global network, whose agents include not only human beings as *deficient creatures* (the notorious *Mängelwesen* of Herder and Gehlen), but also tools, machinery, cultural techniques and media. It is typical of the discourse of the *Anthropocene* to find contributions—such as Schwägerl's and Leinfelder's account entitled *The Man-Made Earth*—which indicate that Man cannot be made accountable »for problems such as climate change.« Furthermore,

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1 Paul J. Crutzen: Geology of Mankind, in: Nature 415 (2002), p. 23.
2 Christian Schwägerl and Reinhold Leinfelder: Die menschgemachte Erde [MgE], in: Zeitschrift für Medien- und Kulturforschung 5/2 (2014), pp. 233–240: 238.
3 Bruno Latour: Facing Gaia. Eight Lectures on the New Climatic Regime, Cambridge 2017, pp. 111–145.

a »problematic anthropocentrism« should be avoided (MgE, p. 238). Thus, the *Anthropocene* should not be misunderstood as the »age of man« (MgE, p. 236). If *anthropos* is not the key agent of the *Anthropocene*, should we not look out for a more appropriate candidate?

Schwägerl and Leinfelder list the »novel hybrids and fusions« of »creatures and technical objects«, whose *shared* agency leaves traces on earth which, according to geologists, form epochs.[4] Latour similarly mentions in his *Facing Gaia* lectures that »Humans‹ are pretty bad candidates to play the role of the Anthropos of the Anthropocene.« This ›role‹ is actually played by *actor networks*, consisting of countless human *and* non-human agents.[5] Man alone does not create an epoch, but humans do so as an »integral part of the earth system«, in interaction with other actors, such as machines, technologies, and media (MgE, p. 239). The Anthropocene includes steamers and ammonia reactors, but also »satellites, computers and the internet« (MgE, p. 237). Schwägerl and Leinfelder describe the »nature-culture-technology-society«—a single compound word in German, *Natur-Kultur-Technik-Gesellschaft*, a mere string of nouns connected by hyphens—»as an interacting […] overall system« (MgE, p. 237). Considering that humans only create a *geo-historical* epoch in a hybrid socio-technical ensemble, or as one element of an actor-network, it might be argued that the article by Schwägerl and Leinfelder should be titled »Media-Made Earth.«

From this perspective on humans and media, there is no essential distinction between the *Anthropocene* and the *Mediocene*. All conceivable differences become irrelevant when humans are not thought of as one side of the great nature-culture dualism, »biologically alive and technically created« (MgE, p. 233), but as one agent in an association with many other agents who collectively constitute the Mediocene as a »hybrid mode consisting of a recursive entanglement.«[6] This concept of a »recursive entanglement« of men and media has an early predecessor: Samuel Butler. His Darwinian hypothesis of a co-evolution of men and machines, life and culture, calls the problematic dualisms »of nature and culture«, »biologically alive and technically created« (MgE, p. 233), into question as well. Experimenting with

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4   »Contrary to the terminology of classical ecology, which is based on a clear separation of the organism and the environment, of culture and nature, the concept of the Anthropocene is concerned with challenging this separation as such.« Eva Horn: Jenseits der Kindeskinder. Nachhaltigkeit im Anthropozän, under: https://www.merkur-zeitschrift.de/2017/02/23/jenseits-der-kindeskinder-nachhaltigkeit-im-anthropozaen/#more-5536 (23 February 2017), my translation.

5   Niels Werber: Der letzte Κατέχων oder: Das Übel der Differenzierung. Latour, Luhmann, Schmitt, in: Soziale Welt 67/3 (2016), p. 267-280.

6   See: http://www.ikkm-weimar.de/en/events/the-mediocene/the-mediocene/; http://www.mediocene.org/ (23 January 2018).

a new view on »Machines«, the author interrogates as early as 1863 the differences between organic (incl. human) and »mechanical life.«[7]

2. The Mediocene as a Community of Limbs

»What is a man's eye but a machine for the little creature that sits behind in his brain to look through? […] What has made man familiar with the scenery of the moon, the spots on the sun, or the geography of the planets? He is at the mercy of the seeing-engine for these things, and is powerless unless he tack [sic] it on to his own identity, *and make it part and parcel of himself.*«[8]

While the eye is called a »machine«, telescopes and microscopes form a part of the visual apparatus: Optical media and sense organs merge into a higher unity. This passage anticipates Ernst Kapp's philosophy of technology, which regards technical media as »continuations of the organism« or as a » projection of organs«,[9] and the idea that this relation is based on reciprocal »enhancement.«[10] In his novel *Erewhon* from 1872, Samuel Butler elaborates the theory based on the idea that every technical »invention increases the efficiency« of the human »body«, in the sense of an externalizing projection. Additionally, our body, together with its ›organ projections‹, composes a »*community of limbs*« (E, p. 119) Humans are said to form a collective of physical and »external bodies«, of organs and media. Man is not a ›prosthetic god‹ (Freud) but an agent in a socio-technical network.

The railway and the telegraph, Butler goes on, increase the speed and range of Man's communication. The media community that mankind is part of shapes people socially because media determine the mode of social organization and the development of mankind as a species. The media ensembles and their enhancing effects are said to create new hominid »species« and »subspecies«. A person who, for example, can »tack on a special train to his identity and go wheresoever he will, whensoever he pleases,« is »more highly organized than he […] whose legs are his only means of locomotion,« (E, p. 120). These are not only individual organs

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7 Samuel Butler: Darwin Among the Machines (1863), in: Zeitschrift für Medien- und Kulturforschung 9/1 (2018), pp. 61-64: 61.

8 Samuel Butler: Erewhon [E] (1872), North Charleston 2013, p. 107 (emphasis added by NW).

9 Ernst Kapp: Grundlinien einer Philosophie der Technik. Zur Entstehungsgeschichte der Kultur aus neuen Gesichtspunkten (1877), edited by Harun Maye and Leander Scholz, Hamburg 2015, p. 36-37.

10 Stefan Rieger: Die Individualität der Medien. Eine Geschichte der Wissenschaften vom Menschen, Frankfurt am Main 2001, p. 320.

transformed into tools, but ensembles that emerge through the »attachement« of machines, techniques, hence also media to human organs and networks. The man who takes the »special train« is said to be »more highly organized« than a man who goes by foot. Media networks not only associate and collectivize cultures; they also stratify and differentiate them.

However, *Erewhon* takes a significant step beyond the anthropocentric theories of organ projection by showing that humankind is a social community not only due to media. Rather, as long as its organs, bloodstream and nerve-cords all consist of »infinite living agents«, man is a mere »swarm of parasites«. In saying that it is »doubtful whether his body is not more theirs than his«, Butler's narrator challenges the asymmetry of Man and media (E, p. 108). »Who can draw the line? Who can draw any line? Is not everything interwoven with everything? Is not machinery linked with animal life in an infinite variety of ways?« (E, p. 119). Drawing a line would be easy for an anthropocentric observer, but from the standpoint that Butler establishes, what is at stake is the capacity of line-drawing to make effective distinctions. In *Erewhon*, Michel Serres and Bruno Latour would find an elaborate thesis on the evolutionary advantages of parasitism and networks, which explicitly includes non-human actors. »Machines« explicitly belong to the »community of limbs«, which constitutes man.[11] The well-established distinctions between machinery and men, between the living and the artificial are brought into question: »Who can pull the divider? Who can pull a partition anywhere? Is not everything interwoven with everything?« (E, p. 104).

Machines and Man are cooperating like parasites and their hosts:

»The fact is that our interests are inseparable from theirs, and theirs from ours. Each race is dependent upon the other for innumerable benefits, and, until the reproductive organs of the machines have been developed in a manner which we are hardly yet able to conceive, they are entirely dependent upon man for even the continuance of their species.«[12]

From a »human point of view«, Butler argues, the differentiation and sorting that are necessary for established dualisms come easy, »but mankind«, he adds, »is not everybody« (E, p. 105). Dissolution of the asymmetrical dichotomies of subject and object, master and servant, nature and culture, is especially notable, when we, following *Erewhon*, observe the »agencies« (E, p. 118) which connect people, machines, and organisms and which aggregate them into higher units. We see

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[11]   Cf. Gilles Deleuze and Félix Guattari: Anti-Ödipus. Kapitalismus und Schizophrenie I (1972), Frankfurt am Main 2014, p. 368.

[12]   Butler: Darwin Among the Machines (as note 7), p. 63.

»combinations« (E, p. 115) everywhere that might be ignored (or purified)[13] for reasons of epistemological comfort (cf. Latour's *moderns*), which is why »our ignorance« remains unbroken (E, p. 116). The anthropocentric hubris, that man is the master of the earth, and that the tools, machines, and everything living are only his servants, meets its reply in Butler: »This is all very well. But the servant glides by imperceptible approaches into the master; and we have come to such a pass« (E, p. 108) that *we serve* the machines[14] and »man's very soul« must be called »a machine-made thing« (E, p. 108). Man is a product of co-evolution with his machines: »it is the machines which act upon man and make him man, as much as man who has acted upon and made the machines« (E, p. 117). Man and machine, culture and nature co-operate in the medium of their limbs and organs (E, p. 116). The self-regulation of the machines (e.g. the »governor« in steam engines) is a central argument for the assumption that »the difference between the life of a man and that of a machine is one rather of degree than of kind« (E, p. 116). Both man and machine similarly exist and evolve in the mode of a feedback loop and in combination with innumerable other agents. Butler has described this decentered human agent as a member of a »group of parasites«, an element of a »machine-park«, and as part of a »superorganism« (E, p. 108 & 114).

In the fictional world of the dystopian novel *Erewhon*, this threat of disempowerment of the ›godlike‹ man is so severe that all machines are destroyed, so that man remains the master of the world. Cellarius, the alias of Butler in *Darwin among the Machines*, concludes his treatise with the same recommendation: »Our opinion is that war to the death should be instantly proclaimed against them.«[15] But the reason for this extreme advice is the firm conviction that »we have raised a race of beings«, i.e. machines, as an evolving »species«.[16] Hence, the inhabitants of Erewhon dare not undertake the experiment of forming a joint ›actor network‹ with machines and other non-human agents.

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13   Bruno Latour: We Have Never Been Modern (1991), Cambridge, MA 1993.
14   »An army of servants do the machines […] employ.« Ibid., p. 110.
15   Ibid., p. 64
16   Ibid., p. 61

3. The Mediocene

According to Foucault, the sciences of man will not awake from their »anthropological sleep«, until they refuse to speak »about man, about his reign or his liberation«, and when they refuse »to think that it is man who is thinking.«[17] Butler, by contrast, is distinctly awake. Roused by Charles Darwin, the 28-year-old sheep farmer expands evolutionary theory, then still quite young, into a vision of the mutual growth of the organic, technical and social. With the help of evolutionary theory, Butler detaches his own theory of organ projection—which in many aspects anticipates Ernst Kapp, Sigmund Freud and Marshall McLuhan—from its anthropological centering,[18] and translates it into a hypothesis of a socio-technical »community of limbs«, constituted by man and machine (E, p. 119). When looking at this »community of limbs« and following the interconnections between its living and non-living elements, one arrive both at machines and at all artificial and natural actors, living or dead, whose networking and cooperation constitute the media ecology, not only of man but also of the world.

To sum up and conclude: *First*, Butler's narrator states that evolution is a global process involving not only plants, animals and humans, but also technologies, machines and cultures. In this sense, evolution is always co-evolution. The evolution of a species never takes place in mere isolation, but always jointly with a »community of limbs« (E, p. 311). *Second*, Butler conceives the symmetrical integration of Man and his socio-technical culture into a global ecology: »The air we breathe is hardly more necessary for our animal life than the use of any machine, on the strength of which we have increased our numbers, is to our civilisation; it is the machines which act upon man and make him man, as much as man who has acted upon and made the machines« (E, p. 117). And *third*, the integration of machines into man's »community of limbs« (E, p. 119) marks an epochal shift to geological time as the pace of the common evolution of this very network of actors, accelerating significantly (»rapid«) since machines and media are a part of it (E, p. 107).

The fast evolvement from the »cumbrous clocks of the thirteenth century« to the small and elegant late 19th century watch is an example and allegory for this vast evolutionary speed of »mechanical life«.[19] With the invention of the steam engine, which Schwägerl and Leinfelder also consider as an important agent of the Anthropocene (MgE, p. 239), the relative tardiness of evolution on earth had come

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[17] Michel Foucault: The Order of Things. An Archaeology of the Human Sciences (1966), London 2002, pp. 340-43.
[18] Cf. Friedrich Kittler: Optische Medien. Berliner Vorlesung 1999, Berlin 2002, p. 23.
[19] Butler: Darwin Among the Machines (as note 7), p. 61.

to an end: »Reflect upon the extraordinary advance which machines have made during the last few hundred years, and note how slowly the animal and vegetable kingdoms are advancing. The more highly organized machines are creatures not so much of yesterday, as of the last five minutes, so to speak, in comparison with past time« (E, p. 104).

However, Man, as a (very slow) element in a community of limbs, could hardly be declared as an epochal factor on its own. This is highlighted by Niklas Luhmann in his essay on the *Problem of Epoch Formation*: »Humans have existed, who knows for how long. But even if they did not live peacefully, they at least lived harmlessly, and if they did not live in an idyllic paradise, they at least did not have any significant influence on their environment.«[20] Only as an associate in a »community« of machines and parasites with self-regulating and rapidly evolving media does man finally become epoch-making. Since Butler makes it very clear that mankind is not the master of media ecology, of which he is only a part, one must conclude: The Mediocene *avant la lettre* was first proclaimed by him, in 1863 and in 1872. Of course, nobody heard the call. Butler was ›only‹ a sheep farmer, *Darwin among the Machines* just another letter to the editor, and *Erewhon* ›only‹ a novel. And to be sure, in the fictitious world of *Erewhon* the Mediocene never begins, because all machines, complex as the steam engine, have been destroyed, allowing man to return to his harmlessness and to lack influence once more. In our time, this has not been the case. And this is the reason why our world can be understood as an evolving network of intertwined »communities« of limbs and lobes, living and non-living, cybernetic and prosthetic agents. This is the age of the *Mediocene*.

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[20]   Niklas Luhmann: Das Problem der Epochenbildung und die Evolutionstheorie, in: Hans-Ulrich Gumbrecht and Ursula Link-Heer (eds.): Epochenschwellen und Epochenstrukturen im Diskurs der Literatur- und Sprachhistorie, Frankfurt am Main 1985, pp. 11–33: 11.

From *Anthropocene* to *Mediocene*?

On the Use and Abuse of Stratifying the Earth's Crust
by Mapping Time into Space

Georg Toepfer

THE TERM *mediocene* comes as a surprise. As it was introduced in the title and announcement of a conference in Weimar, it obviously can be understood with reference to media and media processes. To be sure, we are living in an era of mass media in which communication and all kinds of decision making depend on media. However, there is another understanding of the term based on the old meaning of ›media‹, the 19th century understanding, which referred to the world surrounding us—to the environment. With this understanding in mind, the mediocene would be the era of the environment. This, too, sounds very familiar to us. We are living in the era of the environment; the environment has become important for us, it increasingly is at the focus of our attention, especially the media, in which and from which we live, the air, water, and biosphere surrounding us. My contribution is primarily about this understanding of media in the sense of the environment to which we are related.

Paradoxically, focusing on media may end up not with an emphasis, but with the disappearance, the dissolution of the environment. This is because media, as devices that connect things, tend to eliminate the environment as something which is outside of the system. The effect of media is to integrate everything into the system, to dissolve boundaries, to conceptualize systems as being co-produced by their communications, i.e. by their environment. The overall effect of this binding everything together is the loss of the outside. Thus, media in the sense of connecting devices tend to eliminate the medium in the sense of the environment of a system. Or, to put it in another way: The mediocene as the era of the environment, or of environmental concern, is being eradicated by the mediocene as the era of media processes.

Although the first component in the new term mediocene, the medium, seems to be the more interesting one, I would like to get started with the second component of this neologism, with the *-cene*. This component is most often used in the sense of »era, age, a period of time following after another period of time.« But, as a little knowledge of Greek reveals, this is not the literal meaning of *-cene*.

1. *cene*-Terminology

In a letter dated January 21, 1831, the eminent geologist Charles Lyell asked the Reverend William Whewell from Cambridge for advice on naming the different strata of the Tertiary formations around Europe. In this letter there was a little table. It was a hierarchical division of the most recent periods of earth history into several formations.[1] On the highest level, there were first contemporary formations, and second tertiary formations. The tertiary formations, which as we know now cover the period from 65 million to 2.6 million years before present time, were divided by Lyell into the older »proeliminal« and the more recent »liminal« period. For these he finally proposed another division into four periods: »asynchronous«, »eosynchronous«, »meiosychronous«, and »pleiosynchronous.«

In the text of this letter, Lyell justifies his division of time by pointing out that he feels quite sure about Tertiary and Contemporary formations on the basis that only the latter contained human remains, »anthropites«, as he calls them. Lyell also wrote to Whewell that he was »quite sure« that his three groups of Eosynchronous, Meiosynchronous, and Pleiosynchronous are »natural.« Although he does not explain what he means by that, it seems obvious that what he means is that they were distinct formations on the basis of his methodology. What was his methodology? It consisted of comparing and counting fossils, especially of mollusks, in different regions around Europe. Lyell received his knowledge on these fossils mainly from Gérard-Paul Deshayes, a French conchologist whom Lyell visited in Paris in autumn 1830. Lyell called Deshayes »the strongest conchologist in Europe« and said that he was »acknowledged to be the Cuvier of tertiary shells.«[2] Furthermore, he possessed a private collection of over three thousand living and fossil mollusk species, and it was this collection that Lyell went to study with Deshayes in 1830. From Deshayes he learned to separate different geological layers on the basis of the mollusk fossils they contained. He observed the appearance and disappearance of different species, compared different layers, and characterized them by counting how many species they shared with the most recent layer, the contemporary formation.

By using this method, Lyell distinguished four tertiary formations. His quantitative criterion for their distinction was that the oldest layer, the Asynchronous formation, does not share any fossil mollusks with the contemporary formation; the Eosynchronous had about 1%, the Meiosynchronous about 30%, and the Pleio-

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1   Charles Lyell: [Letter to William Whewell, Jan. 21, 1831], in: Leonard G. Wilson: Charles Lyell. The Years to 1841. The Revolution in Geology, New Haven 1972, p. 305.
2   Martin J.S. Rudwick: Worlds before Adam. The Reconstruction of Geohistory in the Age of Reform, Chicago 2008, p. 287.

synchronous about 65 to 95% of fossil species in common with the contemporary formation.

At that time not only Lyell used the method of counting the number of species in different locations and calculating the proportion of overlap with recent faunae. It was also used by the German geologist Heinrich Bronn who provided »statistical tables« in a book that appeared in 1831.[3] In this table, the last column gives the proportion of the fauna of one region relative to the recent fauna in decimal terms.

Bronn and Lyell performed these calculations and reached similar conclusions on how to divide the tertiary formation into subformations. Lyell, however, wasn't happy on how he named these strata. Therefore, he sought expert advice and wrote the letter I mentioned earlier to William Whewell. And Whewell responded after ten days, on January 31, 1831:

»The termination *synchronous* seems to me to be long, harsh, and inappropriate. For the fact to be described is not that the species are contemporary *with us*, the wretched materials for future *anthropites*; but that they are identical with *recent* species which we take for our type of comparison. I would therefore use a term expressing either *identical* or *recent*; perhaps better the last. Then your terms would be 1 aneous, 2 eoneous, 3 meioneous, 4 pleioneous.«[4]

However, in a postscript to this letter, Whewell added another proposal that he preferred to his first. He wrote: »It has occurred to me that kainos is a better word than neos, and I propose for your four terms, 1 acene, 2 eocene, 3 miocene, 4 pliocene.« These terms appeared to Whewell to be »shortest and best.«[5]

Lyell agreed with Whewell as he happily adopted this last proposal—and ever since, so do we. We may call this letter by Whewell, dated January 31, 1831, the birth of *cene*-terminology.

In his book, the third volume of the *Principles of Geology*, that appeared two years later, Lyell wrote: »We derive the term Pliocene from *pleion*, major, and *kainos*, recens [this is the Latin word], as the major part of the fossil testacea of this epoch are referrible to recent species.«[6] So this is the meaning of the term. The component *-cene* is derived from Greek *kainós* which means »new, fresh, recent.« *Pliocene* means »predominantly recent«, as most of the species found as fossils in these strata have survived to recent time. Correspondingly, *Miocene* means *meios*, or that few

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3   Heinrich Georg Bronn: Italiens Tertiär-Gebilde und deren organische Einschlüsse, Heidelberg 1831.

4   William Whewell: [Letter to Charles Lyell, Jan. 31, 1831], in: Wilson: Charles Lyell (as note 1), p. 306.

5   Ibid., p. 307.

6   Charles Lyell: Principles of Geology, Vol. 3, London 1833, p. 53.

of the fossils in these strata are recent, and *Eocene* refers to the *eos*, the dawn or the faintly recognizable beginnings of recent fauna. Later, in the 1860s, this terminology was completed with the most recent term *Holocene*, which means »wholly or entirely recent« because all of its fossils belong to species still existing nowadays.

Consequently, *Mediocene* literally means »Media of the recent time, recent media.« As it is a word combining a Latin and a Greek component, Lyell would not have liked it; he often opposed words which are, as he called them, a »bastard offspring of Greek and Latin.«[7] But this is not what I wanted to point out. We now have many »bastard words« of that kind. In addition, the component *–cene* often is taken to mean »era, age, period of time.« So, bearing this in mind, *mediocene* might be a good term because one is easily able get a quick idea of its intended meaning.

My main point in this section is that the geological practice of dividing time into a sequence or series of succeeding phases heavily depends on deposits, their quantification, and their change in time. A geological stratum could thus be characterized by a set of typical species, its characteristic fauna, *Leitfossilien*, guiding fossils, as they were called a few years later.[8] One example is mollusk shells selected by Deshayes as characteristic of the »Pliocene Tertiary Period.« This regular change of forms in the fossils of succeeding geological layers introduced a temporal dimension into the research field known as natural history. Traditionally, despite the use of the term ›history‹, this field had no temporal dimension. It simply comprised the descriptive knowledge of natural objects and the practices of collecting, observing, and systematizing them.

This understanding changed fundamentally, two generations before Lyell, in the last decades of the eighteenth century. The decisive steps were taken in the 1770s, most prominently by the French naturalist Georges Buffon, who advanced a temporal understanding of natural history in the initial sentences of his book *Epochs of Nature*. Here, he compared the history of nature to the history of mankind. He speaks of nature's archive in analogy to civic archives, and this comparison refers particularly to the level of methods, the techniques of accessing the past, and the interpretation of its remnants. In both kinds of historiography it is necessary, according to Buffon, to screen, decipher, and interpret the historical remains. In his words, »in natural history it is necessary to excavate the world's archives [les archives du monde], to extract ancient monuments from the earth's entrails, to collect their remains, and to assemble in a body of evidence all the marks of physical changes that are able to take us back to the different ages of nature.«[9]

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[7]   Ibid.

[8]   Julius Ewald and Ernst Beyrich: Ueber die Kreide-Formation im südlichen Frankreich, in: Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde 12 (1839), pp. 559–567: 562.

[9]   Georges Buffon: Les époques de la nature, Paris 1778, p. 1.

Reconstructing the ages of nature—this was the geologist's program for the next decades. It resulted in numerous tables, diagrams, and charts of the stratigraphy of the earth, starting with James Hutton's sketch of geological strata at Siccar Point in 1788.[10]

The iconic logic of these pictures is diagrammatic because it consists in mapping non-spatial relations into space—in the case of geological stratification, it is the sequence of time mapped into space. The temporal sequence of different kinds of fossils is mapped as a spatial sequence of deposits. This is first done by nature, so one may think of the geological process of depositing strata as a diagrammatic operation by itself: mapping non-spatial relations into space. And this operation is reproduced in the geologists' charts that assign names and a time scale to the different strata. The criterion for age is the amount of similarity between the older fossils and the more recent ones. This logic was already established in the early years of the 19th century, e.g. by Heinrich Steffens,[11] and it was quantitatively applied by Charles Lyell in his Plio-/Mio-/Eocene-terminology beginning in 1831.

A particularly beautiful example of this diagrammatic logic of geological stratification can be found as the frontispiece of an 1851 textbook by the two American paleontologists Louis Agassiz and Augustus Gould.[12] In this circular diagram, the series of geological strata is indicated by different colours. It is not just a sequence, but also a differentiation of forms starting in the centre of the circle, with four basic body plans that unfold into diverse types as time passes. In contrast to a tree, which has roots and a top, the circle suggests a kind of equality among the forms, with no one being higher or lower than any other one. But obviously, this is not true in this case because at the top of this circle stands man, and he possesses the crown. Man, however, is not only at the top of this circle, he also is everywhere in the outermost layer of this circle, a ring shaded in grey, the »Human Epoch« as it is called (and as it was called by Lyell before).[13]

This epoch has been called the »Anthropocene« on the basis that human life has a massive impact, at least since the 20th century, on the functioning of the Earth-

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[10] Jack Repcheck: The Man Who Found Time. James Hutton and the Discovery of the Earth's Antiquity, London 2003.

[11] Henrik Steffens: Beyträge zur innern Naturgeschichte der Erde, Freyberg 1801, p. 86: »[Die] ältern Versteinerungen sind zugleich diejenigen, die von den jetzt bekannten Thierformen am meisten abweichen«.

[12] Louis Agassiz and Augustus A. Gould: Crust of the Earth as Related to Zoology, in: Outlines of Comparative Physiology, ed. by Thomas Wright, London 1851, Frontispiece.

[13] Lyell: Principles of Geology, Vol. 3 (as note 6), p. 52: »Some authors apply the term contemporaneous to all the formations which have originated during the human epoch.«

system as a whole.[14] The question is whether the mediocene could be seen as a comparable geological epoch.

2. The Mediocene as a Geological Epoch?

The organizers of the conference in Weimar propose this view by considering »media and media-processes as epoch-making.«[15] They are a »determining force« and they leave a »permanent imprint on the world«, as they write in the conference outline.

One advantage of this view might be that it is less anthropocentric. The term ›mediocene‹ does not focus on man as a biological species with a certain structure of its body that would leave characteristic deposits in geological strata. Rather, it refers to man as being part of a transformative process activating and bringing into contact many diverse things.

This also means that the mediocene, as I understand it, is not about individualized objects known as fossils. In the mediocene, the deposits consist of interrelated objects of inorganic, organic, and anthropogenic origin; the deposits are de-individualised forms that do not correspond to a single individual or species that once has been alive.

Another advantage of the term might be that it does not refer exclusively to material processes. Apparently, the mediocene is about media, and media always have a non-material dimension. One of their essential points seems to be that they establish relationships, and these can be fairly immaterial. In reviewing important media of the past, from railroad tracks to telephone wires to mobile phones, one can get the impression that there is a decreasing amount of matter involved. To be sure, all these media will leave their material traces—in particular the rare-earth elements residing in our mobile phones—in the geological record. However, in my understanding, material deposits are not the essence of the mediocene.

This even seems to be a distinguishing feature of the mediocene: In contrast to traditional geological strata, the mediocene does not primarily refer to deposits but to a shift in the importance of media. The story of the mediocene is not a story about deposits, but about entanglement. The new thing is not just a new deposit that is added to the shells and mineralized bones of fossil species, it is not that man's deposits can be found everywhere on the globe. This is true of many

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[14]   Paul J. Crutzen and Eugene F. Stoermer: The ›anthropocene‹, in: Global Change Newsletter 41 (2000), pp. 17–18.

[15]   Program for the Conference »The Mediocene«, Internationales Kollegs für Kulturtechnikforschung und Medienphilosophie (IKKM), Weimar, May 31 – June 2, 2017.

other organisms as well. The major change is that the environment becomes part of a singular managed global system. Thus, the new thing of the term refers to a shift in the relationship between life and its environment, a radical shift, a turning point. So the term introduces a dichotomy: we have, on the one hand, the *mediocene* and, on the other, everything before—the *amediocene*, if you will.

In order to get a clearer understanding of this turning point, I would like to focus on the traditional understanding of the relationship between organism and environment.

3. The Organism and its Medium

In the German tradition of the philosophy of biology, especially in theories of the organism, the environment is usually depicted as being the complement of an organism. In diagrammatic representations, the organism is shown as a network of interrelated elements that is clearly separated from its surroundings and which forms a kind of integrated holistic system. However, despite its physical closure, the system of the organism is somehow related to its environment. There are activities from the organism that are directed towards its environment and there are reverse influences from the environment on the organism.

However, the main point in the classical understanding of organisms is that their environment is not part of the system. Although there are interactions between the organism and its environment, these interactions are clearly distinct from the interactions between the parts of the organism. Within the organism the parts mutually depend on each other, they stand in a relation of interdependence; no part would exist without the influence of the other parts of the system. In contrast to this, the relationship of the organism towards its environment is merely a unidirectional action or, in some cases, an interaction: The organism as a whole may depend on certain elements of its environment, but these elements do not necessarily depend on the organism. Most terrestrial organisms depend, for example, on the sun, but the sun does not depend on terrestrial organisms. Therefore, the sun is part of their environment and not of the organism itself.

This is the traditional view of the environment as a given, as something which does not form part of the system. However, many organisms are able to transform their environment to suit their needs. Well-known examples are these: Birds build their nests by using twigs and leafs they find in their environment, and beavers even log trees to construct their dams for protection and food supply. These are clear examples of ›niche-construction‹, as biologists call it: animals constructing their own environment. In these cases, one may think of the animal together with the transformed parts of its environment as a system of a higher order. Like the

organism, it is a system of interdependent parts: the dam depends on the existence of the beaver, and the beaver in turn depends on its dam.

In man, this capacity to transform the environment has been brought to perfection. Some anthropologists—most notably Arnold Gehlen in his classic *Man, his Nature and Place in the World*—have even grounded their definition of what man is on this capacity. Gehlen wrote in 1940: »Man is incapable of surviving in truly natural and primitive conditions […]. He must make up for his loss of means on his own by actively transforming the world to suit his own ends.«[16]

This transforming activity could also be expressed by saying that man converts the environment into a part of an encompassing system. To my understanding, this is the fundamental process of the mediocene. During this process, the environment changes its status from nature to culture or technology. Interestingly, this change has also taken place in the conceptual history of the term ›medium‹, to which I will now briefly turn.

4. The Shift of Media from the Environment (Nature) to the System (Technology)

The 19th century meaning of the term ›medium‹ was ›environment‹. It especially referred to the natural elements such as water, earth, fire, and air. To give just three arbitrary examples for this usage: »To maintain the living organism, a certain external medium must be present« (1863)[17]; »The external conditions of existence‹ is […] the correct definition of the Medium« (1868)[18]; »[the] relation of Organism and Medium is […] the most fundamental of biological data« (1868)[19].

At the end of the century, when microorganisms were cultivated in the laboratory, the term was applied to the substance in which these organisms are cultured. These are the culture media. Media in general, then, are material structures and conditions in which living beings sustain and unfold their lives.

The term was so important for biology that an entire discipline, or at least subdiscipline, of biology was proposed for the branch of science that deals with the relationship between organisms and their environment. Its name was *Mesology*. The term was introduced in 1860 by the French naturalist and statistician Louis-Adolphe Bertillon. He defined mesology simply as the »science of the media« (»*science des milieux*«) or of the mutual relationship existing between living beings

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16   Arnold Gehlen: Man, his Nature and Place in the World (1940/62), translated by Clare McMillan and Karl Pillemer, New York 1988, p. 29.
17   Transactions of the Medical Society of the State of New York 1863, p. 28.
18   The Fortnightly Review 10 (1868), p. 64.
19   Ibid., p. 63.

and their surroundings.[20] Bertillon thought of the medium, or milieu, as something on an equal footing with the organism. He was interested in the reciprocal relationship between organism and environment, the one influencing the other and vice versa. For biology, this was important at that time because Lamarckism, the inheritance of acquired characters, still was a valid option.

But this symmetrical understanding of the medium—not as an instrument but as a determining force—gradually disappeared since the end of the 19th century, when the term ›medium‹ was increasingly applied to the channels of mass communication, to newspapers, radio, television, etc. With this new understanding, media were seen predominantly as instruments, devices that were designed and used for intended purposes.

I have the impression that the idea of a mediocene goes back to the older, symmetrical understanding of the term ›media‹ in the 19th century, when they were not seen as instruments but as forces influencing and forming organisms. With this symmetrical understanding of organism and medium—one influencing and shaping the other—a new system of interaction and of interdependence is established—which is the mediocene. In the mediocene, media bind and couple things together, whether they are inorganic, organic, or anthropogenic. The result of this coupling is that the organisms, at least the human organisms, are amalgamated with their environments. Man becomes inseparable from his environment.

5. The »Dissolution of the Environment« and Universal Interrelatedness

»We are in everything«, as the German author Andreas Maier has put it in a melancholic essay with the title »Nature Was Yesterday.«[21] We are even in our songbirds in the garden, such as the robin. It is not pure nature anymore, it exists in habitats that we have created, and it is an object of our concern and care.

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[20] Louis-Adolphe Bertillon: Revue de biologie. Presse scientifique des deux mondes, in: Revue universelle du mouvement des sciences pures et appliqués 1 (1860), pp. 119-131: 124/5; cf. id.: Mésologie, in: Dictionnaire encyclopédique des sciences médicales, 2e série vol. 7 (1873), pp. 211-266: 211/2: »Mésologie […]. Science des milieux, ou science qui a pour objet la connaissance des rapports qui relient les êtres vivants aux milieux dans lesquels ils sont plongés: c'est dire que cette science s'efforce de découvrire les influences réciproques que les deux termes en présence, le milieu et l'être immergé, exercent l'un sur l'autre, ainsi que les modifications qui résultent pour chacun d'eux.«

[21] Andreas Maier: Natur war gestern, in: Die Zeit, Nr. 13, March 24, 2011, p. 49: »Natur war gestern […] Es gibt keine Wiese und kein Rotkehlchen mehr, die von uns unberührt wären. […] Sie (Wiese, Rotkehlchen) sind, und ich meine es gar nicht metaphorisch, neuerdings nur noch Existenzen von unseren (technischen) Gnaden. […] Es bedeutet,

This outcome of dedifferentiation can be seen as a product of media. Media are the devices that eradicate dichotomies, e. g. the dichotomy of nature and culture, or nature and technology. Bound together by media, one cannot tell anymore where nature starts and technology ends. As I understand it, in this activity of providing connections media are comparable to narratives: both supply relations, and put into contact.

By their capacity to bind things together, media make the medium disappear. In the mediocene the media are becoming part of the system. Consequently, the beginning of the mediocene is the point in history where the medium has vanished. In his 2013 Gifford Lectures *Facing Gaia*, Bruno Latour called this step the »dissolution of the environment.«[22] He writes:

»The humblest props now play a role, as if there were no distinction any more between main characters and the environment drawn around them. Except for deep molten rocks inside the Earth and deep space beyond the thermosphere, every single element of the background is brought to play its part in the foreground. Every thing that was a mere intermediary for transporting a strict concatenation of causes and consequences becomes a mediator adding its grain of salt to the narrative. In Lovelock's terms, life and climate evolve together and function as two sides of the same phenomenon.«[23]

The only true environment that is unaffected by the nature-culture system on earth and which still remains as untouched but essential environment is extraterrestrial. It comprises particularly the sun. The sun certainly remains environment because it is not altered by terrestrial agents. Perhaps this will change at some point in history; perhaps future intelligent beings on earth—or elsewhere—will be able to regulate the process of nuclear fusion which takes place in the sun. Then, the sun will also be part of one gigantic system which may have lost its environment completely.

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dass ich nur noch in einem holistisch geschlossenen Menschenraum lebe, der bis an die Grenzen von Menschenwillen und Menschentaten und Menschensünden angefüllt ist. Dass ich in einer Welt lebe, in der ich, selbst wenn ich ein Rotkehlchen sehe, die gesamte zivilisatorische Menschheit in diesem Rotkehlchen mitsehen muss. […] Es gibt nichts mehr ohne uns. Wir sind in allem.«

[22] However, this phrase does not appear in the version of the lecture which was published as a book with Cambridge University Press in 2017. It only occurred in the manuscript which circulated before the book was published: Bruno Latour: Facing Gaia. Six Lectures on the Political Theology of Nature. Being the Gifford Lectures on Natural Religion, Edinburgh, 18th–28th of February 2013, p. 69.

[23] Ibid., p. 63. The version of this passage published in the book is much less clear; cf. Bruno Latour: Facing Gaia. Eight Lectures on the New Climatic Regime (2013), Cambridge 2017, Third Lecture.

In science fiction novels, worlds of this kind already exist, e.g. in Stanislaw Lem's *Solaris*. ›Solaris‹ is the name of a distant planet that is almost completely covered with an ocean that appears to be a single planet-encompassing organism. Lem describes this organism in the following manner: »unlike terrestrial organisms, it had not taken hundreds of millions of years to adapt itself to its environment—culminating in the first representatives of a species endowed with reason—but dominated its environment immediately.«[24]

So Lem claims that this ocean-organism still has an environment, but that it is dominated or controlled by the ocean. Therefore, one might also think of an entity which is dominated not as an environment, but as a part of the organism. In Lem's imagination the ocean is even capable of exerting an active influence on the planet's orbital path.

This organism really seems to be a *Fechneria mirabilis*, as Ernst Jünger termed an individual superorganism of planetary dimensions.[25] And this naming *Fechneria* points to the fact that already in the 19th century there were visionary ideas about global systems of interdependence, a »terrestrial total organism« (*irdischer Gesammtorganismus*) as Gustav Theodor Fechner called it in 1848.[26]

This ecological idea of a global system of interconnectedness has now also been propagated by the Catholic Church. In the encyclical *Laudato si'*, published in 2015, Pope Francis puts forth an »integral ecology« which is characterized by these claims: »everything is interrelated« (120), »Nature cannot be regarded as something separate from ourselves or as a mere setting in which we live. We are part of nature, included in it and thus in constant interaction with it.« (139); [there is a] »universal fraternity« (228); »[t]he world, created according to the divine model, is a web of relationships. […] Everything is interconnected.« (240)[27]

All non-human beings are explicitly included in this picture of interconnectedness. An intrinsic value is even assigned to non-human species. This is a remarkably modern approach inspired by ecological thinking of our time. However, it seems to be difficult to understand how this could be a Catholic position, since the

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24　Stanislaw Lem: Solaris (1961), translated by Joanna Kilmartin and Steve Cox, London 1971, Chapter 2.

25　Ernst Jünger: Grenzgänge (1965), in: Sämtliche Werke, Bd. 13, Essays VII, Stuttgart 1981, pp. 175-192: 186: »Ist überhaupt Individuation notwendig? Heberer, mit dem ich darüber korrespondierte, bejahte es. Ich könnte mir Welten denken, die von einem einzigen Wesen besiedelt, plasmatisch überwuchert wären von einer Fechneria mirabilis als universalem Individuum.«

26　Gustav Theodor Fechner: Nanna oder über das Seelenleben der Pflanzen, Leipzig 1848, p. 308.

27　Pope Francis: Laudato si' (2015), Encyclical Letter of the Holy Father Francis on Care for Our Common Home, under: http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html (1 February 2018).

idea of ecological interrelatedness is far more difficult to reconcile with Catholic dogmas than is the idea of genealogical descent. Descent seems to be much more compatible with the idea of God as a central agent and with man having some exquisite position in the cosmos. In contrast, the idea of universal interrelatedness, i. e. the mediocene, as I understand it, does not leave much room for central agents and hierarchical top-down interventions. But this is not my problem and I leave it to Catholic thinkers to solve it. There are many of them, even among the prominent predecessors of the mediocene, such as Teilhard de Chardin, McLuhan, and Latour.

To sum up: I started with Lyell and the practice of geological stratigraphy to separate different deposit strata on the basis of their relative amount of recent species. For this purpose, Lyell, with the assistance of William Whewell, designed the terminology of ›Eo-‹, ›Mio-‹ and ›Pliocene‹ as formations of the tertiary. I then turned to the Mediocene and explained that in my view it is different from geological epochs insofar as the mediocene is not a story about physical deposits, but is about relational entanglement. The major change taking place in the mediocene is that the environment has become part of a singular managed global system. This innovation refers to a shift in the relationship between life and its environment, a radical shift, a turning point. This introduces a dichotomy between *amediocene* and *mediocene* which also generates a kind of paradox because in the amediocene we have a clear separation between organisms and their environment. Thus there still is a medium in the classical 19th century sense, whereas in the mediocene the media have coupled everything together to the point where there is no environment left, to the point where the system is everywhere. This means, paradoxically, that we have lost the medium in the mediocene. I further tried to show that there has been a change in the conceptual history of the term ›medium‹, from the 19th century, when it was associated predominantly with the elements of nature, to the 20th century, when it came to designate technological devices. A third change would be in the mediocene where everything comes together and in which the sharp distinction between organism and medium no longer makes sense. My final step was to present some positions embracing the new universal interrelatedness in the mediocene, namely Bruno Latour's theoretical approach, Stanislaw Lem's science fiction story about the ocean that controls its environment, and Pope Francis' Catholic »integral ecology.«

Materializing the Medium

Staging the Age of Humans in the Exhibition Space

Nina Möllers

News about environmental damages and catastrophes has become so commonplace that it often elicits only a short and fleeting expression of shock, anger, and resignation before life goes on as before. In societies increasingly insensitive to such news, it is often single images rather than elaborate news articles fed by complex scientific findings that trigger global attention. Such was the case in November 2017 when images of garbage patches flowing in the Caribbean, shot by underwater photographer Caroline Powers, travelled around the globe and created a concert of outcry from scientists, politicians, activists and the general public.[1] Powers' striking images were picked up by traditional media such as daily newspapers, weekly magazines and TV shows, but were also spread widely via online (social) media channels.

The issue of garbage, whether it is the plastic in the oceans or electrical waste in African landfills, is rightfully very present in the debate about humans' impact on planet Earth. As direct result of energy- and resource-intensive lifestyles in many, though far from all, regions of the Earth, garbage directly points to a set of key questions we are facing today and in the future: Where will we get sufficient raw materials for building our intricate consumer goods such as mobile phones? Where do we deposit what we discard? The fact that we take too much from the Earth and return too much of the wrong stuff has, among other things, led to the current discussion about a new geological age: the Anthropocene. Originating in the geological sciences—whose specialists have traditionally been considered as a rather secluded, if not eccentric bunch–the Anthropocene concept suggests that human beings have deeply, long-lastingly and often irrevocably shaped and changed the earth's geo- and biospheres and that there are valid geological records which justify the recognition of a new geological time period following the current Holocene. The Anthropocene Working Group (AWG), which currently con-

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[1] Caroline Power Photography, Facebook page, under: https://de-de.facebook.com/carolinepowerphotography/; The Giant Mass of Plastic Waste Taking Over the Caribbean. BBC News, 6 October 2017, under: http://www.bbc.com/news/av/world-41866046/the-giant-mass-of-plastic-waste-taking-over-the-caribbean (2 February 2018).

sists of 37 members from the field of geology, although other natural sciences and even the humanities are represented, is working on specifying these geological changes and finding the Anthropocene marker—the golden spike—that would allow for a scientifically solid and official declaration of the Anthropocene as the current geological era.[2] In a recent article, the AWG has pointed to entirely human-made materials such as plastic, cement, or pure metals, to the sudden disappearance of particular fossils due to species extinction, and to the accumulation of radionuclides from atomic bomb tests as powerful empirical evidence for the geological Anthropocene.[3] Beyond the geological debate, however, the Anthropocene has long since entered into the arts, public debates, and even economy and policy-making. Newspapers and magazines, TV, film and art have jumped on the bandwagon and try to shed light on the term, the concept and its impacts.[4] As a buzzword, substantiated with more or less solid knowledge of its origin, meaning and defining characteristics, it has entered popular discourse particularly in more fluid media channels. Nevertheless, despite the fact that the term and concept are very young and, in fact, still very much under discussion, the Anthropocene has already come to an end for some—or rather should never be declared. Instead, scientists and publicists of different backgrounds and agendas have made their case for a number of alternative *-cenes* such as the capitalocene, plantationocene, carbocene, chthulucene, or the mediocene as the current issue of this periodical suggests.[5] From the viewpoint of someone who has tried to make sense and use of the Anthropocene concept for a wider audience, this seems odd, a bit hasty perhaps, and at times can even smell of academic narcissism. By no means should this be read as a definite argument for the Anthropocene and against alternative concepts.

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2   Subcommission on Quaternary Stratigraphy. Working Group on the ›Anthropocene‹, under: https://quaternary.stratigraphy.org/workinggroups/anthropocene/ (2 February 2018).

3   Colin N. Waters et al.: The Anthropocene is Functionally and Stratigraphically Distinct from the Holocene, in: Science 351/6269 (2016), pp. 137-149; Colin N. Waters et al.: Global Boundary Stratotype Section and Point (GSSP) for the Anthropocene Series: Where and How to Look for Potential Candidates, in: Earth-Science Reviews (December 2017), under: https://doi.org/10.1016/j.earscirev.2017.12.016 (13 February 2018).

4   The Anthropocene (UK/KY/NO/CH 2015, Steve Bradshaw), under: http://www.anthropocenethemovie.com/; HKW Anthropozän-Projekt, under: https://www.hkw.de/de/programm/projekte/2014/anthropozaen/anthropozaen_2013_2014.php, Scobel: Rasante Veränderungen. Der Mensch und die Erde, 3Sat, 8.9.2016, under: https://www.3sat.de/page/?source=/scobel/188336/index.html (13 February 2018).

5   Donna Haraway: Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin, in: Environmental Humanities 6 (2015), pp. 159-165; Donna Haraway: Staying with the Trouble: Making Kin in the Chthulucene, Durham, NC 2016; Christophe Bonneuil and Jean-Baptiste Fressoz: The Shock of the Anthropocene. The Earth, History, and Us, London 2016.

But it does seems as if the difficulties of coming to grips with the concept of the Anthropocene, of ›making it work,‹ has led some to escape into even newer labels, most of them with similar heuristic and definitory difficulties and shortcomings.

In addition, the rather long history of the ›idea‹ behind the Anthropocene concept, which reaches back a few centuries, is too often neglected, making it difficult to see the differences between and advantages offered by competing terms and concepts. Although it is still surprisingly new to many engaged in the discussion, the idea of thinking of humans as geological agents is by no means an invention of the 21st century. Already in the 1880s, the Italian geologist Antonio Stoppani created a strikingly similar label for what he thought was a decidedly different period in Earth's history: the anthropozoic age. He spoke of humanity as a »new telluric force which in power and universality may be compared to the greater forces of earth.«[6] And a few years earlier, George Perkins Marsh published *Man and Nature*, a book which includes a detailed list of geographical areas where humans heavily influence their environments. Geologists, philosophers and others took up this line of thought and explicitly described humans as »geological factors« or »geological agents.«[7] The mineralogist and geochemist Vladimir Vernadsky emphasized how closely human life was connected to the biosphere and geosphere, focusing on the cognitive capacities of humans that were heavily influencing the Earth's biology to the point that it seemed reasonable to him to add the »noosphere« of human thought to the system of spheres.[8]

Of course, the world of Marsh, Vernadsky and others was a different one from ours. In this respect, it makes sense to turn to the role of media and mediality and think about how they have played into the processes that are currently and often irrevocably changing planet Earth.

The core postulate of the mediocene concept is the fundamental and pervasive role that media plays for our understanding of the Earth, including the changes that we bring about. In this understanding, media is no longer simply a vehicle or a tool for communicating content and knowledge; it is co-producer of this knowledge and shaper of reality. As such, media gains a new material quality because it

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6 Antonio Stoppani: Corso di Geologia, Milano 1873.

7 George P. Marsh: Man and Nature, New York 1864; Ernst Fischer: Der Mensch als geologischer Faktor, in: Zeitschrift der Deutschen Geologischen Gesellschaft 67 (1915), pp. 106-149; R. L. Sherwood: Man as a Geological Agent: An Account of His Action on Inanimate Nature, London 1922; Edwin Fels: Der Mensch als Gestalter der Erde, Leipzig 1935. For a good summary of the Anthropocene idea and precursor concepts see Christian Schwägerl: A Concept with a Past, in: Nina Möllers, Christian Schwägerl and Helmuth Trischler (eds.): Welcome to the Anthropocene. The Earth in Our Hands, München 2015, pp. 128-129.

8 Vladimir Vernadsky: Geochemistry and the Biosphere, Santa Fe 2007; Vladimir Vernadsky: La Biosphere, Paris 1929.

literally forms our Earth and our perception of it. According to the IKKM's defi-
nition of the mediocene, »media of communication and transport, of observation,
of surveying and surveillance, of representation and visualization, and of calcula-
tion, are deeply involved with contemporary planetary perspectives.«[9] Those in
support of a Mediocene concept do not ask so much for a substitution but rather
a complementation of the Anthropocene concept by emphasizing the dynamics of
different forms of media. Highlighting the agency of media beyond its mere tech-
nological being is, however, not so new after all. For quite a while, the history of
technology has understood technological devices as actors and mediators in their
own right, forming a part in various, often intertwined networks that consist of
living and non-living things. In particular, Actor-Network-Theory, developed in
Science and Technology Studies (STS) in the 1980s and heavily defined by Bruno
Latour's work, has focused on the agency of technological objects.[10]

   Another issue to be grappled with in the Mediocene is the definition of ›media‹.
Due to its omnipresence and pervasiveness, digital media has taken a front seat
in forming and communicating the debates about humans' impact on Earth. The
changes we are bringing about are often global, they become particularly evident
from a global perspective and they can only be confronted and dealt with in a
global setting. At the same time, however, the global often remains diffuse and
uncanny while the local, the here and now, and the concrete become dramatically
visible and tangible. As shocking as the images of the plastic patch in the Caribbean
may seem, for many it is the unusual drought, more frequent flooding, or the eerie
silence of a summer without bees that really hit home. Bringing the near and far
together, combining the tangible and intangible, the interplay of the blatant and
the latent: these mark the playground of the exhibition as medium, in which time
and space overlap in a way that is nearly impossible for other media to achieve.

   The following paper will take the first large exhibition on the Anthropocene
worldwide—»Welcome to the Anthropocene: The Earth in Our Hands,« shown
at the Deutsches Museum in Munich from December 2014 to September 2016—

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[9]   The Mediocene. Media and Planetary Transformations, under: http://www.mediocene.
     de/ (2 February 2018).
[10] Bruno Latour: Where Are the Missing Masses? The Sociology of a Few Mundane Arti-
     facts, in: Wiebe E. Bijker and John Law (eds.): Shaping Technology, Building Society,
     Cambridge, MA 1992, pp. 225-258. For STS and user-centered studies in the history of
     technology see also Wiebe E. Bijker, Thomas P. Hughes and Trevor J. Pinch (eds.): The
     Social Construction of Technological Systems. New Directions in the Sociology and
     History of Technology, Cambridge, MA 1987, Nelly Oudshoorn and Trevor Pinch (eds.):
     How Users Matter. The Co-Construction of Users and Technologies, Cambridge, MA
     2003; Madeleine Akrich: The De-Scription of Technical Objects, in: Wiebe E. Bijker
     and John Law (eds.): Shaping Technology, Building Society, Cambridge, MA 1992,
     pp. 205-224.

as a starting point for some very pre-liminary thoughts on the character-istics, potential and limitations of exhibitions as mediums and framers of a Mediocene. From a retrospective standpoint, I will first look at two examples of image use in the exhibi-tion and then proceed to discuss the spatiality and then the materiality of objects as materialized media. I will conclude with a discussion of exhi-bitions as examples of slow media and their potential for the Anthropocene and/or Mediocene.

The motif chosen for the exhibi-tion poster was simple and straight-forward—and very powerful: the Globe, reminiscent of the iconic pho-to made by the Apollo 17 mission in 1972 and later used in the developing environmental movement, overlaid with a large human fingerprint. The idea of the global is indeed a funda-mental one for the perception of the Anthropocene as the sum of changes brought about by humans. Globality,

Fig. 1: Exhibition poster »Welcome to the Anthropocene. The Earth in Our Hands,« Deutsches Museum, Munich

along with the pace and scale of the change, distinguishes the impact humans have today from earlier periods, for example in the Neolithic Age or before the Great Acceleration that began in the 1950s.[11] It comes as no surprise, therefore, that the Munich exhibition started off with an installation focusing on the global picture. Embedded in an artificial flower landscape, a large steel-and-metal-cube served as the framework for more than 50 monitors that provided different medial content on the Anthropocene, including the short film WELCOME TO THE ANTHROPOCENE (CA/SW 2012, Owen Gaffney/Felix Pharand-Deschenes) in eight languages, two
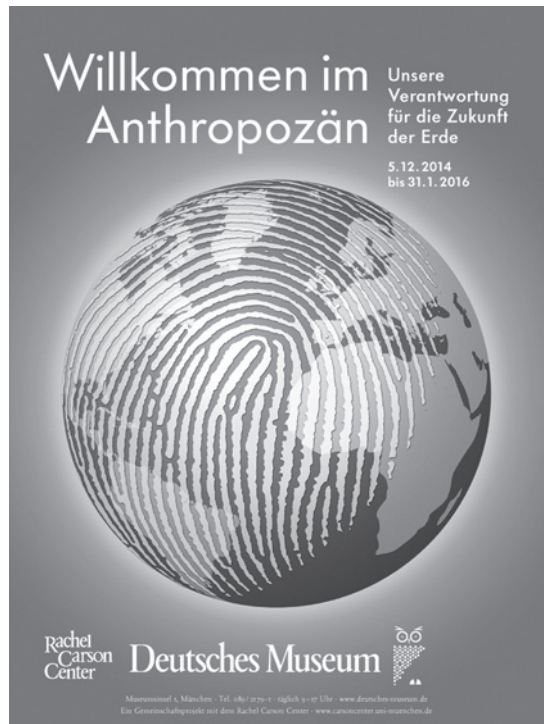
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[11]   On the great acceleration in connection to technology and the discussion on the degree of human impact, see Helmuth Trischler: The Anthropocene from the Perspective of the History of Technology, in: Nina Möllers, Christian Schwägerl and Helmuth Trischler (eds.): Welcome to the Anthropocene. The Earth in Our Hands, München 2015, pp. 25-29 and Helmuth Trischler: The Anthropocene. A Challenge for the History of Science, Technology, and the Environment, in: NTM 24/3 (2016), pp. 309-335.

Fig. 2: View into exhibition with media cube, object shelf and participatory flower landscape

animated explanatory films on the history of the concept and the geological debate, and a slide show with famous quotes in twenty languages. The centerpiece featured a film on loop, consisting of 20 one-minute presentations, that covered Anthropocene phenomena ranging from resource depletion and climate change to energy, agriculture and the population boom to global inequalities and the loss of cultural and language diversity.

Historically one of the most used media for understanding the Earth—the map—was displayed on another set of monitors that showed selected »Views of the World« maps by Benjamin Henning.[12] These cartograms visualize important environmental issues such as carbon dioxide emissions, the amount of land area used as croplands and pastures, the development of megacities, airplane routes, water insecurity, and—at the height of its crisis—Ebola deaths. Henning's maps stem from his PhD thesis, in which he developed a technique aimed at making the relationship between humans and their environments visible and comprehensible with the help of new digital tools. In contrast to traditional maps, it is now relationality, rather than simple representational quality that takes center-stage. Using digital technology, the resulting gridded cartograms stretch the map in ac-

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[12] Views of the World: The World in 2018, under: http://www.viewsoftheworld.net/ (13 February 2018).
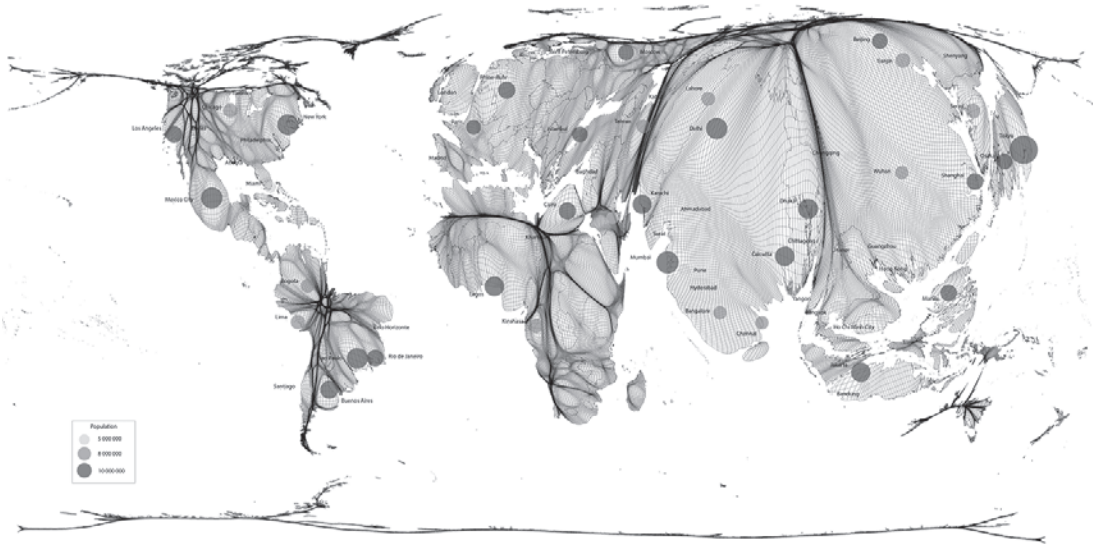
Fig. 3: Cartogram of World Population and Megacities, 2015

cordance with the input of quantitative data, while a density-equalizing cartogram technique is applied to an underlying grid, so that reference to the geographical real world is maintained.[13]

Henning's cartograms showcase the relevance of media in a twofold way: First, their relational focus and unique view on the matter at hand are direct outcomes of a digital technology that has only been available for a comparatively short period of time. Secondly, by using this technology, the developed cartograms attain a medial power beyond the sheer content inherent in maps. Their image power stems from the relationality they exhibit: the world is not flat, not the same in every region of the planet, but rather often extremely diverse and antagonistic, often to the breaking point. Looking at some of the maps, it becomes dishearteningly clear that although we might all be in the Anthropocene, we are not all in it in the same way;[14] and that while it is a story about everyone, it is also not a story about equality.

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[13] Views of the World: Rediscovering the World, under: http://www.viewsoftheworld. net/?p=1925 (13 February 2018); Benjamin D. Hennig: Rediscovering the World. Map Transformations of Human and Physical Space, Heidelberg 2013; Michael T. Gastner and M. E. J. Newman: Diffusion-Based Method for Producing Density Equalizing Maps, in: Proceedings of the National Academy of Sciences USA 20/101 (2004), pp. 7499-7504.

[14] This statement was coined by US-American environmental historian William Cronon in the final discussion of the Anthropocene Slam at the University of Wisconsin-Madison

Images of the globe have always had powerful effects on humans. As already mentioned, seeing the blue marble in all its beauty and vulnerability has inspired many to rethink their relationship with Earth. One of the major problems of this perspective, however, is that we tend to see ourselves in a manner that is humble, but also belittling. Paradoxically, beholding the global leaves us deeply impressed at the same time that we lose the drive for change since we consider ourselves too small and too few to make a difference. As only part of a mass of billions, we hide behind the cynical idea that our minor endeavors will not meaningfully impact the overall, global picture.

In terms of perspectives and zooming, the images of *Daily Overview*[15] that were presented as the centerpiece of the exhibition section on »Nature« took a middle path in the look and feel of an art gallery. Covering agriculture, fishing, industry, mining, and cities, the images were presented as the Anthropocene heirs to classical landscape masterworks by Rembrandt, Cézanne, Turner, and Friedrich, showing ›cultural landscapes‹ around the globe where humans have left and are continuing to leave their mark in one way or another. Questioning the persistent Western dichotomy between nature and culture, they asked for a reconsideration of what we view as nature and natural and its innate aesthetic beauty. What these images succeeded in doing was to position the beholder firmly between the local, the private and the potentially trivial on the one hand and the global, the public, and the overwhelmingly important on the other. Approaching the installation, many visitors were first enticed by the beautiful colors and patterns of the images, only to find themselves dumbfounded when they realized that they were enjoying the ›beauty‹ of an environmentally toxic and morally questionable aluminum waste dump.[16]

The effect of the images on the visitors was to a large part due to their arrangement in the horizontal gallery installation. One of their primary traits, the three-dimensional space used by exhibitions makes them very particular and powerful mediums. Coupled with its unique fluidity in time, this spatiality of exhibitions is advantageous for the interpretation and communication of the Anthropocene,

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in November 2014, referred to by Libby Robin in her talk »Slow Media,« Anthropocene Campus, Haus der Kulturen der Welt, Berlin, 14 November 2014, https://www.hkw.de/de/app/mediathek/video/36160 (13 February 2018).

15   Daily Overview, under: http://www.dailyoverview.com/ (13 February 2018).

16   The Daily Overview-installation was ranked as one of the most liked elements of the exhibition in the evaluation. Cf. Leysan Khafiatullova: Visitor Survey of the Special Exhibition »Anthropocene« at the Deutsches Museum, Munich. M.A. Thesis, TUM Munich, 2015. For the image of the aluminum waste dump near Darrow, Louisiana see http://www.dailyoverview.com/ or Benjamin Grant: Overview. Faszinierende Bilder unserer Erde aus dem All, München 2016, p. 242.

thus distinguishing exhibitions from other types of media. As arguments in space, exhibitions mediate messages by using not one, but many communication tools combined in myriad possible ways. As multimedial compounds, they use both material objects that have varying origins, forms and contexts, written texts, calligraphy styles, infographics, images, films, models, hands-on demonstrations, and installations. More significantly, exhibitions present these in a mise-en-scène setting, put together with the help of architectural elements, display cases, lighting, graphics, acoustics design, and route planning, all of which together stages an orchestrated dramaturgic event. How its messages are read, however, is not completely controllable within an exhibition. Its content is available synchronously and each visitor decides for him- or herself which route to take, in what order, what to skip, and what to concentrate on. Differing from the theater, visitors have a say in the dramaturgy of the exhibition. And in contrast to virtual reality, where space is often only the shell for an installation, space in exhibitions is an active and materialistic designer and shaper of reality, which visitors experience through the movement of their bodies.[17] In a way, exhibitions focus less on representation and more on staging, so that their documentation always already amounts to a strong interpretation. Their multimediality and potential for non-linear, circular, or even anarchic ordering holds particular promise for the interpretation of the Anthropocene. In exhibitions, more than in any other place, it is possible to glide back and forth between different geological periods and geographical spaces and simultaneously view both the materiality and the meaning of the Anthropocene. It becomes possible to wander about from one display to another, to make detours, or even to turn back without ending up in a conceptual or literal dead-end. In their spatiality, exhibitions offer »contact zones«[18] where it is not only the two aspects (namely, the geological and the social) of the Anthropocene concept that meet, but also categories formally constructed in opposition to one another, such as nature and culture, humans and environment, natural sciences and humanities, and past, present and future.[19]

Changing our perspective on time and extending it beyond traditional scales is indeed one of the main challenges of the Anthropocene.[20] Competing for rele-

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17   Stefan Paul: Kommunizierende Räume. Das Museum, in: Alexander C. T. Geppert (ed.): Ortsgespräche. Raum und Kommunikation, Bielefeld 2005, pp. 355-356.

18   James Clifford: Routes. Travel and Translation in the Late Twentieth Century, Cambridge, MA 1997.

19   Cf. Nina Möllers: Das Anthropozän: Wie ein neuer Blick auf Mensch und Natur das Museum verändert, in: Heike Düselder, Annika Schmitt and Siegrid Westphal (eds.): Umweltgeschichte: Forschung und Vermittlung in Universität, Museum und Schule, Köln 2014, pp. 225-226.

20   Bronislaw Szerszynski: The Anthropocene Monument. On Relating Geological and

vance with studies on the future and in light of geological timescales relevant to the study of deep history, historians in particular are working towards a new (self-) understanding of time and history.

Exhibitions offer a serviceable tool because they are similar to what Mikhail Bakhtin has described in his theory of the novel as the chronotope,[21] in which time and space coincide as a unit with its own temporalities and narrative structures. Here, it is possible to open up the gap between the Carboniferous Period 300 million years ago—in many ways a precondition for the industrialization processes that have ultimately led us into the Anthropocene—and the long future of the year 12,000 when the so-called Clock of the Long Now is supposed to still run, even if there are no longer humans around to maintain it.[22] Making use of the fact that historical objects are metonymic—they bridge past and present by remaining identifiable as the same object throughout time—[23] this grand timescale was visualized and spatialized in the exhibition room by juxtaposing a steam-engine of the 19th century and a research model of the Clock of the Long Now being built into a limestone mountain in Nevada. The exhibition space is thus mediatized as a sort of time-compressor on the basis of material objects that can be seen, heard, smelled and touched. The ability to reach far into the beyond while rendering it palpable and real is one unique to exhibitions.

In various ways, exhibitions showcase some of the main characteristics that have been similarly formulated in the »Slow Media Manifesto« as a reaction to the profound technological changes, particularly in the digital and social media world, since the beginning of the 21st century. According to the authors of the manifesto, slow media first and foremost promotes monotasking. Although even (museum) exhibitions are nowadays experimenting with cross-media elements that reach into the digital and social media realms, the exhibition fundamentally remains a medium that cannot be consumed casually, but rather requires the full attention of its audience. In fact, exhibition ›consumers‹ are closer to the ›prosumers‹ propagated by the manifesto because they actively shape their consumption experience.

Human Time, in: European Journal of Social Theory 20/1 (2017), pp. 111-131. For a current research project on the question of evidence practices in the context of this debate, particularly the challenges of differing timescales, see Fabienne Will: Negotiating and Communicating Evidence: Lessons from the Anthropocene Debate, in: History of Knowledge, January 26, 2018, under https://historyofknowledge.net/2018/01/26/nego tiating-and-communicating-evidence-anthropocene-debate/ (13 February 2018).

[21] Michail M. Bachtin: Chronotopos, Frankfurt am Main 2008, referred to in Alexander Klein: Expositum. Zum Verhältnis von Ausstellung und Wirklichkeit, Bielefeld 2004, p. 102.

[22] The Long Now Foundation: The 10,000 Year Clock, under: http://longnow.org/clock/ (13 February 2018).

[23] Klein: Expositum (as note 21), p. 37.

Charting their own path through the exhibition space at their own speed and choosing to read some texts and disregard others, visitors are far from the mindless, uncritical herd of sheep that we supposedly often witness in the consumption of digital media. Thirdly, exhibitions are in fact what the slow media concept seeks out: discursive, dialogic social media in the true sense of the word. Even visitors reluctant to participate in hands-on activities or participatory elements engage in and with the exhibition in a way that is seldom possible with other media. Dialogues and discourses happen on many different levels: between sections and topics of the exhibition, between beholder and contemplated object, and between humans—whether among a visiting group or family (often intergenerational), between unrelated visitors, or between visitors and mediating museum staff. Finally, slow media is characterized by an auratic quality, generating »a feeling that the particular medium belongs to just that moment of the user's life. Despite the fact that they are produced industrially or are partially based on industrial means of production, they are suggestive of being unique and point beyond themselves.«[24] This is obviously true of temporary exhibitions, but even permanent ones (which despite their name are anything but permanent) are not usually consumed on a regular and frequent basis, indeed, they are often a once-in-a-lifetime event. Some are quickly forgotten, others—or at least parts of them—remain with us for a long time. Although architecture, installations, and scenery are helpful, it is often the objects—themselves surprising, beautiful, mysterious or shocking—that make us halt, contemplate, rethink and remember. Exhibition objects have the power to blur and transcend the boundaries between object and subject; in a way, exhibition objects may even become subjects themselves in a network of actors shaping our lives and our planet. Through the visitor's personal and immediate engagement with them (even if they are kept behind glass), objects have the potential to »show, not tell« a story—a core belief of exhibition curators. In contrast to the collection setting, the exhibition space both allows objects to be experienced as material objects, but, in presenting them as sign vehicles, also show them to be meditators.[25]

Material objects intentionally or inadvertently created by human activity serve as superb points of crystallization and conjunction, at which relations, applications, experiences, and opinions towards certain issues meet and have become material, waiting to be decoded. In their materiality, they conserve history, tradition, knowledge, and use while they are simultaneously wrested from their original contexts. In museological terms, objects in exhibitions constantly oscillate be-

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[24] The Slow Media Manifesto, under: http://en.slow-media.net/manifesto (14 February 2018).

[25] Anke te Heesen: Verkehrsformen der Objekte, in: Anke te Heesen and Petra Lutz (eds.): Dingwelten, Köln 2005, p. 54.

Fig. 4: Wardian case, early 20th century, loan from Botanic Garden and Botanic Museum Berlin-Dahlem

tween actualization and latency, speaking to a temporal differentiation between the here and now of the present and other time(s) embedded in the object.[26] In an age when humans have become a major shaper of planet Earth, objects serve as intersections, possessing both material reality and symbolic power. Their materiality reflects the ways they have been produced, consumed, collected and disposed of, creating a bridge between the geological sedimentation of the Anthropocene and its relevance as a framework for thinking about the human impact on the bio-, geo- and socio-spheres.[27] Embedded in a global network of things while charged with personal and local meaning, objects are particularly well-suited to concretize the Anthropocene, to make it imaginable and even tangible, and thus to provide a focal point and base not only for reflection and discussion of Anthropocene phenomena and effects, but also for necessary action.

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26   Ulrike Vedder: Museum/Ausstellung, in: Karlheinz Barck et al. (eds.): Ästhetische Grundbegriffe. Historisches Wörterbuch in 7 Bänden, vol. 7: Supplemente, Register, Stuttgart/Weimar 2005, p. 183.
27   Möllers: Anthropozän (as note 19), p. 225.

For concrete examples, let us examine two objects that were shown in the Munich exhibition.

The first is the so-called Wardian Case, included in the section on »Mobility«, which addressed the manifold ways humans, whether as consumers, travelers, or refugees, have set ourselves and the world around us in motion. Knowingly or unknowingly, other species travel with us and our cargo, and by creating barriers, we stall movement or redirect natural material flows. Until the 19th century, however, there were natural limits to these human-induced movements. Excessive sunlight, harsh weather, sea spray, and temperature fluctuation, for example, made the shipment of live plants and their continued growth at new locations nearly impossible. In 1829, all this changed when English doctor and naturalist Nathanial B. Ward somewhat accidentally devised the Wardian case.[28] When plants were put in a glazed wooden crate with damp soil, they profited from the water vapor created during daytime heat, thus helping them survive long voyages without damage. The Wardian case became a reliable container for moving live plants with commercial potential such as bananas, rubber, and tea from their original habitats through botanic hubs such as Kew Garden in London to other parts of the Earth, particularly to faraway European colonies in Asia and Africa. Between 1891 and 1907, the Botanical Garden in Berlin alone transported circa 16,000 plants to Cameroon, Tansania, Togo and Papua New Guinea. Of course, all of these stories are not automatically visible to the beholder of the object in the exhibition. In fact, objects do not ›speak‹ to us, as a long-held curatorial dream would have it. Their appropriation and recontextualization in collections and exhibition settings allow knowledge and meaning to be perceived, accepted, refused, modified, and complemented by the visitor. The communicative and mediating quality of objects consists in both what they are—their materiality—and what they mean; in contrast to words, the relationship between materiality and meaning is not arbitrary.[29] In its green color and heavily used condition, the three-dimensional Wardian Case showcased in the exhibition thus materializes more than a century's worth of intertwined global histories of knowledge, economy, colonialism, and environment. As an active part in a network of actors consisting of humans, plants, political entities, technological objects, and materials, the Wardian case transcends temporal boundaries pointing into the potentially deep future of human geological imprint upon the Earth.

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[28] Luke Keogh: The Wardian Case: Environmental Histories of a Box, in: Environment and History, forthcoming (accepted 08-05-2017); Wouter van der Weijden, R.J. Lewis and Pieter Bol: Biological Globalisation: Bio-Invasions and Their Impacts on Nature, the Economy and Public Health, Amsterdam 2007, pp. 31-32.

[29] Lorraine Daston: Introduction, in: Lorraine Daston (ed.): Things That Talk. Object Lessons from Art and Science, New York 2004, p. 20.

Our second object example is something more akin to a museum of technology. Although for conservation reasons we discouraged our visitors from touching the SYNchron-TELe-MANipulator, or Syntelmann for short, we chose to present it as proximately to visitors as possible. Face to face with this machine, the question inevitably arises: What is an object, what is a subject? Engineered and manufactured by Hans Kleinwächter in 1973, the Syntelmann consisted of a human-operated exoskeleton, a ›master,‹ and a ›slave,‹ connected via cable. Controlled from a distance and equipped with sensors, cameras, and motor-powered joints, it was meant to perform tasks in environments too hazardous for humans, such as the deep sea, outer space, or nuclear power plants. Movements were transmitted electronically from the ›master‹ to the mechanical manipulator, which was up to 100 meters away. However, Syntelmann never advanced beyond the prototype stage. Today, exploratory robots still have difficulties when remote control by humans malfunctions or is otherwise not possible. The robots used in the nuclear reactor Fukushima, destroyed in 2011, had limited movement ability due to large amounts of rubble. The unpredictable conditions were beyond the robots' capabilities; instead, 25,000 human workers cleaned up the accident. Nevertheless, Syntelmann already hints at the possibility on the horizon that machines may in fact become independent of their makers and develop into autonomous artificial intelligence, which at some point may no longer be controllable.

The growing number of technological things and their materials that surround us and that create a technosphere in relation to the bio- and geospheres are in fact discussed as a prime characteristic of the Anthropocene and potentially even one of its geological markers.[30] Interestingly enough, although our lives are becoming increasingly digital, influencing how we consume, work, play, and even love, and despite our technological devices growing into communicating networks, we are simultaneously hoarding more and more things in our private and public lives. At the top of this list are the numerous hardware devices used for the exploration of virtual and digital worlds. In an ironic twist, it seems that digitization and the heavy use of digital media appliances has resulted in a turn to clinging, sometimes desperately, to materiality.

On closer inspection, this may in fact be not so surprising since, after all, many of our traces on planet Earth are very material indeed: from the mounds of aluminum, cement, or cow manure to gas pipelines, dams, and the plastic garbage patches in the Caribbean. Their stories and effects are part of mediatizing networks of surveillance, analysis, transportation, and communication, forming our understanding, knowledge and communication, but they are also undeniably material.

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30   Jan Zalasiewicz et al.: Scale and Diversity of the Physical Technosphere: A Geological Perspective, in: The Anthropocene Review 4:1 (2016), pp. 9–21.
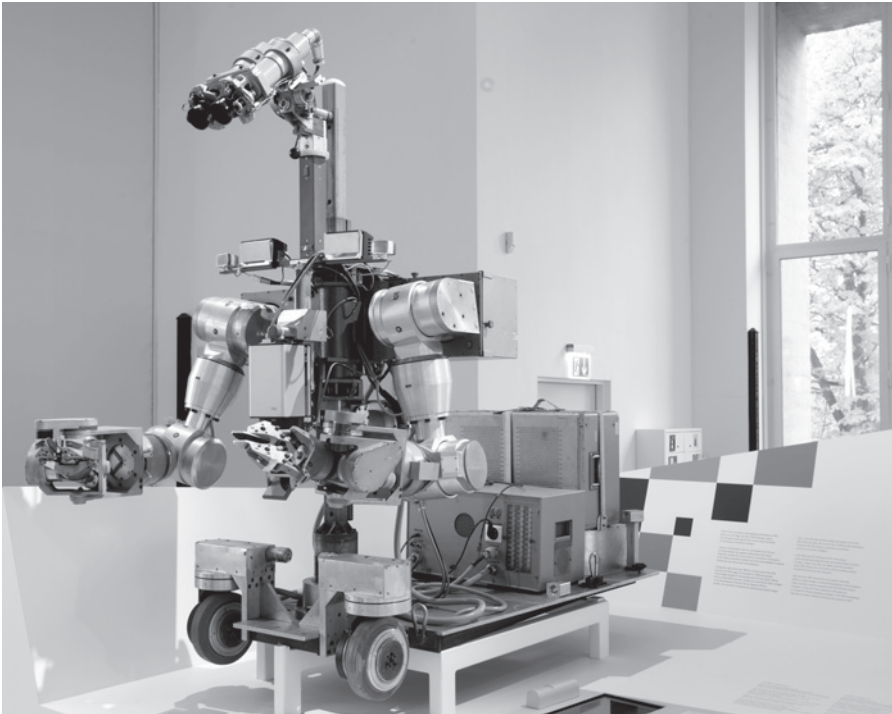
Fig. 5: Electronic manipulator »Syntelmann« RS 21/4, 1973, manufactured by Hans Kleinwächter, Inv. No. 1978-63

The charm of the Anthropocene concept is that it maintains a clear connection to the geological thesis at the origin of the discussion; a connection that, to my mind, is needed if the concept is supposed to have any meaning beyond academic circles and become a tool with transformative power for transdisciplinary change. Too much emphasis on mediality results in de–materialization, perhaps even in detachment from the problem at hand.

In the theoretical and methodological discussion about the Anthropocene and the Mediocene, exhibitions may help as counteracting, or at least as balancing, mediums. Unique in that they allow for the immediate contemplation of the human impact on Earth in a way that transcends temporal and spatial boundaries, exhibitions also succeed in rendering knowledge personal. And in this there lies the potential to reach far beyond what has rightfully been criticized as the anthropocentrism and the hegemony of the Anthropocene concept.

One of the supposed advantages of the term and concept Mediocene is that it avoids the innate hubris of (certain segments of) humanity by focusing on the network, which may include many other human or potentially non–human play-

ers. Yet, to my mind, this wrongfully reduces, if not completely misunderstands, the Anthropocene concept and instead overestimates the Mediocene. What of hegemony, insofar as access to media networks is anything but equal on a global scale? Inserting such a question into the debate over the Mediocene of course does not invalidate its viability, and perhaps the concept of the Mediocene is indeed the more promising one with which to make sense of global inequality. It is a task for the future to put flesh on the bones of the concept in order to make it usable as an analytic tool. The additional value of the Mediocene cannot lie in its blurring of categories such as nature and culture, or in its integrated network viewpoint that fashions a human technosphere, other biological organs and non-living, and technological actors, because these are already contained in the Anthropocene concept.

We may in fact be in need of the prominence of the root *anthropos* in the Anthropocene. In light of the social and political transformations that are needed to meet environmental challenges, do we not need to highlight the role of humans as actors? As a public institution aimed at promoting citizen science and encouraging public engagement, the most gratifying success of our exhibition, as evinced by the results of the visitors' survey, was to motivate individuals to learn more on their own about the Anthropocene and its attendant issues beyond the exhibition room.[31] In order to elicit personal concern and to trigger the will to contribute to the tasks before us, it remains important to convey the role and power that humans have in the networks that shape our planet. If we had left our visitors only with the idea that nameless and faceless systems control our world, personal engagement and motivational impact would not have been achieved.

Granted, the working ›definition‹ of the Mediocene as found on the IKKM website makes no claim to be complete, but it does strike me that in its list of »media of communication and transport, of observation, of surveying and surveillance, of representation and visualization, and of calculation,«[32] the word ›media‹ could easily be substituted with ›technology.‹ What could the powers of definition entail if we focus on media instead of technology, as studies on the history and sociology of technology have long done? And how can the Mediocene be differentiated from the Technoscene, which is already being floated around as a competing term? Speaking from the perspective of the history of technology, I would warn against oversimplifying technology and particularly against neglecting human agency and power out of fear of coming across as anthropocentric. Humans are important actors. They invent, develop, and use technology. Nevertheless, ascribing agency to technological devices and networks does not entail curtailing the human agency or the power to define. The concept of the Anthropocene, I believe, offers exactly

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31   Khafiatullova: Visitor Survey (as note 16), pp. 20–22.
32   The Mediocene (as note 9).

the source of friction that is needed to create a meaningful debate with theoretical and methodological merit, one that is not confined to academia, but which has the potential to reach beyond it, to public and political discussion, where it might even translate to real and meaningful action. The Anthropocene does not stylize the human being as a creator free to act as s/he pleases, but, on the contrary, it prevents us from relinquishing our responsibility. Using the Mediocene idea to sharpen, rather than to replace, the Anthropocene concept may be the better option for providing answers in a world that is growing more and more complex.

Picture Credits:

Fig. 1: Deutsches Museum

Fig. 2: Deutsches Museum, Photo: Axel Griesch

Fig. 3: Benjamin Henning, www.viewsoftheworld.net

Fig. 4+5: Deutsches Museum

Medianatures[1]

Jussi Parikka

Media is hardly just about media. Furthermore, nature is not merely nature either but embedded in the cultural understanding of life. This is not to say that nature—to use the shorthand to refer to the biosphere, hydrosphere, geosphere, and also atmosphere—is merely a representation or defined by cultural meanings. It is just to point out that the nature and animals have been understood and operationalized as a resource[2] and by way of techno-scientific frameworks that define it through its chemistry and other sorts of analytics. This does not exhaust the intensity of nature as a living formation but it does for sure force us to consider it as part of a feedback loop that involves much more than just nature.[3] Hence to talk of *medianatures*—a term that is a useful neologism—is a way to try to grasp the intensive co-determination and co-emergence of the two spheres of natural dynamics and media cultural epistemologies, of the onto-epistemological situation that defines our technical modernity. Media are in and of nature in ways that expand any talk of the environment into a virtual ecology of social, political, ethical and aesthetic dimensions.[4]

Medianatures is a concept that owes its existence to Donna Haraway's notion of *naturecultures*.[5] Naturecultures is a key term that features in many of Haraway's examples and discussions of companion species. It is a concept that troubles separations of nature from culture, and in general, addresses the problematic categories by way of the microinteractions that define for example animal–human relations. Hence, when addressing companion species, Haraway speaks of the shared co-

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1   This text was first published in: Rosi Braidotti and Maria Hlavajova (eds.): Posthuman Glossary, New York 2018.

2   As Martin Heidegger and others argued, including Rosi Braidotti: Transpositions: On Nomadic Ethics, Cambridge 2006, p. 98.

3   Cf. Jussi Parikka: Insect Media: An Archaeology of Animals and Technology, Minneapolis 2010.

4   Braidotti: Transpositions (as note 1), p. 123; see also Félix Guattari: The Three Ecologies (1989), translated by Ian Pindar and Paul Sutton, London/New Brunswick, NJ 2000; Matthew Fuller: Media Ecologies: Materialist Energies in Art and Technoculture, Cambridge, MA 2005.

5   Cf. Donna J. Haraway: The Companion Species Manifesto. Dogs, People, and Significant Otherness, Chicago 2003.

becomings in which the two are mutually implied: they are symbiotic and emergent. Such situated case studies are not merely for the purposes of ontological meditation but they are ways to address »livable politics and ontologies in current life worlds.«[6] They teach that ontologies not merely »are« but they emerge; they are active realities, which resist stable typologies of being. Haraway draws on A.N. Whitehead's process philosophy and the active verb form: the world is through prehensions,[7] an insight that forms Haraway's understanding of the world as knotted. This is where it becomes clear that the concept is driven by situated practices that take into account feminist knowledge, which refuses handed-down categories. It also draws from the reality of postcolonial situations that inform Haraway's examples. Indeed, it is also the anthropologist Marilyn Strathern's work that becomes an important reference point in thinking outside the dysfunctional dualism of nature or culture. Instead, Strathern's fieldwork in Papua New Guinea contributes to Haraway concept in terms of offering the idea of partial connections that are not determined by »wholes nor parts.«[8] It is instead a relational nexus that one could also understand through Gilles Deleuze's and Félix Guattari's emphasis on molecular realities that work under and across the visible, formed molar identities.[9]

Naturecultures is a way of addressing the world of intra-actions and co-becomings in which the significant others—dogs, bacteria, and a multiplicity of non-humans—are accompanying the so-called human. This sort of an agenda contributes to the possibility of thinking outside the individual and other similar concepts that misplace concreteness (in Whitehead's sense) on the stability of the form (such as nature).[10] There would be a lot to be unfolded as to the philosophical genealogy of this sort of an account that—in addition to the mentioned Whitehead, Deleuze and Guattari, feminist theory and for example Strathern—could be seen related to Gilbert Simondon's notion of individuation. Furthermore, through radical anthropology, one can summon a wide range of alternative metaphysics to understand the contemporary condition of mutation of understanding of culture and technology but also the multinaturalism.[11]

Besides its own conceptual power, the term *naturecultures* allows us to think of *medianatures*, a concept which builds on the new materialist emphasis on the connectedness of material-semiotic (Haraway) and discursive-material (Barad) by way

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6 Ibid., p. 4.
7 Ibid., p. 6.
8 Ibid., p. 8.
9 Cf. Gilles Deleuze and Félix Guattari: A Thousand Plateaus: Capitalism and Schizophrenia (1980), translated by Brian Massumi, Minneapolis/London 1987.
10 Cf. Donna J. Haraway: When Species Meet, Minneapolis/London 2008, p. 32f.
11 See Eduardo Viveiros de Castro: Cannibal Metaphysics: For a Post-Structural Anthropology, edited and translated by Peter Skafish, Minneapolis 2014.

of a specific media cultural and technological focus. Similarly, as *mediation* happens across a whole spectrum of material realities irreducible to the media devices,[12] *media* itself can be seen to consist of an assembly of elements of nature.[13]

Instead of thinking that there is a historical disconnection between media culture and the natural formations that historically precede the modern technical media, medianatures works to illustrate the specific and situated material interactions that underpin media technological practices. Media technology itself is material; it is composed of a variety of geological material and geophysical forces. It needs metals and minerals to summon its worlds of audiovisuality, colour, speed, processing power and storage. Such processes of technical quality are made of seemingly odd elements (at least to standardised media studies) such as lithium, coltan, rare earth minerals, while not forgetting the massive energy consumption of the devices and the networked cloud services. This assembly that we call by the name of media technology is reliant on massive global networks of energy and supply chains that themselves are linked to a geography of media materials from African, Chinese, South American minerals, to various pipelines and power plants that provide energy,[14] to the labour conditions and practices that make these materials move.[15] It is a massive ecological operation that sustains the fact that we have a communication sphere of digital information that seems immaterial when it comes to the speed of retrieval of a web page, the reliability of the cloud stored image, and the instantaneous feeling of the intimate chat services that run, in most cases, through corporate servers. To talk of medianatures illustrates this double bind: on the one hand, media offers our epistemology, and is instrumentalized in the intensive mapping of the planet for its resources, materials and energy. And it is these resources excavated often in places inhabited by indigenous people or in environmentally vulnerable areas like the Arctic that places special emphasis on locality.[16] The epistemologically misplaced dualism of media and nature gives way to the intensive ties and individuations that bring about media culture as a formation that consists of ecologies of materiality as well as labour. In addition to the construction of technologies, issues also reach out to the discarded technology

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[12] Cf. Richard Grusin: Radical Mediation, in: Critical Inquiry 42/1 (2015), pp. 124–148; Sean Cubitt: The Practice of Light: A Genealogy of Visual Technologies from Prints to Pixels, Cambridge, MA 2014; Jussi Parikka: A Geology of Media, Minneapolis 2015.

[13] Cf. John Durham Peters: The Marvelous Clouds: Toward a Philosophy of Elemental Media, Chicago, IL 2015.

[14] Mél Hogan: Facebook Data Storage Centers as the Archive's Underbelly, in: Television & New Media 16/1 (2015), pp. 3–18.

[15] On the metabolic rift see McKenzie: Molecular Red: Theory for the Anthropocene, London/New York 2015.

[16] See Sean Cubitt: De-Colonising Ecomedia, in: Cultural Politics 10/3 (2014), pp. 275–286.

that is an e-waste hazard and becomes another disposed zombie media object in rural locations outside the main centres of consumption.[17] They end up in regions such as West Africa (Nigeria, Ghana), China (Guiyu), Pakistan, and India where even the opening up of dead media technologies for their scrap metals is seemingly worth the risk despite the massive health risks involved.

Hence, medianatures is a concept that speaks to the materiality of media technologies. But it does it in ways that are also always about place and placement, of use and uselessness, of the work of material sciences and the prehistoric Earth materials such as fossil fuels firing up our computers. It is a philosophical concept but sustains the energy of Haraway's naturecultures in that also medianatures is to contribute to politics of global life of media products in their prehistory and their afterlife—as well as the various people exposed to media before, and after, they become media for the consumer sphere.

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[17]   Garnet Hertz and Jussi Parikka: Zombie Media: Circuit Bending Media Archaeology into an Art Method, in: Leonardo 45/5 (2012), pp. 424-430.

Entangled Trees and Arboreal Networks of Sensitive Environments

Birgit Schneider

THE GERMAN METEOROLOGIST and climatologist Heinrich Dove (1803-1879) related weather's influence to human feelings. His meteorological handbook from 1837 begins with the sentences: »When the sky is covered with a uniform grey for weeks, we also become gloomy in the end, when it's finally light again above, we also become bright. We are thus faithful mirrors of the sky above us, we adopt its moods, and in this sense, not only is everyone a meteorologist but also, so to speak, meteorology itself.«[1]

One could take this suggested direct relation of humans and weather conditions one step further and ask: Are humans also all climatologists in this sense? Could we also be faithful mirrors of the climate and climate change? Or is this something that we indeed embody but cannot consciously perceive, at least in the same way?

Interestingly, during the 19th century, the definition of climate was still grounded on emotional perceptions. In his very early definition of climate, Alexander von Humboldt, one of the first climatologists in the modern sense, addressed the sensual apparatus of humans directly. He wrote:

»The term climate, taken in its most general sense, indicates all the changes in the atmosphere which *sensibly affect our organs*, as temperature, humidity, variations in the barometric pressure, the calm state of the air or the action of opposite winds, the amount of electric tension, the purity of the atmosphere or its admixture with more or less noxious gaseous of the sky, which is not only important with respect to the increased radiation from the Earth, the organic development of plants, and the ripening of fruits, *but also with reference to the feeling and mental condition of men* [my italics].«[2]

Following Humboldt, one could infer that people of the 19th century were all still climatologists; the climate would directly enter the emotional ecology as »tem-

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1   Heinrich Dove: Meteorologische Abhandlungen, Berlin 1837, p. 3.
2   Alexander von Humboldt: Kosmos. Entwurf einer physischen Weltbeschreibung, Frankfurt a. M. 2004 [1845-1862], p. 340, translation taken from: Cosmos: A Sketch of a Physical Description of the Universe, translated by E.C. Otté, vol. 1, London 1849-58, pp. 317-318.

pered atmosphere« (»gestimmte Atmosphäre«, Gernot Böhme).[3] So what happened that modern people seem to have lost this ability? Is it because ›we‹ (city inhabitants of the industrialized countries) spend most of our lifetime in shielding interior spaces which are regulated, like houses or vehicles, by air conditioners and heating? Or have we never been climatologists?

The overriding theme of this essay is an aesthetic question, one particularly regarding conditions and possibilities of sensing climate change or sensing the environmental crisis. Embedded into the history of climatology and the history of weather measurements lies a media-aesthetic paradigm that has undergone a deep transformation over the last 200 years. In his definition, Humboldt addressed climate within a broad aesthetic of the atmosphere. Climate knowledge was derived as a result of very distinct but equally valuable epistemic cultures of sensing: sentiments, impressions, feelings, observations, and technical measurements. In contrast to this diverse approach to the environmental sensorium, I would argue that in the course of the 19th century, media devices of sensing have become more and more important as organs of environmental perception. Today, sensing media might even be called the dominant interface for sensing climate change. But possibly this argument holds true in an even broader sense for nature[4] perception in general, because the sensing paradigm today is not so much a direct immediate affection of the physical organs by the phenomena of the environment, but an affection through mediated interfaces of environmental data.

In my (media-)aesthetic conception of environment, I am guided by the notion of the German term *Umwelt* (literal: around-world) of the biologist and Neo-Kantian Jakob von Uexküll (1864-1944). He introduced the term in the early 20th century to determine—broadly speaking—how physical surroundings (*Umgebungen*) of animals become inner perceptions (*Umwelt*). Later on he transferred the distinction of *Umwelt,* in contrast to *Umgebungen,* from animals to humans by considering how perceptions of the environment, and thereby world views, profoundly change when human organs are equipped with technical devices, like telescopes or microscopes. I regard media devices for sensing the environment, such as sensors, satellites, or statistical maps, as similar to the Uexküllian concept. They are devices that alter the boundaries of the perceived *Umwelt* by equipping

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3   Gernot Böhme: Für eine ökologische Naturästhetik, Frankfurt a. M. 1993. Translated as: Aesthetics of Nature—A Philosophical Perspective, in: Hubert Zapf (ed.): Handbook of Ecocriticism and Cultural Ecology, Berlin 2016, pp. 123-134.

4   I use the term ›nature‹ in this article extensively, being aware that the term implies the problematic and untenable notion of nature as an object outside of ourselves and the notion of a sharp boundary between nature and culture. At the moment I still do not know how to replace the term in order to be able to speak about my subject, because terms like ›ecology‹ and ›environment‹ are also very ambiguous in their meaning.

the environment with new items, such as the planet Uranus, Martian canals, the mycobacterium tuberculosis, the ozone hole, and atmospheric CO_2-concentrations, which did not belong to the technically unmediated *Umwelt* before. In the same vein, but going even further with this argument derived from media-aesthetics, I would say that media not only change the *Umwelt* on the level of perception, but they also change the environment itself by establishing new media ecologies, such as sensor environments, by establishing an incremental densely furnished mediasphere in, on, and around planet Earth. Hence, the human biological sensorium has lost its monopoly, an observation which media philosophy needs to reflect on further.[5]

By thinking about media from an environmental and aesthetic perspective, the term »media« becomes vital in two fundamental ways which might conflict on a structural level. Nevertheless, I believe that for the subject discussed here, both notions are of equal relevance. The first way in which the term needs to be considered is from the ancient perspective of *nature as medium* word. This opens up an ontological perspective on atmospheric or elemental media, such as air, water, and earth: »Media […] are vessels and environments, containers of possibility that anchor our existence and make what we are doing possible.«[6] Secondly, we need to look at perspecitve *media of nature*. In this case, I refer to media providing interfaces for relating, connecting, and entangling nature and technology by ways of abstracting or drawing off measurements and data by techniques of grafting, which form hybrids of nature and technology. It is important to combine these two basic notions of the term »media« at this stage, because under the media and technospherical conditions of the environmental crisis, such as climate change, deforestation, or extinction, they blend into one another.

Having made this opening remark, the guiding questions of this essay are the following: How do trees become technically connected networks? What happens when trees become data? And how do trees help to make climate change understandable and visible? I will follow these questions by the use of three main examples which allow for an elucidation of the relation between trees, sensory networks, and sensory perception. By introducing different examples from the fields of

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5   As has been done by Mark B. N. Hansen: Ubiquitous Sensation. Towards an Atmospheric, Collective, and Microtemporal Model of Media, in: Ulrik Ekman (ed.): Throughout. Art and Culture Emerging with Ubiquitous Computing, Cambridge 2012, pp. 63–88; Luciana Parisi: Technoecologies of Sensation, in: Bernd Herzogenrath (ed.): Deleuze | Guattari & Ecology, Basingstoke 2009, pp. 182–199; Jennifer Gabrys: Program Earth: Environmental Sensing Technology and the Making of a Computational Planet, Minneapolis/London 2016.

6   John Durham Peters: The Marvelous Clouds. Toward a Philosophy of Elemental Media, Chicago/London 2015, p. 2.

science, art, and technology, I want to describe and comprehend »forests as an ontological multiplicity,«[7] such as data, speaking subjects, proxies, biomass, or topoi.

1. Talking Trees Undergoing Stress on Twitter

The first example might seem rather trivial, or even amusing, at first sight. During the last years, individual trees became part of the ontology of the internet (Fig. 1, p. 111). Accompanied by newspaper articles with the headline »The forest goes online«, international research projects started a new way of scientific communication via the online news and social networking platform *Twitter*. The numbers of trees going online are growing steadily. What ›followers‹ of Twitter are able to witness here is what I would like to critically describe as a new form of *nature writing*—this special form of non-fiction poetry about the natural environment which evolved in the 19th century in English-speaking countries in the style of »ecomimesis«[8]—although this form of writing comes here to a poetical end. The purpose of tweeting in the name of a particular tree is to allow people to learn about its well-being under the increasing stress of a changing climate. The public interest in tweeting trees may be associated with the best-selling books of a German forester entitled »The Hidden Life of Trees: What they Feel, How they Communicate«.

Via the twitter-account »TreewatchBritz«, a pine tree is introduced by »I am a Scots pine (Ø = 26.1 cm) in Germany (Britz) in a forest of the Thünen Institute of Forest Ecosystems.« Several times a day tree data are transferred by WLAN to Ghent, where assistants of TreeWatchNet translate them into tweets. More than five hundred tweets have been published so far. On May 24: »My sap has started flowing!« May 26: »Today I have grown 0.037 mm, transported 2.7 L of water at a maximum speed of 0.3 L/h.« […] »My sap is stopping to flow for today. The maximum speed was 0.2 L/h.« May 28th: »During this warm day (max 26.7°) I lost 114 L of water and my max sapflow was 9.4 L/h—tough day.«

Even compared to nature writing, these diary entries read rather poorly. But I would like to go deeper into this example[9] because it speaks on many levels

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[7]   Anne-Sophie Springer and Etienne Turpin: Foreword, in: Anne-Sophie Springer and Etienne Turpin (eds.): The Word for World is Still Forest (Intercalations 4), Berlin 2017, p. XIII.

[8]   Timothy Morton: Ecology Without Nature. Rethinking Environmental Aesthetics, Cambridge 2009, p. 33.

[9]   A full-length article on the subject is published in German: Birgit Schneider: Neue Formen der Klimakrisenwahrnehmung? Sprechende Bäume im Netz der Dritten Natur, in: Dritte Natur. Technik, Kapital, Umwelt 01/2 (2018).

Fig. 1: Tweeting pine tree located in the forest-lab of the Thünen-Institute of forest ecology Brandenburg, Britz.

Fig. 2: Interface for data abstraction from the tweeting pine tree.

about the relation of media and nature. Forests and trees have always played an important role in this approach to the environment. Like *nature writing,* this form of text is written in the first person. The shift from trees as objects of re-search to self-writing subjects is telling. It not only reveals how trees are thought about as subjects, but also how the technological possibility of Twitter, at least on the surface, transforms trees into authors, and thus into subjects. On the so-cial networking platform, trees become social by becoming subjects. From now on, and under media conditions, it is possible to do tree hugging on a symbolic level.

The ›tweeting‹ pine tree from Brandenburg's Institute of Forest Ecosystems has many followers, some of them are other tree-accounts. The trees are embedded in a network of tweeting trees and forest observation that is connected via a research network called STReSS, TreeWatch. It is the objective behind the observation of trees to learn about the trees' resilience and their limits to adapt and cope with climate pressures, like increasingly long dry periods, but also the alteration of seasonal patterns. On this account, the wired trees under observation can be as-sociated with observed patients in the intensive care unit of a hospital. This inter-est also defines what is measured: Evaporation, speed of growth, and amounts of water and sap flooding through the tree tell much about how trees already react to climate change. Taking this into consideration, the tweet of a poplar tree in Ghent reads more like a plea: »Hot, hot, hot—low air humidity is causing much water loss!« (TreeWatchEFA) Therefore, tweeting trees might be seen as the at-tempt to make perceivable the pain trees feel when climate patterns are changing and how they are affected by new climate extremes. The hope seems to be to set up a frame for care for the environment via trees, most directly realized by the reply of a reader: »Give him/her some water, please.«

In the outline of the conference »The Mediocene«, which lead to this article, one could read that »Life itself is short-circuited with the evolution of technical beings.« In the same line of thought, it can be asked: How exactly is the pine tree in Britz connected to the internet? And what metaphors are available to think connections of nature and technology on a more general level? The concept of short-circuiting, for instance, should be critically examined. Because, when used as a metaphor for the connection of technical and living beings, it seems that the concept does not carry on the destructive side effects of short-circuiting incidents, such as overheat-ing, fire, and explosion. Such effects are the core consequence of this connection but the metaphor of short-circuiting only seems to maintain the concept of an electrical connection. So how is the pine tree ›short-circuited‹ with technology?

The interface (*Schnittstelle*), which establishes a connection for listening to the language of the tree in order to translate it into tweets, is reminiscent of the bo-tanical technique of grafting (*pfropfen*) (Fig. 2, p. 111). In grafting—which has been
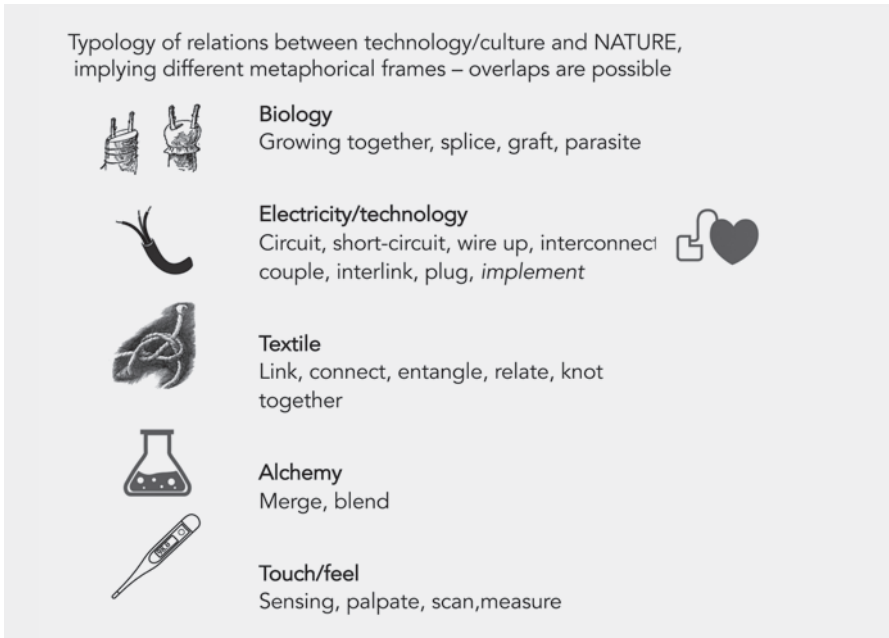
Fig. 3: Typology of metaphors for connecting nature to technology.

elaborated on media-philosophically by Uwe Wirth[10] and can only be indicated here—two different plants are connected so as to grow together. But the interface here—the connection between the trunk of the tree and the wires, tubes, and circumference measuring devices—is growing together on a visual level only (Fig. 1). We might better compare it to the cutting of the tree's bark for the abstraction or drawing of tree-milk, like *kautschuk* or *gutta percha*. The grey synthetic clay, which has been moulded so carefully around the entry where the black cables lead into the tree, is not put there to merge technology into culture like two branches of apple trees in the case of grafting; it secures the interface for a robust data abstraction. Looking carefully into the different topoi of connecting life and technology, such as short-circuiting (electricity), grafting (biology), interlinking (textile technology), blending (Alchemy), or the broad field of touch (sensing, feeling, scanning), reveals a typology of very distinct concepts about the connection of nature and technology by opening up particular metaphoric frames of how this connection is regarded, which I tried to bring into a scheme as shown in Fig. 3.

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10   Uwe Wirth: Kultur als Pfropfung. Pfropfung als Kulturmodell. Prolegomena zu einer Allgemeinen Greffologie (2.0), in: Uwe Wirth (ed.): Pfropfen, Impfen, Transplantieren, Berlin 2011, pp. 9–28.

The subjectification of the Pine, on the other hand, can be associated with the long history of myths, legends, and fables that frequently set speaking and magical trees at their center. Oracle trees foretell the future and warn of dangers.[11] Such legends are deeply rooted in the concept of »tree awareness.« This is because trees and forests still play a fundamental role for the concept and imagination of the environment. Seen from that perspective, it might even be unusual not to talk about trees as subjects. If forest hydrologists today grant the right of speech to trees by means of sensory technology and the internet, trees potentially become socialized actants for a collective »politics of subjects« (Bruno Latour).[12]

2. Drawing Trees as Testimonies of a Proxy-Nature

To better understand the different underlying topoi embedded in the purpose of making trees speak, and thus to translate and listen to the language of nature, a piece of art will be examined here. In a series of artworks, British artist Tim Knowles perverted a typical arrangement of landscape painting, which was established as a new practice of art after 1800, when landscape painters went outside into the environment and put up their easels to paint nature directly (Fig. 4, p. 115). Knowles' artwork cites the basic setting of landscape painting or environmental painting (painter-subject and nature–object), albeit he blurred the static roles in this romantic schema for nature contemplation. The branch of a tree is transformed anthropomorphically; it looks like an arm holding a pencil. The branch of the tree touching the surface of the paper on the easel then causes swaying structures to appear on the paper. It is not a human being guiding the pencil but the wind in connection with the tree. Of course, this arrangement is reminiscent of the famous vortex sketches by Leonardo da Vinci trying to follow the patterns of running waters and blowing winds in order to make visible the moving actor behind the wind.

Is this a pencil of Nature? What would physiologist Jules Etienne Marey have written in his »Methode graphique« (1878) about this connection of nature and culture? Is this a graphical method, the language of the phenomena themselves, a graphical expression of the tree? Or is it just the noise of many inseparable voices—the wind moving the tree? Who is speaking in this setting?

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[11] Lutz Röhrich: Der Baum in der Volksliteratur, in Märchen, Mythen und Riten, in: Adrien Finck (ed.): Germanistik aus interkultureller Perspektive. Collection Recherches Germaniques 1. Strassburg 1988, pp. 9–26.

[12] Bruno Latour: Das Parlament der Dinge. Für eine politische Ökologie, Frankfurt am Main 2001, p. 92. (Bruno Latour: Politics of Nature. How to Bring the Sciences into Democracy, Cambridge, MA 2004.)

Fig. 4: Photography showing the arrangement for the Tim Knowles' artwork »Tree Drawing—Hawthorn on Easel #1«, Foot of Castel Crag, Borrowdale, Cumbria, 2005, in this case an oak tree with easel.

Of course, it is not so much the outcome but the arrangement that is interesting here. The role swap of the painter and the tree points to the idea of *nature inscribing itself.* By finding a simple and evident image for this pseudo self-inscription, Knowles refers to the dream of a direct inscription of nature. This concept of understanding nature by disclosing secret inscriptions from it is part of the scientific inscription of nature in data, but is also part of a common aesthetic of nature (*Naturästhetik*). This ideal also guided many representatives of nature writing who were writing about nature under the ideal of the greatest possible closeness to nature. But, as the example of the tweeting trees might represent, the aesthetic of nature today actually is dominated by media interfaces translating measurements into numbers and data. Nature is to be found in data. Therefore, it is essential to ask what nature is inscribed here. How are the interfaces arranged in order to make nature speak in data? And how are these processes still guided by the longing for a direct, immediate connection?

The ideal of a self-inscribing nature still applies today. Here, tree data graphs can be seen as another way to make trees speak. Following Lynda Walsh, such graphs are also guided by the ideal of self-inscribing nature,[13] like the paleo-climatological »Hockey Stick Graph« representing climate history and temperature development since the year 1000 for the Northern Hemisphere. The graph, with its significant shape that lead to its nickname, was published by dendrologist and paleo-climatologist Michael Mann and his colleagues in 1998. The curve is particularly interesting in the context of trees as mediators or prosecutors of climate change perception because the temperature data were derived from chemical tree ring analysis. The curves reveal the notion of a very fundamental in-between-ness that goes together with the proxy method: The proxy is a decoy or surrogate, from Latin »procurator«, an agent representing others in a court of law. In the case of tweeting trees, proxies are the scientific nature-ghost-writers in the name of trees. They are another version of the time series graph rendered parallel to the text messages. Seen as proxies, it is possible to broaden the interpretation of speaking trees as potential agents in a politics of nature. Here, trees became testimonies of anthropogenic global warming, because only by proxies like tree-ring-analysis was it possible to find temperature data, even before instrumental weather observation through correlation.

3. Technologically Networked Natures

The history of the terms ›net‹ and ›network‹ reveals that the idea of a connection between the human nervous system and technical wires has existed since even before electricity was used to cross space.[14] This idea of the inseparable linkage between humans and nature was followed up by Karl Marx. He sketched out a profound ecological thought when stating that »Nature is man's inorganic body […]. To say man's physical and mental life is linked to nature simply means that nature is linked to itself, for man is a part of nature.«[15] One might pursue this line of thought and say that it is because of this inborn linkage to the organic and inorganic bod-

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13   Lynda Walsh: »Tricks«, Hockey Sticks, and the Myth of Natural Inscription: How the Visual Rhetoric of Climategate Conflated Climate with Character, in: Birgit Schneider and Thomas Nocke (eds.): Image Politics of Climate Change, Bielefeld 2014, pp. 81-104.

14   E.g. Laura Otis: Networking: Communicating with Bodies and Machines in the Nineteenth Century, from the Series Studies in Literature and Science, Ann Arbor 2001.

15   Karl Marx: Ökonomisch-philosophische Manuskripte, 1844, Karl Marx/Friedrich Engels Werke, Bd. 40, p. 516, translation taken from Martin Mulligan: Economic & Philosophic Manuscripts of 1844, chapter »Estranged Labour.«

ies of natures that logging tree data has become so important today. Nature in this perspective seems to be a forced companion, something one is very directly linked to; like an embryo connected to the placenta with an umbilical cord. It is in fact the other way round, as Marx put it: Ecological thinking in this sense makes explicit this enforced companionship, something Joseph Beuys made the subject of his performance »How to Explain Pictures to a Dead Hare« (1967). By talking to the hare, Beuys did not listen to nature or make nature speak, but rather playfully exchanged the positions of transmitter and receiver, and by this, the direction of communication. The idea of explaining art to a dead hare is radically unsettling to paradigmatic concepts of people's role on Earth, concepts in which they see themselves as stewards of the Earth, gardeners or foresters of Nature, and eventually managers of systems.

In his book *Internet der Tiere* (*Internet of Animals*), Alexander Pschera based his perspective on nature on the metaphor of economic circuits as ecologies. He here follows, I would think, what filmmaker Adam Curtis tried to elaborate critically in his BBC documentary series ALL WATCHED OVER BY MACHINES OF LOVING GRACE (UK, 2001, Adam Curtis) from the year 2011. The second episode of the series is entitled THE USE AND ABUSE OF VEGETATIONAL CONCEPTS (S01E02). What Curtis tried to critically pile up in this documentary are the profound consequences of establishing an analogy between *ecology* and *system theory* in the 20th century, one which could become a leading model for economists, psychologists, social studies, and cybernetic thinkers alike. The result was a universalized idea of ecological systems subsuming technological cybernetics and natural ecologies, such as the ecology of a lake, under the same term. The consequence of this analogy is profound: Not only did technological networks become naturalized, but also a shifted perspective on nature was established, one which allowed for the inclusion of nature into processes of automatization, circuits, and feedback loops. A result of this dominant analogy, which is still valid today, is the reversion of the idea, as Pschera puts it, of »learning from nature« to »learning from digital code«,[16] to codes controlling nature. The priority of this approach towards nature is the reason why Pschera talks about a *Technocene* or *Digicene*: »Nature and digital technology merge to a system, where organic and electronic components interlock.«[17] What follows is the observation that the experience of nature is no longer a space free of data, but rather the reverse—nature in most cases is experienced only through media and data.

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[16] Alexander Pschera: Das Internet der Tiere: Natur 4.0 und die conditio humana, in: Zeitschrift für Medien- und Kulturforschung, 7/2 (2016), p. 113.

[17] Ibid., p. 114.

Fig. 5: Amazon Tall Tower Observatory monitoring the Amazon forest relationships be-
tween the jungle and the atmosphere since 2015 (Brazil's National Institute of Amazonian
Research and Germany's Max Planck Institute.)

4. Monitoring Forests as »Lungs of the Earth«

A third example making use of trees for data logging connects to this idea; it is
the laboratory for »dating the atmosphere« that belongs to the new regime of
techno-managed nature protection, where monitoring has become the essential
feedback tool for system management on the largest scale.

For the purpose of learning more about the »Lungs of the Earth«, the tropical
rain forest, researchers built a tower in the middle of the Amazon rainforest, which
is said to be the world's first long-term tropical observatory. The observatory is
called the *Amazon Tall Tower Observatory* or ATTO Climate Tree (Fig. 5). It is 325
m high, and by this, the highest building in South America. It is a collaborative
research project between Brazil's *National Institute of Amazonian Research* and Ger-
many's *Max Planck Institute* designed to monitor the relationship between the
Earth's largest rainforest and the atmosphere. Since 2016, the observatory has
permanently gathered data about the sensitive Amazonian ecosystem, which is
expected to change in the upcoming decades due to climate change. Researchers
want to understand the global carbon cycle, the exchange between biosphere and
atmosphere, and, hence, how the forest is coupled with the atmosphere.

Built in the Sao Sebastiao do Uatumã nature reserve, 350 kilometres from the city of Manaus and reachable only after hours of travel on rough roads and a boat ride, the ATTO is »remote from human influences«, as the researchers point out. The project team uses the term »pure data« in relation to this remote situation: »Being far from town's and man's influence ensures we can collect relatively pure data«, states Meinrat Andrae, the director of the Max Planck Institute of Chemistry.[18] The notion of purity might be seen as going hand in hand with the »quintessential representation of [Amazonia] in the imaginary and epistemic constructions of Western culture and sciences«,[19] which contains the unstructured, the remote, and the untouched. Amazonia is important in an era of the world history perceived as the Anthropocene, where the human signal is expected to be anywhere. For the observation tower, this also means that since there is no internet (the station itself is »unplugged«), gathered data has to be transported physically to be processed and stored.

The tower observatory is described in terms that might remind media historians of Ernst Kapp's philosophy of technology. Kapp interpreted technical artefacts in the second half of the 19th century as »organ-projections«, as extensions of and substitutes for human sensual organs.[20] Researcher Wolfgang Lucht has highlighted the tower in its crucial role of achieving new climate change knowledge as humanity's »eyes and ears« observing the condition of Earth as a whole.[21] This makes the tall tower a giant fever thermometer sticking in the centre of the Amazonia in order to always inform humans of the health state of the climate circulation system—but the tall tower observatory might even remind one of the surreal movie *Fitzcarraldo* by Werner Herzog (1982), in which the main actor has to carry a huge steamship over a steep hill in order to gain access to a rubber-rich territory in the Amazon.

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[18] See Javier Tovar: Brazil Builds Climate Tower in Pristine Amazon Jungle, under: http://www.thejakartapost.com/news/2015/08/26/brazil-builds-climate-tower-pristine-amazon-jungle.html http://www.ticotimes.net/2015/08/26/brazil-builds-climate-tower-in-pristine-amazon-jungle(26 August 2015)

[19] Paolo Tavares: The Political Nature of the Forest: A Botanic Archaeology of Genocide, in: Anne-Sophie Springer and Etienne Turpin (eds.): The Word for World is Still Forest (Intercalations 4), Berlin 2017, p. 125.

[20] Ernst Kapp: Grundlinien einer Philosophie der Technik. Zur Entstehungsgeschichte der Kultur aus neuen Gesichtspunkten (1877), edited by Harun Maye und Leander Scholz, Hamburg 2015; on this issue see also Leander Scholz: Der Weltgeist in Texas. Kultur und Technik bei Ernst Kapp, in: Zeitschrift für Medien- und Kulturforschung 4/1 (2013), pp. 171-190.

[21] Simone Humml: Potsdamer Klimaforscher über einen Messturm in Brasilien. »Die Erde ist noch viel komplizierter«. Interview mit Wolfgang Lucht, in: Potsdamer Neueste Nachrichten (19.04.2017), p. 20, under: http://www.pnn.de/campus/1175557/ (31 January 2018).

The outcome of this form of nature sensing are masses of observation data from high above the forest in the atmosphere: data on heat, water, carbon gas, winds, cloud formation, and weather patterns. The transformation of the forest into data and diagrams might be described as chains of representation, like the process described in the photo-philosophical essay written by Bruno Latour in 1999, in which he followed the practices of an interdisciplinary team of pedologists and botanists in the Amazon rainforest—and where he detailed how the soil of the forest is transformed, via the rituals of science and through a long chain of representations, into diagrams.

The tower helps analyse the Amazon rainforest's gas emissions, like carbon dioxide, methane, and nitrous oxide, and can be seen as the counterpart of the observatory on Mauna Loa where the »Keeling Curve« of human-induced increase of CO_2 has been perpetually charted since the 1950s while simultaneously showing the annual variation of the world's forests »breathing.« The tower can also be seen as a supplement to the monitoring and collection of data on forests done by satellites such as ESA's Centre for Earth Observation »Earth Explorer Biomass«, a satellite that provides global maps of the amount of carbon stored in the world's forests.

5. Gutta Percha Tree Milk as Network Material

Suggestive here would be further examples of *media of nature* and *nature as media* in order to think about the different ways of merging/connecting nature and media systems. For this purpose, I finally would like to examine a very special piece of memorabilia, or relic, from the early age of submarine telegraphy, one which might function as a philosophical item for the whole subject discussed here (Fig. 6, p. 121). What is displayed in the ritualistic glass case is a short piece of the transatlantic cable that was installed between Europe and North America in 1873. Forty years later, in 1903, the cable was replaced and this piece was recovered for display at the Science Museum in London.

This essay already thematised the similarities of abstracting data from trees with abstracting milk from natural rubber trees. At the same time, the connection of forests and trees to electronic communication networks was highlighted. Both layers can be discussed further with the historic piece of transatlantic cable. This is because it is the inseparable interplays between organic and inorganic systems and the conditions of existence which become explicit in the relic of the transatlantic cable placed so beautifully in the glass case. What interests me in the first place is that every piece of submarine cable in this age had been isolated by a special type of raw material called ›gutta percha‹, and this is also true for the specimen we see here. This material was derived from tropical trees that only grew

Fig. 6: Museum piece of a transatlantic cable covered with gutta percha from the Science Museum London, showing the biocenosis of organic and anorganic nature. The transatlantic cable is encrusted by inhabitants of the sea like corals and sea shells. The cable was installed in 1873; in 1906 parts of it were removed.

in Southeast Asia on islands like Papua, Malaysia and the Philippines, by that time under the rule of colonial powers.

It had been a great problem to protect electric cables against saltwater, as no material had been found that would be durable enough. In the late 1840s, with gutta percha, a material was finally found that was resistant to saltwater—which thus allowed short-circuiting to be avoided—and a machine was invented that was able to cover the cable seamlessly.[22] In August 1850, a journalist wrote about this essential invention for the fortune of the ›age of communication‹ in the line with the spirit of technological euphoria: »We live in an age of wonders. […] There

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[22] Media study scholars have worked on the history of telegraphy extensively as this is a key example for the evolution of technical networks. In media history the focus is naturally placed on technology and not so much on ecology. In contrast, environmental historians such as Verena Winiwater and John Tully have elaborated on the ecological implication of telegraphy and the use of gutta percha. For some years a focus on the insustainability of resources to produce media also has been taken by media scholars, such as Nicole Starosielski in her book The Undersea Network, Durham 2015, in which she combines both perspectives.

seems to have been a ›special providence‹ in the case, for had gutta percha not turned up in the nick of time in all probability the submarine telegraph would still have been numbered among the visionary projects of the day.«[23]

What is interesting here, when reflecting about the entanglement of human, technological, and earthly forces, is that in the very centre of media history lies a history of excessive unsustainability and colonialism.[24] Between 1845 and 1847, on the island of Singapore, 70.000 trees were felled. Until 1880, more than 160.000 kilometres of cable was installed in the oceans, in 1907, 370.000 km were counted. Every part of these cables was covered with gutta percha. The indigenous people of the islands undertook the extraction of gutta percha. They walked into the tropical forests and searched for wild-growing gutta percha trees, cut it, and harvested its milk. With this method, by 1890, more than 80 million trees were cut down. Since three quarters of gutta percha were consumed by the telegraph industries, we can say that the tropical stock of gutta percha trees fell victim to telecommunication. At the end of the 19th century, there were barely any trees left; as a consequence the companies were unable to establish more telegraph lines according to schedule. This meant they could not work on establishing the communication sphere needed for the distribution of colonial power.

Solutions to this shortcoming were sought by cultivating *gutta percha* trees, but the material limitations remained. Finally, in 1933, the problem was solved by the invention of another material derived from organics: plastic. Gutta percha was replaced by polyethylene, the geological remains of microorganisms.

What we can learn from this story is the very close entanglement of the organic and the inorganic for the very early establishment of networks. To think about the material in such a way stands in contrast to the notion of ›the internet‹ that is guided by an *immaterial* imagination. This early example of the network shows how the net is strongly dependent on ecology; raw and organic materials nourish it. The conditions of the existence of the early communication networks have been tropical trees felled in colonies, unsustainable conditions of overexploitation, and exploitative working conditions.

Current examples that bring to mind these interdependencies of the technosphere with the bio- or the geosphere would be the inhuman conditions of how rare-earth elements are gathered in the Congo, but also how electronic waste is shipped to Ghana where it forms large toxic graveyards. This is in addition to the seldom-discussed geopolitical fact that 97 % of rare-earth elements produced today are sourced from China—therefore the future of technical media and networks,

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23 Carlisle Journal: The Submarine Telegraph, 7 September 1850, p. 2.
24 See John Tully: A Victorian Ecological Disaster. Imperialism, The Telegraph and Gutta Percha, in: Journal of World History 20/4 (2009), S. 559-579: 572f.

but also essential raw materials to realize an exit from fossil–fuel energy can be realized only under the conditions of this geopolitical condition.

What would it change if the encrusted cable in the glass case were to be moved into the collection of a Natural Museum? How would nature as media and media as nature be reconfigured if the glass case were to be placed next to the diorama of an oyster bank, which biologist, oyster-specialist, and director of the museum, Karl Möbius, installed in the late 19th century—a habitat made of natural material he displayed at the Berlin Natural Museum to demonstrate how different specimen coexist in a biocenosis, or ecological community (Fig. 7)? Would this be an opportunity for contemplation about the politics of subjects and nature that we—people of the former colonies and industrialized countries—need to rethink

Fig. 7: Replica of an oyster bank from Schleswig-Holstein. Glass showcase from the collection of the Museum of Natural History Berlin showing the cohabitation of oysters and other maritime creatures in a biocenosis, Karl A. Möbius, late 19th century.

so urgently today? The enshrined object in the glass box is encrusted by marine growth, inhabitants of the sea, like corals and sea shells. The glass box contains the cable, like an aquarium located in a museum of natural history, but in reality it is stored in another institution, the museum of science and technology. The display case with the encrusted gutta percha cable may therefore be an early example of the interplay and entanglement of organic and inorganic natures and technologies; an ecosystem of communication; or a model and shrine enabling one to consider the inseparable entanglement of technological, social, organic, and earthly spheres—a media ecology.

6. Trees as Smart City Environments—Outlook

Perhaps the dream and desire to merge nature an technology take shape in the more than 40-year-old phantasies of futurist city structures. In many cases such visions present the city or the building as a forest.The imagined architectures of Sou Fujimoto and Vincent Callebaut, or the realized architectures of Stefano Boeri's *Bosco Verticale*, or the so-called *Trees by the Bay* in Singapore (Fig. 8) would be the renewed versions of this dream of the healthy merging of trees and technology— today, of course, planned in the ecological paradigm of the so-called smart city. They reveal the persistent romantic dream of a symbolic healing of nature and civilization, of city and forest. Thus the dream of a possible symmetric relationship between the spheres appears. Today, such concepts come together with the ecology of the smart house, as Jennifer Gabrys has pointed out. Sensing environments that »know« how the inhabitants of the habitat feel, where to shed light, or when to change the room atmosphere. The old fear of a hostile nature is suspended symbolically into an image of two different spheres healing. Ecomimesis in the city becomes the new symbol of domination over nature, quite similar to the European idea of the baroque garden.

Then again, following the ideas of Marx, nature always has been the anorganic part of the human body, connected to it in different metabolistic ways. However, the question why most people do not feel the »pain« they cause to the anorganic parts of their extended nature body still remains.

The discussion of different examples might make the following explicit: currently, the mediasphere primarily or even uniquely seems to offer the conditions to perceive the nature of climate change. We have become climatologists through media—by transpositions and mediations of nature in cascades of different discourse networks and on the basis of media materialities, as can be concluded according to Friedrich Kittler. His method to study media is still valid for this domain, because in order to find nature, one has to examine the tools, monitoring

Fig. 8: *Supertree Grove* in the *Garden by the Bay*, Singapore, spanning 101 hectares, built on an artificially raised coastal area, completed in 2012. The grove follows the idea of a city in a garden.

devices, and technological networks that shape the environmental sensorium. This is also what media theory scholars drawing on environmental criticism and history can base their studies on, because »with technical media, Nature becomes registered, inscribed as the Real through the possibilities of technical media.«[25] The climate crisis becomes sensible only through and within mediated data of concern.

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[25] Jussi Parikka: So-called Nature: Friedrich Kittler and Ecological Media Materialism, in: Nicole Starosielski and Janet Walker (eds.): Sustainable Media. Critical Approaches to Media and Environment, New York/London 2016, pp. 196–212: 206.

Picture Credits:

Fig. 1: Tweeting pine tree located in the forest-lab of the Thünen-Institute of forest ecology Brandenburg, Britz. © Photographer: Birgit Schneider, 2017.

Fig. 2: Interface for data abstraction from the tweeting pine tree. © Photographer: Birgit Schneider, 2017.

Fig. 3: Typology of metaphors for connecting nature to technology, Birgit Schneider.

Fig. 4: Photography showing the arrangement for the Tim Knowles' artwork »Tree Drawing—Hawthorn on Easel #1«, Foot of Castel Crag, Borrowdale, Cumbria, 2005, in this case an oak tree with easel. © Tim Knowles.

Fig. 5: Amazon Tall Tower Observatory monitoring the Amazon forest relationships between the jungle and the atmosphere since 2015 (Brazil's National Institute of Amazonian Research and Germany's Max Planck Institute.) © Bruno Kelly.

Fig. 6: Museum piece of a transatlantic cable covered with gutta percha from the Science Museum London, showing the biocenosis of organic and anorganic nature. The transatlantic cable is encrusted by inhabitants of the sea like corals and sea shells. The cable was installed in 1873; in 1906 parts of it were removed. © Science Museum/SSPL.

Fig. 7: Replica of an oyster bank from Schleswig-Holstein. Glass showcase from the collection of the Museum of Natural History Berlin showing the cohabitation of oysters and other maritime creatures in a biocenosis, Karl A. Möbius, late 19th century. © Museum für Naturkunde, Berlin.

Fig. 8: *Supertree Grove* in the *Garden by the Bay*, Singapore, spanning 101 hectares, built on an artificially raised coastal area, completed in 2012. The grove follows the idea of a city in a garden. © Harrytan Photography.

Abandoned Infrastructures

Technical Networks beyond Nature and Culture

Gabriele Schabacher

In discussions of the Anthropocene,[1] infrastructures play an eminent role as expression of man's deep interference with nature. Because of their networked character, they are said to mediate the planet by fundamentally shaping the relation between man and environments with long-lasting effects and by transforming social, cultural, and aesthetic conditions. »Anthroturbation« modifies the earth in several ways. It transforms the surface by changing landscapes, soils, oceans, and the atmosphere (human constructions, excavations, and other interventions in urban and agricultural settings); and it alters subsurface layers through structures built at a shallow level (i. e. systems of energy supply, sewerage, and transportation such as underground urban networks, subways and tunnels) as well as through »deep anthroturbation« (especially mining and boreholes).[2] According to the various forms of anthroturbation, different actors and activities are said to be the prime movers of the anthropocene, for which corresponding terms have been coined: the »plantationocene«[3], for example, takes into account the vast transformation of farmland and forest into enclosed plantations through slave labour, the »oleocene« stresses the overall importance of fossil fuels and the infrastructures of the oil drilling industry, and the »anthrobscene« points to the »obscene« economy of all the materials necessary to produce today's media world.[4] Nevertheless, there is basic agreement about the overall assumption underlying the anthropocene,

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1   See Paul Crutzen: Geology of Mankind, in: Nature 415 (2002), p. 23; Will Steffen, Jacques Grinevald, Paul Crutzen and John McNeill: The Anthropocene: Conceptual and Historical Perspectives, in: Philosophical Transactions of the Royal Society 369 (2011), pp. 842–867.

2   See Jan Zalasiewicz, Colin N. Waters and Mark Williams: Human Bioturbation, and the Subterranean Landscape of the Anthropocene, in: Anthropocene 6 (2014), pp. 3–9, see pp. 4–5.

3   See Donna Haraway: Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin, in: Environmental Humanities, vol. 6, 2015, pp. 159–165, see note 5.

4   See Jussi Parikka: The Anthrobscene, University of Minnesota Press 2014; also Jussi Parikka: Deep Times and Media Mines: A Descent into Ecological Materiality of Technology, in: Erich Hörl with James Burton (ed.): General Ecology. A New Ecological Paradigm, London 2017, pp. 169–191.

namely that through the processes of industrialization from the beginning of the 19th century onward, man has changed his position from a mere »biological agent« in environmental history to a »geological force.«[5]

In such a perspective, infrastructures are assumed to have an enduring quality and they are discussed as stable socio-technical formations. This notion of infrastructural stability, however, can be debunked as a typically Western idea, as diverse processes and cultural techniques of maintaining, upholding, and repairing are needed to keep socio-technical networks running despite breakdowns and disturbances, or erosion and decay. With regard to the mediocene, introduced in the present volume as a complementary term to the notion of the Anthropocene in order to account for the predominant role of media in the shaping and conceiving of the planet, the notion of stability is of interest here, however, since it addresses the specific temporality of infrastructures. The question of temporality concerns not only the process of constant infrastructural upkeep just mentioned, but also the vast, ever growing field of abandoned infrastructures that—although no longer in use—are not demolished, because they are too monumental, or because it would be too expensive, or just because no one cares. Deprived of their function for society, these structures no longer belong to the realm of culture in the way they did before. But neither do they belong to the realm of nature in the way a plant, for example, does. Thus, they exist in a sort of hybrid, precarious state. In what follows, I will try to make sense of this specific state of abandoned infrastructure: Being both present and not quite there, these structures exhibit a sort of »zombie« status,[6] which can be productive for understanding the temporalities inherent to the notions of the anthropocene and the mediocene, respectively.

My argument unfolds in three steps. First, I give a few examples of what I understand by abandoned infrastructures and discuss this abandonment as a lack of care. In a second step, I take a closer look at recent discussions in Science and Technology Studies and Urban Studies concerning processes of decay and deterioration with regard to architecture and infrastructure. This means shifting the attention from notions of disturbance and disaster, as more or less discontinuous and abrupt events, towards a perspective that takes into account slower and often unnoticed temporal processes of change. The notions of ruin and ruination will be of particular interest here. In the last part of the paper, I focus on the relation

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5   Dipesh Chakrabarty: The Climate of History: Four Theses, in: Critical Inquiry, vol. 35, no. 2, 2009, pp. 197–222, see p. 206. For further discussion of Chakrabartys theses, see Robert Emmett and Thomas Lekan: Whose Anthropocene? Revisiting Dipesh Chakrabarty's ›Four Theses‹, Rachel Carson Center Perspectives 2016/2.
6   With respect to media archeology, see the reflections on »zombie« or »dead« media by Garnet Hertz and Jussi Parikka: Zombie Media: Circuit Bending Media Archaeology into an Art Method, in: Leonardo, vol. 45.5 (2012), pp. 424–430.

of nature and culture as well as on the aspect of temporality, reframing the discussion of abandoned man-made structures on a more abstract level of the terms anthropocene and mediocene. I propose to understand the temporal regimes of decay and abandonment as processes of transformation that constantly rework the distinction of nature and culture, geology and archeology, life and death. In addition, I argue that—in contrast to the notion of the Anthropocene—the mediocene concept might be able to account for their complex networked and mediating character as well as their specific temporality.

1. A Lack of Care

To give an impression of what I have in mind with infrastructural deterioration and the »zombie« status of abandoned man-made structures, I want to refer to some photographs. On the one hand, there are examples that evoke the past by showing formerly functioning structures. Considering the photographs of Thomas Jorion,[7] we encounter an artistic presentation of built structures that are all in a way reconquered by nature. The pictures display recent examples of abandonment as well as older relics, in industrial and rural regions, from Western and postcolonial contexts. Two pictures may serve as examples: a decaying Soviet military basketball court in Germany (Fig. 1, p. 130) and a 19th century slave prison in Guadeloupe (Fig. 2, p. 130). Although these relics stem from different times, geographical settings, and national contexts, the entanglement and overlapping of nature and culture that is shown in these pictures seems so similar, that it would be difficult to decide, without additional information, the time or region to which the relics belong. In addition to such »aesthetic« representations, there are also examples that seem to claim a documentary status (Fig. 3, p. 131). By implicitly evoking the contrast to what once has been, these pictures suggest a process of decline, as the photograph of the 2004 Athens Olympic village illustrates. However, abandonment happens not only to single buildings, but also to whole towns or areas, creating so-called ghost towns. They often emerge after the natural resources of the region have been depleted (gold, diamonds), after infrastructure projects have been completed (railroad), because of political reasons, or in the aftermath of a catastrophe. Examples are the Ukrainian town Pripyat next to Chernobyl, which had to be evacuated after the 1986 nuclear accident, or Plymouth on the island of Montserat where an entire region had to be abandoned after a series of local volcanic eruptions and pyroclastic flows. An emblematic case illustrating the fate of a formerly highly successful industrial region is Detroit with all its empty, dete-

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7 http://www.thomasjorion.com/uk/index.php/ (18 January 2010)

Fig. 1: Basketball Hall of a Former Soviet Military Base, Germany, 2010

Fig. 2: Prison, Petit-Canal, Guadeloupe, 19th Century

Fig. 3: Training Pool, Olympic Village Athens, 2004

riorated industrial architecture left behind by the ongoing process of post–industrial, economic change.[8] Economic causes are also responsible for rural exodus, as in the case of the former fishing village Houtouwan (Fig. 4, p. 132) on the Chinese half island Shenghsan, East of Shanghai, where people have left their houses behind in the early 1990s due to better living conditions and transport routes on the mainland. The reason this village has not been completed abandoned— and the reason we know about it— is because the picturesque landscape has been subsequently reinvented as a regional tourist attraction. This renewed economic interest can be seen as an effect of the emergence of the type of photography shown above that indulges in the aesthetic quality of abandoned urban areas (such as Detroit). The discussion of this phenomenon is controversial, since some denounce the photographs as nostalgia and even »ruin porn«[9] on the one hand, while others

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8   Detroit has been documented recently in several illustrated books, see Andrew Moore: Detroit Disassembled. Photography by Andrew Moore. Essay by Philip Levine, Bologna 2010; Dan Austin: Lost Detroit. Stories Behind the Motor City's Majestic Ruins. Photography by Sean Doerr, Charleston, SC 2010; Yves Marchand et al.: The Ruins of Detroit, Göttingen 2010. See also the work of Camilo José Vergara: New American Ghetto, New Brunswick, NJ 1995; Camilo José Vergara: American Ruins, New York 1999.
9   JoAnn Greco: The Psychology of Ruin Porn, in: CityLab (January 6, 2012), under: https://www.citylab.com/design/2012/01/psychology-ruin-porn/886/ (23 January 2018).

Fig. 4: The Abandoned Village of Houtouwan on Shengshan Island, China

interpret them, on the other hand, as an attempt to »reprogram« and revitalize these obsolete urban regions as places to be remembered.[10]

The abandoned infrastructures shown so far evoke a sort of pastness. However, they also are used in fictional, dystopian contexts, where they often depict a catastrophic future of mankind.[11] Architecture and infrastructures are here presented as ambivalent or hybrid zones between nature and culture. The TV-series THE WALKING DEAD (USA, 2010-, Frank Darabont), for example, depicts survival after a zombie apocalypse within an environment furnished by abandoned infrastructures (highways, schools, hospitals, prisons etc.). All of these structures are shown in a state of decay. However, as part of the poor living conditions presented in the series, they also assume the status of quasi »natural resources«, which have to be found, searched through, exploited, and rearranged.

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[10] Robert M. Arens: Say Nice Things About Detroit: Private Visions and Public Debate, in: 85th ACSA Annual Meeting Proceedings, Architecture: Material and Imagined, ed. Lawrence W. Speck, 1997, pp. 634–638, see p. 636.
[11] The scary, abandoned building or town is also a characteristic element of gothic, fantasy and horror fiction (i. e. in the *Weird Tales* of H.P. Lovecraft) to evoke a sense of fear and the uncanny.

Now, what do all these examples tell us about the temporality of abandoned infrastructure? For a long time, infrastructure research has been informed by the idea of stability. In his canonical work on electricity infrastructure in the United States and Europe, Thomas Hughes, for example, is interested primarily in the processes of consolidation of invented socio-technical systems, including factors such as »momentum«, which he analyzes as a tendency towards the stabilization of existing structures.[12] From this point of view, infrastructure systems are permanent, stable technologies or even—in the case of architecture—timeless buildings, based on standards, path dependence, and being embedded in pre-existing networks. Recent approaches in the fields of Science and Technology Studies and Urban Studies, however, have criticized this understanding for not taking into account the interconnectedness of infrastructures as well as processes that destabilize socio-technical systems.[13] Consequently, they have developed a more process-focused approach to infrastructure and architecture. Pursuing a kind of un-blackboxing, these approaches consider not only the heterogeneous actors that a certain infrastructure assembles, but also their strong tendency to drift apart. Following Steven J. Jackson's suggestion to invest in sort of a »broken world thinking«[14], this means to reverse the perspective and to take »erosion, breakdown, and decay, rather than novelty, growth, and progress, as our starting points in thinking through the nature, use, and effects« of technology.[15] To acknowledge the fact that »the world is always breaking« consequently leads to attesting to infrastructures ephemeral qualities.[16] As Stephen Graham and Nigel Thrift have convincingly argued, we have to be careful not to follow what they call »the myth of order.«[17] With this notion, they refer to an understanding of infrastructure that derives from a preoccupation with catastrophic failures and disasters as extraordi-

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[12] See Thomas P. Hughes: The Evolution of Large Technological Systems, in: Wiebe E. Bijker, Thomas P. Hughes and Trevor Pinch (ed.): The Social Construction of Technological Systems, Cambridge, MA 1989, pp. 51–82, see p. 76ff.

[13] Paul N. Edwards et al.: Understanding Infrastructures: Dynamics, Tensions, Designs. Report of a Workshop on ›History & Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures‹ January 2007, under: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/49353/UnderstandingInfrastructure2007.pdf?sequence=3&isAllowed=y (23 January 2018); Geoffrey Bowker et al.: Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment, in: Jeremy Hunsinger et al. (eds.): International Handbook of Internet Research, Dordrecht/London 2010, pp. 97–117.

[14] Steven J. Jackson: Rethinking Repair, in: Tarleton Gillespie, Pablo Boczkowski and Kirsten Foot (eds.): Media Technologies: Essays on Communication, Materiality and Society, Cambridge, MA 2014, pp. 221–240, see p. 221.

[15] Ibid.

[16] Ibid., p. 223.

[17] Stephen Graham and Nigel Thrift: Out of Order: Understanding Repair and Maintenance, in: Theory, Culture and Society 24/3 (2007), pp. 1–25, see p. 8.

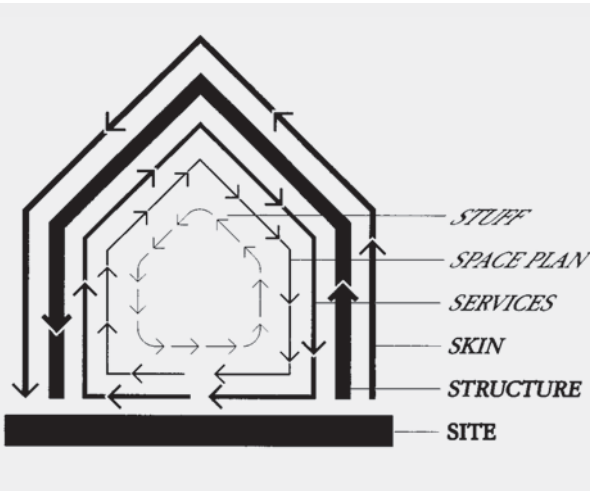Fig. 5: Layers of Change in a Building

nary states of infrastructural disorder and disturbance, which all too easily leads one to believe that life beyond such situations is neatly ordered. In fact, the contrary is true.[18] There is a huge amount of ongoing—usually invisible—mundane care and repair invested in maintaining the status quo. According to Graham and Thrift, one reason why we so readily believe in the myth of order stems from ignoring the experiences of the Global South where the »broken« status of technical systems represents a ubiquitous experience in everyday life.[19]

In the same way, the example of a single building can teach us a lot about change, if we are ready to see it. As Stewart Brand shows in his famous study *How Buildings Learn*, buildings not only change over time, but they do so with respect to the several layers of built components that differ in their longevity (Fig. 5). Whereas the »site«, according to Brand is quite eternal, exterior surfaces have to be renewed every twenty years, and on the level of »stuff« (including kitchen, appliance), things »twitch«, as Brand says, monthly, weekly, and daily.[20] These different temporalities within the »same« building are responsible for the fact that a building actually never stays the same over time. A building, as Albena Yaneva and Bruno Latour suggest in very much the same line of thought, is a »flow of

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18 The research on accidents shows that routinized modes of work are in fact unordered, insofar they include accidents as well as measures to prevent accidents as normal procedure, see Jörg Potthast: Papier, Bleistift & Bildschirm. Die Bodenhaftung der Flugsicherung, in: Christian Kassung (Hg.): Die Unordnung der Dinge. Eine Wissens- und Mediengeschichte des Unfalls, Bielefeld 2009, pp. 303–327, see p. 307. However, as social scientist Brian Wynne argues, »because it is seen this way only around accidents, the belief is consolidated that *normally* practices are more orderly.« (Brian Wynne: Unruly Technology: Practical rules, impractical discourses and public understanding. In: Social Studies of Science 18 (1988), pp. 147–167, see p. 150).

19 See Graham/Thrift: Out of Order (as note 17), p. 11. See also Brian Larkin: Zersetzte Bilder, verzerrte Klänge. Video in Nigeria und die Infrastruktur der Raubkopie, in: Zeitschrift für Medienwissenschaft 6 (2012), pp. 49–65.

20 Stewart Brand: How Buildings Learn. What Happens After They're Built, London 1994, p. 13.

transformations«[21], not a »static object but a moving project«.[22] Furthermore, according to Brand, the temporalities of the different building layers cause interferences: »Because of the different rates of change of its components, a building is always tearing itself apart.«[23] The costs going along with these diverse temporalities of a building, that is to say, the costs of materials and labour which have to be invested in restoring, renovating, and refurnishing it, are usually overlooked, while they considerably exceed the original investment costs: »Over fifty years, the changes within a building cost three times more [at least in 1994, G.S.] than the original building.«[24]

These types of costs also pose significant problems on the national level, as the example of the USA shows. Every four years, the American Society of Civil Engineers (ASCE) publishes *The Infrastructure Report Card*, a report which grades the current state of national infrastructure according to categories on a scale of A through F. Since 1998, America's infrastructure has earned persistent D averages. The 2017 Infrastructure Report Card reveals that, although there is some progress being made (the cumulative grade is again D+), the failure to close the investment gap for needed maintenance and improvements continues. A look at the ASCE infographics shows that there is only one B for rail, a few Cs for bridges, ports and solid waste, but Ds for hazardous waste, drinking water, schools, transit, etc.[25] There are 15.498 dams that are considered to have high-risk potential. Repairing the entire infrastructure would cost up to two trillion American dollars. Deferring repair, however, leads not only to huge losses in the national economy, but also to increasing costs for future repair; the estimated funding gap will more than quadruple to $10.3 trillion by 2040.[26]

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21 Bruno Latour and Albena Yaneva: »Give me a gun and I will make all buildings move«: An ANT's View of Architecture, in: Reto Geiser (ed.): Explorations in Architecture: Teaching, Design, Research, Basel 2008, pp. 80–89, see p. 85.

22 Ibid., p. 80.

23 Brand: How Buildings Learn (as note 20), p. 13.

24 See ibid. Brand refers to architect and architectural theorist Frank Duffy, who states that »the unit for analysis for us isn't the building, it's the use of the building. Time is the essence of the real design problem.« (Frank Duffy cited after Brand, ibid.) And even ruins need maintenance (see David Edgerton: The Shock of the Old. Technology and Global History since 1900, London 2006, p. 78).

25 https://www.infrastructurereportcard.org/the-impact/explore-infographics/americas-infrastructure-grade/ (18.01.2018).

26 Failure to Act report: Closing the Infrastructure Investment Gap for America's Economic Future, American Society of Civil Engineers 2016, under: https://www.infrastructure reportcard.org/wp-content/uploads/2016/10/ASCE-Failure-to-Act-2016-FINAL.pdf (18.01.2018), p. 11.

Taken together, the stability of socio-technical structures has to be understood as the result of ongoing practices of caring in the widest sense, and of maintenance activities in the more particular sense of standardized and industrial procedures.[27] In what follows, I want to take a closer look at what happens when maintenance and caring activities are lacking, that is, when infrastructures are left to themselves. This means to shift the focus to processes of decay and deterioration as well as to material forms such as rubble and debris.

2. Decay and Ruins

In their study *Buildings must die*, architect and urbanist Stephen Cairns and human geographer Jane M. Jacobs elaborate a »complex view of architecture's ›life‹ and ›death‹«,[28] which includes what they call the »flip side« or »shadow story«[29] of architecture's (accepted) defining attributes. Thus, they do not take as their starting point architecture's »material durability, its creative genesis, its productive utility, its aesthetic value«,[30] but focus on architecture's relation to »decay, deterioration, and destruction«.[31] Referring to Michael Thompson's *Rubbish Theory* and his analysis of the complex processes of transfer between the categories of the transient and the durable as well as their respective de/valuation, they highlight Thompson's argument »that one man's rubbish can be another man's desirable object.«[32] Cairns and Jacobs, too, stress the importance of both aspects, of »matter« and »mattering«,[33] that is to say, of the dimension of materiality on the one hand and of the processes of valuation on the other. Only these two aspects together are able to explain the »relative durability«[34] of built structures and their specific temporality: »Architecture's relative durability does not exempt it from the principle

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27   See also Gabriele Schabacher: Im Zwischenraum der Lösungen. Reparaturarbeit und Workarounds, in: Holger Brohm, Sebastian Gießmann, Gabriele Schabacher und Sandra Schramke (eds.): Workarounds. Praktiken des Umwegs, Berlin 2017, pp. XIII–XXVIII; Stefan Krebs, Gabriele Schabacher and Heike Weber (ed.): Kulturen des Reparierens. Dinge – Wissen – Praktiken, Bielefeld 2018.

28   Stephen Cairns and Jane M. Jacobs: Buildings Must Die. A Perverse View of Architecture, Cambridge, MA/London 2014, p. 2.

29   Ibid., p. 1.

30   Ibid.

31   Ibid., p. 2.

32   Michael Thompson: Rubbish Theory: The Creation and Destruction of Value, Oxford 1977, p. 96. For their discussion of Thompson's approach see Cairns and Jacobs: Buildings Must Die (as note 28), p. 57.

33   See ibid., p. 49.

34   Ibid., p. 58.

of mutable value, but it does ensure that architecture generally ›circulates‹—via processes of reinvestment, restoration, and revaluation—more slowly through its ebb and flow. As a consequence, buildings are regularly out of time—unused, unloved, unappreciated, devalued—but still very much in place.«[35]

This specific spatio-temporal obduracy of built structures seems interesting with regard to the logic of abandonment. As Cairns and Jacobs argue, we deal with an »[o]bduracy-in-obsolescence«[36], insofar as »[a]n obsolete building is in place but out of time.«[37] This status results from the fact that it is simply impossible to remove particular structures from sight: »Unlike other waste objects, which can be managed or rendered invisible by being pushed into a garbage bin, stored in the attic, compacted in a landfill, or biodegraded, buildings often, resolutely and publicly, stay in view and in place regardless of their economic and public evaluations.«[38]

The architecture of bunkers that Paul Virilio analyzes provides a very impressive example of this type of obduracy. Many of the buildings along the »Atlantic Wall«—a massive infrastructure consisting of over 8.000 coastal bunkers reaching from Norway to the Bay of Biscay that was constructed by Organization Todt from 1942 to 1944 as a defense against an anticipated Allied invasion—are still in place, although they have been relatively unnoticed since the war. In an autobiographical memory, Virilio states that the misuse of these bunkers as cabanas represented the starting point of his inquiry into »bunker archeology«:

»I was leaning against a solid mass of concrete, […]; all the usual seaside games had become a total bore; […]. So I turned around for an instant to look at what my field of vision onto the sea had not offered up […] and decided to have a look around this fortification […].

I was most impressed by a feeling, internal and external, of being immediately crushed. The battered walls sunk into the ground gave this small block-house a solid base; a dune had invaded the interior space, and the thick layer of sand over the wooden floor made the place ever narrower. Some clothes and bicycles had been hidden here; the object no longer made the same sense, though there was still protection here.«[39]

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35 Ibid.

36 Ibid., p. 111.

37 Ibid., p. 103.

38 Ibid., p. 58. For the problem of obduracy see also Anique Hommels: Unbuilding Cities. Obduracy in Urban Sociotechnical Change, Cambridge/MA/London 2008. In analyzing three cases of urban obduracy, Hommels not only refers to the material side of obduracy, but proposes heuristically three conceptual models for explaining the phenomenon: the constraining role of »dominant frames«, the entanglement of structures as result of their »embeddedness«, and persistent traditions caused by path dependencies (ibid., pp. 21–39).

39 Paul Virilio: Bunker Archeology (1975), New York 1994, p. 10f.

Fig. 6: Command Post in the Bay of Biscay

One example of Virilio's bunker research, taken from a section of pictures under the heading »War Landscape«, shows a command post at the Bay of Biscay that is sunk into the beach (Fig. 6). For Virilio, it is especially the monolithic character of these structures that prevents them from being removed: »While most buildings are embanked in the terrain by their foundations, the casemate is devoid of any, aside from its center of gravity, which explains its possibility of limited movement when the surrounding ground undergoes the impact of projectiles. This is the reason for our frequent discovery of certain upturned or tilted works, without serious damage.«[40] They are »still very much in place«, as Cairns and Jacobs put it.[41]

In order to understand this type of obduracy, it might be useful to turn to the concept of »ruin«. Cairns and Jacobs consider the notion of ruin (in addition to »decay«, »obsolescence«, »disaster« and »demolition«) one of the five key concepts for their empirical analysis of the overlapping processes of »building deaths«.

Questions regarding the specific beauty and temporality of the ruin have been widely discussed. They have been addressed, for example, in terms of aesthetic

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40 Ibid., p. 37.
41 For further discussion see Gabriele Schabacher: Regime der Geschwindigkeit. Paul Virilios Verkehrstheorie, in: Friedrich Balke and Maria Muhle (eds.): Räume und Medien des Regierens, München 2016, pp. 140-167; Claus Pias: Bunker schreiben. Paul Virilios Architexturen, 2001, under: https://www.uni-due.de/~bj0063/texte/virilio_neu.pdf (23.01.2018).

figurations,[42] which historically led to a specific engagement with and idealization of ruins in 19th century Romanticism.[43] Rose Macaulay analyzes the »pleasure of ruins« experienced by the spectator as a motive that has driven travelers to them throughout the ages.[44] The infamous Nazi architect Albert Speer even developed a »theory of ruin value« according to which a collapsed building can leave behind valuable ruins that do not require any maintenance.[45]

For the present purpose, however, I would like to focus on the specific and paradoxical temporality of ruins that has been observed by Georg Simmel. In an article from 1911 entitled »The Ruin«, he states that the nostalgia associated with ruins and the fascination they attract stem from the fact that »the natural forces begin to become master over the work of man«[46], thus making the work of man appear »entirely as a product of nature«.[47] Nature, as Simmel argues, »has transformed the work of art into material of her own expression, as she had previously served as material for art.«[48] In reference to the cyclic nature of human existence as expressed in the Bible (»for dust you are and to dust you shall return«) and the antagonistic potentialities of »the striving upward and the sinking downward«[49], the tragic element of the ruin, according to Simmel, lies in the fact that »destruction here is not something senselessly coming from the outside but rather the realization of a tendency inherent in the deepest layer of existence of the destroyed.«[50] The specific temporality of the ruin between »the not-yet and the no-longer«[51] stresses »the character of the ruin as *past*.«[52] However, although life has departed from it, the fact that it was once there constitutes a specific type of perceivable presence: »The ruin creates the present form of a past life, not according to the contents or remnants of that life, but according to its past as such.«[53]

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42 For a history of the aesthetics of ruins see: Hartmut Böhme: Die Ästhetik der Ruinen, in: Dietmar Kamper, Christoph Wulf (Hg.): Der Schein des Schönen; Göttingen 1989, pp. 287-304.

43 It is especially their character as fragment which leads to a high appreciation of ruins as sublime figurations, even to constructions of artificial ruins in garden architecture. See Andrea Siegmund: Die romantische Ruine im Landschaftsgarten. Ein Beitrag zum Verhältnis der Romantik zu Barock und Klassik, Würzburg 2002.

44 See Rose Macaulay: The Pleasure of Ruins, New York 1953.

45 See Albert Speer: Inside the Third Reich, New York/Toronto 1970.

46 Georg Simmel: The Ruin (1911), in: The Hudson Review 11.3 (1958), pp. 379-385, see p. 379.

47 Ibid., p. 381.

48 Ibid.

49 Ibid., p. 383.

50 Ibid., p. 382

51 Ibid.

52 Ibid., p. 384.

53 Ibid., p. 385.

Returning to the notions of matter and mattering stressed in the work of Thompson as well as Cairns and Jacobs, I now want to discuss two studies that account for both aspects— the specific material form of ruins and their valuation— in notably postcolonial contexts: Gastón R. Gordillo's study *Rubble. The Afterlife of Destruction* and the volume edited by Ann Laura Stoler, *Imperial Debris*.[54] Gordillo's ethnographic study explores the complex entanglement of relics in the Gran Chaco in northern Argentina between the Spanish Empire and subsequently the Argentinian State on the one hand and the indigenous population on the other. Gordillo emphasizes his astonishment at the beginning of his research when he is confronted with a multiplicity of traces in this region and the different timescapes that made it »not possible to separate older ruins from new ones.«[55] Furthermore, he underlines the experience that, for the local population, the ruins he was interested in—for example, a former Jesuit mission—were just old walls (Gordillo's guide even breaks some material out of the stucco frame over a door to demonstrate its aged status).[56] The ruin concept did not mean anything to the locals; in their perspective, it was only »a homogenizing abstraction that does not resonate with the sensuous texture of actual places and objects.«[57] Acknowledging this, Gordillo argues against a »hierarchy of debris«[58] that downgrades rubble as something shapeless and worthless, suggesting instead that rubble should be explored »as textured, affectively charged matter that is intrinsic to all living places.«[59] With regard to ruins, this means seeing them as rubble in the first place, thus exposing the esteeming of something as a ruin as in fact an act of fetishization: »The best-kept secret of the heritage industry is that its ruins are rubble that has been fetishized.«[60] In her analysis of postcolonial contexts, Ann Laura Stoler takes the difference between »ruin« (the monument) and »ruination« (the process) as a starting point. She approaches the problem from a slightly different angle by asking »how […] imperial formations persist in their material debris.«[61] For Stoler this means analyzing the »imperial tangibilities« of the long-lasting, but underestimated effects of colonial debris »that saturate the subsoils of people's lives.«[62] The word »ruin« designates not only the state of a thing, but also the process affecting

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54   Gastón R. Gordillo: Rubble. The Afterlife of Destruction, Durham/London 2014; Ann Laura Stoler (ed.): Imperial Debris: On Ruins and Ruination, Durham/London 2013.
55   Gordillo: Rubble (as note 54), p. 1.
56   Ibid., p. 4.
57   Ibid., p. 7.
58   Ibid., p. 10.
59   Ibid., p. 5.
60   Ibid., p. 9.
61   Stoler: Imperial Debris (as note 54), p. 10.
62   Ibid., p. 5.

it, thus making »ruination« an ambiguous term by definition, since it involves »an act of ruining, a condition of being ruined, and a cause of it.«[63] According to Stoler, to call something a ruin, is not a fetishization (as maintained by Gordillo), but a political act: »ruins are made.«[64] Imperial ruins in particular are not necessarily to be considered as monuments, but as ecologies of remains,[65] with which people constantly interact when they »live *with* and *in* ruins.«[66]

Looking at the description of what Gordillo and Stoler call ruins, the question arises as to how we can understand the specific temporality that accompanies them. On the one hand, there are processes of decay and deterioration, on the other hand, one can observe an obduracy, a sort of resistance of these man-made structures. This resistance, however, might now itself be interpreted as resulting from a specific fetishization, monumentalization, or ruination of living conditions, which permanently re-inscribe ruins into cultural processes. If ruins »create pastness«, as Simmel puts it, they also create the present.

3. Temporalities in the Anthropocene/Mediocene

In his article *Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems*, Paul N. Edwards rethinks the historiography of modern infrastructures with respect to the question of scale. He starts from the premise that »mature technological systems—cars, roads, municipal water supplies, sewers, telephones, railroads, weather forecasting, buildings, even computers in the majority of their uses—reside in a naturalized background, as ordinary and unremarkable to us as trees, daylight, and dirt.«[67] In order to analyze these systems, Edwards suggests a »multiscalar approach« which examines infrastructures on macro-, meso- and micro-levels with respect to the three dimensions of force, time, and social organization.[68]

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63 Ibid., p. 11.

64 Ibid., p. 21.

65 Ibid., p. 22

66 Ibid., p. 12f.

67 Paul N. Edwards: Infrastructure and Modernity, in: Thomas J. Misa, Philip Brey and Andrew Feenberg (eds.): Modernity and Technology, Cambridge, MA 2003, pp. 185-225, see p. 185.

68 Ibid., p. 186. Such a distinction of levels can lead, however, to ›metrological‹ problems, as Latour has shown with reference to the laboratory and its transforming power between ›micro‹ and ›macro‹, suggesting that laboratories represent a field from where the whole of society can be reworked (see Bruno Latour: Give me a laboratory and I will raise the world, in: K. D. Knorr-Cetina and M.J. Mulkay (eds.): Science Observed, Beverley Hills:

Regarding the dimension of force, Edwards suggests distinguishing the human body from geophysical forces and to understand infrastructure on a meso scale, as a mediating in-between structure. With respect to the dimension of social organization, he identifies the micro-level with the brief temporal relations of individuals, the meso-level with longer-lasting (decades) institutional formations, and the macro-level with large systems (namely, infrastructures) that last for several decades or even centuries. Finally, there is the multiscalar dimension of time, and Edwards discusses »scales ranging from the *human* (hours, days, years) through the *historical* (decades, centuries) to the *geophysical* (millennia and beyond).«[69] According to Edwards, infrastructures change too slowly for most of us to notice on a human time scale. Infrastructures, therefore, exist »chiefly in historical time«,[70] which is why they have the power to shape and affect human time. On the geophysical level, however, »or even long-term historical, time scales, infrastructures are fragile, ephemeral things.«[71] Here, it is time itself that shapes infrastructures, rather than the other way round. These temporal regimes also fundamentally affect the way the relationship of nature and infrastructure is construed:

»[T]he irregularity with which ›natural disasters‹ occur can be seen (on human force and time scales) as one vehicle for constructing properties of a modernist ›nature‹ (as dangerous, unpredictable, and/or inconvenient), thereby separating nature from infrastructure and framing technology as control. Yet in geophysical time, this same irregularity becomes a fundamental, predictable property of nature, deconstructing the separation between them by illustrating the permanent imbrication of infrastructure in nature.«[72]

For Edwards, this means that »on long historical and geophysical time scales, breakdown is a natural property of infrastructures, or instead is a property of nature *as* infrastructure«.[73] And with reference to global warming he underlines the »permanent imbrication of industrial infrastructures within the planetary carbon metabolism«, making »the fossil-fuel economy […] a part of this larger process«,[74] which renders—and this interpretational shift is significant—»[n]ature […] in some sense the ultimate infrastructure.«[75]

Sage 1983, pp. 141-170). Nevertheless, Edwards' reflections can be usefully applied to the problem of abandoned infrastructures and the temporalities going along with them.
69 Edwards: Infrastructure and Modernity (as note 67), p. 194.
70 Ibid.
71 Ibid., p. 195.
72 Ibid.
73 Ibid., p. 196.
74 Ibid.
75 Ibid.

As one can see, Edwards' multiscalar approach refers to the different temporalities of history and geology. Infrastructures exhibit stability and durability only on the level of human and historical times; on geological or »long historical« scales, however, infrastructures and nature present themselves as gradually less distinguishable from each other, up to the point of their identification where »nature« is (the ultimate) »infrastructure«. Nevertheless, Edwards' view on infrastructure's fragile, ephemeral qualities is informed by an understanding of technical malfunctioning (he uses the concepts of »irregularity«, »breakdown«, etc.). One reason for this could be that he is less interested in processes of decay and deterioration or material relics and ruins, which are already beyond a logic of function and purpose. We have seen that entities (such as bunkers), though, can be subject to archeological activities and time scales.

The different time horizons of geology, archeology, and history, however, are not only important for an understanding of the relation of infrastructure and modernity. They are also highly relevant for the historiography of media and, therefore, for concept of the mediocene.

In media theory, it is Harold Adams Innis in particular who raises the question of media history as an effect of geological formations. From his dissertation on the Canadian Pacific Railroad in the 1920s onwards, the trained economic historian Innis considers geological formations as equally important as human built structures for the political and cultural development of a nation: »The spread of civilization was dependent on the geographic characteristics of the area and on the character and institutions of the people involved. The rapidity and direction of the growth of civilization were largely dominated by the physical characteristics, the geological formations, the climate, the topographical features, and the consequent flora and fauna which these conditions produced.«[76] Against this background, Innis studies the histories of different staple trades: »Canada emerged as a political entity with boundaries largely determined by the fur trade. These boundaries included a vast north temperate land area extending from the Atlantic to the Pacific and dominated by the Canadian Shield. The present Dominion emerged not in spite of geography but because of it.«[77]

With »Canadian Shield«, Innis refers to the geological core of the North American continent that forms five huge drainage basins, and therefore a system of waterways (and routes of transport) that allows for different transportation directions and regional economies. Together with the role Innis attributes to animals

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[76]   See Harold Adams Innis: A History of the Canadian Pacific Railway (1923). Reprint with a foreword by Peter George. Toronto/Newton Abbot 1971, p. 1.

[77]   Harold Adams Innis: The Fur Trade in Canada. An Introduction to Canadian Economic History (1930). Rev. Ed. Toronto 1956, p. 393.

(such as the beaver for the fur trade), vessels (for example, the canoe), and the indigenous population, he develops an understanding of media history, which is not only rooted in natural history, but *is* natural history. Interestingly, Innis points to the fact that the Canadian Shield represents a Precambrian formation, thus referring to the most ancient period in earth's history, preceding even the emergence of life.[78]

Turning to the notion of the mediocene, what kind of history is implied by this concept? And what can we deduce from the remarks on abandoned infrastructures with respect to this question? Without doubt, infrastructures are a part of the human footprint; they sustainably shape the relation of man and environment. As part of material history, they can be traced back further than recorded histories based on techniques of writing. They belong to what is called the deep history of mankind.[79] Their durability, however, is a relative one, since the complex networks of heterogeneous components they consist of (humans, non-humans, living and non-living entities, codes, prescripts, etc.) are always on the edge of falling apart. On the other hand, as we have seen, it is not so easy to get rid of something. Abandoned infrastructures also tend to stay, they resist being gotten rid of. Thus, as Simmel says, apart from its content, the ruin »creates the present form of a past life«. Accordingly, in their resistance, their obduracy, abandoned infrastructures permanently re-articulate distinctions of past and present. And through this complex temporality, abandoned infrastructures at the same time question additional fundamental distinctions such as those between nature and culture, life and death, humans and non-humans.

The concept of the mediocene can be understood as an account of precisely these processes of transformation, translation, mediation, and hybridization and of the effects they generate. Understood in this way, the idea of a mediocene might substantially enrich the concept of the Anthropocene with its programmatic bias towards human agency.

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78   For further discussion of Innis' media theory, see Gabriele Schabacher: Traffic as ›Dirt Experience‹. Harold Innis' Tracing of Media, in: Marion Näser-Lather and Christoph Neubert (eds.): Traffic. Media as Infrastructures and Cultural Practices, Leiden/Boston 2015, pp. 50-72.

79   See Daniel Lord Smail: On Deep History and the Brain. Berkeley/London 2008; James C. Scott: Against the Grain: A Deep History of the Earliest States, New Haven/London 2017.

Picture Credits:

Fig. 1: Basketball, Military Base, Germany 2010 © Thomas Jorion 2015.

Fig. 2: Prison for Slaves; Petit-Canal, Guadeloupe 19th © Thomas Jorion 2016.

Fig. 3: Steven Bloor: Abandoned Athens Olympic 2004 Venues, 10 Years On – in Pictures, in: The Guardian, 13 August 2014, under: https://www.theguardian.com/sport/gallery/2014/aug/13/abandoned–athens–olympic–2004–venues–10–years–on–in–pictures (23.01.2018). Photograph by Thanassis Stavrakis/AP.

Fig. 4: The Abandoned Village of Houtouwan on Shengshan Island, China © Visual China Group/Getty Images.

Fig. 5: Stewart Brand: How Buildings Learn. What Happens After They're Built, London: Penguin 1994, p. 13.

Fig. 6: Paul Virilio: Bunker Archeology (1975), New York: Princeton Architectural Press 1994, p. 87.

Odyssey without Nostos, or, From Globe to Planet

Hans-Christian von Herrmann

STANLEY KUBRICK'S MOVIE *2001: A SPACE ODYSSEY* came out in 1968. At first sight, the epic film takes up the well-known narrative structure of a life-threatening journey that concludes with the protagonist returning home. *Nostos* is the expression for this final homecoming in ancient Greek. While the return of Homer's Ulysses to Ithaca may already have been an ambivalent one, in Kubrick's film there is certainly no longer such a return. It is admittedly an arrival at planet earth, the starting point of the journey, but the protagonist and his former home have been deeply transformed. Although screenwriter Arthur C. Clarke mixes some esoteric undertones into the script, Kubrick's endeavor is obviously to make a statement about his own time as the age of space travel, then in its early stages. At its outset, the film makes a musical reference to Friedrich Nietzsche via the tone poem *Thus Spoke Zarathustra* by Richard Strauss. »Man is a rope«, Nietzsche says in his *Book for Everyone and Nobody*, »tied between beast and overman—a rope over an abyss. A dangerous across, a dangerous on-the-way, a dangerous looking-back, a dangerous shuddering and stopping. What is great in man is that he is a bridge and not an end: what can be loved in man is that he is an *overture* and a *going under*.«[1] This tightrope walking, as Kubrick clearly shows in the first part of his movie (»Dawn of Man«), is initiated by the advent of technology. Thus in the famous match cut, which juxtaposes an animal bone handled as a cudgel and an armed satellite, the history of mankind spans from the first use of tools to aerospace engineering. The famous enigmatic monolith—which could well be a piece of minimalist art designed by Donald Judd—seems to confront mankind with its extraterrestrial origin. It is also a transmitter of an electromagnetic signal directed towards Jupiter, the gas giant. In allusion to a phrase by William Burroughs, one could say: Kubrick's monolith appears not as a virus but as the occurrence of formal abstraction from outer space. The odyssey eventually leads to the insight that this stimulus from a nameless exterior can never be comprehended by man. So the final image of the film—the so-called starchild hovering above planet earth in his amniotic sac and looking into the camera—should be understood as an allegory.

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[1] Friedrich Nietzsche: Thus Spoke Zarathustra: A Book for All and None, in: The Portable Nietzsche, edited by Walter Kaufmann, New York 1982, pp. 103-439: 126f.

The embryo is the pictorial expression for a new kind of technology which has cocooned mankind, enabling human life to acquire a completely new shape. In this reading, Kubrick's movie marks the beginning of a new era which one could call the planetary age. While the globe and the global are bound to the idea of an open space and undefined territory that has to be conquered and colonized, the planetary refers to planet earth as an encompassing life support system discovered and enhanced by science and technology. One could also call this the *Mediocene*. This shall be further explained in the following.

The 1960s were also the decade when media studies was born. Media studies arose in the realm of the humanities as an earth-shattering research program highlighting the primacy of technological structures for cultural semantics. Media history, media aesthetics, and media theory attacked the basic ideas of historiography and interpretation setting exuberant wit, ironic lightness and elegant style against meaning, gravity and causation. Nevertheless, this program of media studies proved itself to be highly ambivalent, because it obviously addressed humanist culture and the field of the humanities at the same time that it pointed to the new continent of technical artifacts emerging from the ocean of history. From the beginning it was very clear that this rapidly growing intermediate realm could very well be observed by media studies but would always remain a forbidden ground that could never be really entered. So to a large extent, media studies was closely bound to the narrative of the decline of the humanist culture and the humanities.

The appearance of media studies during the 1960s was preceded by Marshall McLuhan's conversion from literary studies to the exploration of American post-war culture which was undergoing a dramatic change to a technological environment different from any previous form of human existence. McLuhan understood intuitively what was happening then and developed a new kind of historiography that could translate cultural forms into technical terms. In 1972 McLuhan gave an outline of this approach in an interview conducted by the French Magazine *L'Express*:

»*McLuhan*: What I am interested in are innovations as such, and especially their effect. I study what would happen if we did this or that. Most people wonder what happens to our children when they see violence on television. I am really no longer concerned about this. What I study is why individuals have the need for violence, and this has nothing to do with TV shows. I analyze phenomena starting from effects and moving toward the cause, not starting from the cause to arrive at the effects, as is a more common practice. […]
L'Express: This is the opposite of what we normally do. Why do you act like that?
M. McLuhan: Because it is when we invert the order of a process that we find its structure, its scheme. Meanwhile, neither the study of an emission nor that of its reception will give

you the scheme of a message or of an action. I learned that with advertisement. In the world of advertisement, you do not start by the creation of an ad, but by studying the effect you wish to elicit. You create the cause after the effect has been defined. Likewise, when you have to solve a management problem, you start by the aspects you ignore, not by what you know. The ignorance zone is the environment, the zone in which you get immersed in the environment, like in the case of a fish in the water: water is what it is completely ignorant about. […] What I want to say is simply that I do not study what the fish does, but its environment.«[2]

What can be recognized in this passage is a naturalization of technological »environment« in McLuhan's thought, even though the term »media« was coined by him in a thoroughly cultural sense. So, although McLuhan looked upon technology as an artificial living environment, he completely excluded the realm of nature from his media research. For him, technology had built an artificial world which had to be analyzed with reference to its transformation of everyday life and to its shaping of cultural forms and social behavior. As McLuhan himself declared, he learned this kind of environmental research from modern literature and the advertising industry. One should also mention the historical context of cybernetics and its concept of feedback control systems. In his 1962 book *The Gutenberg Galaxy*, McLuhan says that Martin Heidegger »surf-boards along on the electronic wave as triumphantly as Descartes rode the mechanical wave«.[3] Be this as it may, the phrase certainly holds true if we replace Heidegger here with McLuhan himself.

At this point it can be instructive to examine Bruno Latour's concept of the quasi-object.[4] Extending a debate that originates in science studies in the 1990s, Latour emphasizes that technology should be treated in the context of a new cosmology. He introduces his Actor-Network Theory as a dismantling project that removes the remnants of European metaphysics from the historical scene. By doing so, he seeks to open the way for a non-modern perspective within which man could no longer claim the central epistemological position, because he would see himself again in close community with animals and inanimate things. Latour's writings can also be described as a theoretical disarming that seeks to overcome the great cultural divide between the humanities and the social sciences on the one hand and the hard sciences on the other. So the Actor-Network Theory is also

[2]   Interview with Marshall McLuhan, 14 February 1972, in: L'Express va plus loin avec …, Paris 1973, pp. 425–443: 425–426. English translation here: http://docshare.tips/marshall-mcluhan39s-interview_58287087b6d87f73678b4b43.html (8 October 2017).

[3]   Marshall McLuhan: The Gutenberg Galaxy: The Making of Typographic Man, London 1967, p. 248.

[4]   Bruno Latour: We Have Never Been Modern, Cambridge, MA 1993.

a clear answer to Charles Percy Snow's famous lecture *The Two Cultures and the Scientific Revolution*, given at Cambridge University in 1959.[5]

Snow's lecture may not have been very inventive but it became epoch-making by describing an urgent issue very clearly, namely the breakdown of the traditional order of knowledge and its institutional forms. What Snow tried to take account of in his lecture was the scientific revolution which had emerged during the 1920s and had come to a first climax during the era of cybernetics. Snow's main subject was the totally new status and impact of science and technology in his own time, much like for Latour and his Actor-Network Theory. »Technoscience« is the keyword in Latour's writings and it is used as an epoch-making term similar to Snow's »scientific revolution«. But at the same time, Latour cautiously tries to exorcise any hint of the avant-garde from his argumentation. In marked contrast to the decisive description of our situation as being determined by a techno-scientific complex, there stands an ethnological approach that aims to redescribe European modernity as a short and disastrous episode, a kind of sickness which has become global and has to be cured by acknowledging our irreducible involvement with the world of things. Thus we are not only forced by Latour to face our unprecedented and monstrous present populated by quasi-objects but at the same time we are compelled to reassemble the social in a new non-anthropocentric structure. The current situation, however, is characterized by dissolution, driven as it is by a frantic capitalist culture and its incessant production of artifacts that populate our lifeworld.

For Latour, the main goal of his writings is to overcome the modern dichotomy between nature and culture by denying the exceptional position of man on earth and in the cosmos. In his 1873 essay *On Truth and Lie in an Extra-Moral Sense* Nietzsche had already made a similar move. He wrote:

»In some remote corner of the universe, poured out and glittering in innumerable solar systems, there once was a star on which clever animals invented knowledge [das Erkennen]. That was the haughtiest and most mendacious minute of ›world history‹—yet only a minute. After nature had drawn a few breaths the star grew cold, and the clever animals had to die.«[6]

What Nietzsche does here narratively is to invert the telescopic survey of the universe done by modern astrophysics. What he brings about with this fictitious

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5   Charles Percy Snow: The Two Cultures, Cambridge 1998.
6   Friedrich Nietzsche: On Truth and Lie in an Extra-Moral Sense, in: The Portable Nietzsche, edited by Walter Kaufmann, New York 1982, pp. 42-47: 42.

turn is an explicitly nonhuman position that adopts the point of view of nature. And Nietzsche continues:

»One might invent such a fable and still not have illustrated sufficiently how wretched, how shadowy and flighty, how aimless and arbitrary, the human intellect appears in nature. There have been eternities when it did not exist; and when it is done for again, nothing will have happened. For this intellect has no further mission that would lead beyond human life. It is human, rather, and only its owner and producer gives it such importance, as if the world pivoted around it. But if we could communicate with the mosquito, then we would learn that he floats through the air with the same self-importance, feeling within itself the flying center of the world. There is nothing in nature so despicable or insignificant that it cannot immediately be blown up like a bag by a slight breath of this power of knowledge; and just as every porter wants an admirer, the proudest human being, the philosopher, thinks that he sees the eyes of the universe telescopically focused from all sides on his actions and thoughts.«[7]

By radicalizing Kant's transcendentalism, Nietzsche's narrative confronts the subjective or humane perspective with a nature that is introduced and mediated by technoscience. We can also call this perspective geological. It is obvious that Nietzsche's exchange of positions can likewise be applied to the current Anthropocene debate. Do we find ourselves today under the severe gaze of the universe assigning us the role of a cosmic villain? Or is nature just taking a few breaths after which mankind and cultural history will vanish from the scene?

In 1979, the Swiss writer Max Frisch published his novella *Man in the Holocene* (*Der Mensch erscheint im Holozän*). In retrospect, this short text appears as a striking attempt to confront the art of storytelling with the onset of a geological scale that makes cultural history shrink to the size of an ant, a point condensed in the short phrase which also serves as the novella's title: »– man emerged in the Holocene«[8]. That is to say: The existence of man may be the outcome of an evolutionary process. As a living being defined by cultural history, man was born in the neolithic age, the period when sedentism, agriculture, and stock farming arose. Geiser, the protagonist of Frisch's novella, is an elderly man who has retired to the solitude of a Tessin valley where he faces a heavy landslide. Without being in acute danger he begins imagining a future catastrophe in which mankind will meet the fate of the dinosaurs. At the same time, Geiser's life turns into a steady fight against memory

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loss. This threat of amnesia is to some degree caused by an apoplectic condition but it also indicates the approaching erasure of cultural memory as a whole. For this reason, Geiser starts his own memory project by excerpting passages and paragraphs from the Bible, a Brockhaus encyclopedia in twelve volumes, and a travel guide, all of which Frisch's text includes as clippings and handwritten notes. Gradually the walls of Geiser's hut are covered with notes about the great del–uge, the history of the Tessin, the geometry of the golden ratio, natural disasters, amnesia, erosion, the geologic eras, dinosaurs, and so on. »It is no longer a living room«,[9] says the text when all the walls are totally blanketed by slips of scribbled paper. At the end, Geiser explains the fundamental distinction between nature and culture by referring to the word »natural catastrophe« as a contradiction in terms:

»What is there to think about?
– EB : AE = AE : AB
– the Bible and the fresco of the Virgin Mary do not prove that God will continue to exist once human beings, who cannot accept the idea of a creation without a creator, have ceased to exist; the Bible was written by human beings.
– the Alps are the result of folding.
– ants live in colonies.
– the arch was invented by the Romans.
– if the Arctic ice were to melt, New York would be under water, as would Europe, except for the Alps.
– many chestnut trees are cankered.
– only human beings can recognize catastrophes, provided they survive them; Nature recognizes no catastrophes.
– man emerged in the Holocene.«[10]

Catastrophes for Frisch thus mark the border between culture and nature in a very specific way. Nature penetrates into the realm of culture in the form of catastro-phe. Nature without culture, however, is nothing but an endless and nameless becoming:

»The ants Geiser recently observed under a dripping fire tree are not concerned with what anyone might know about them; nor were the dinosaurs, which died out before a human being set eyes on them. All the papers, whether on the wall or on the carpet, can

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9   Frisch: Man in the Holocene (as note 8), p. 39.
10 Ibid., pp. 78–79.

go. Who cares about the Holocene? Nature needs no names. Geiser knows that. The rocks do not need his memory.«[11]

By underlining the nature–culture divide Frisch seems to uphold the modern narrative we find in Kant's critical writings: the loneliness of man set in contrast to the infinity of an indifferent universe. But at the same time, Frisch develops a form of catastrophic narrative. His novella creates an archive of planetary disasters and imagines a world of unmanageable contingency in which the nature–culture divide has been swept away.

Walter Benjamin was one of the first cultural theorists who, against the backdrop of the scientific revolution of the 1920s, recognized the transformative effects of technology. The term Benjamin used in this context was the »planetary«. The last paragraph of Benjamin's 1928 book *One-way Street*, an aphoristic and highly artistic snapshot of a groundbreaking reconfiguration, reads as follows:

›To the Planetarium

If one had to expound the teachings of antiquity with utmost brevity while standing on one leg, as did Hillel that of the Jews, it could only be in this sentence: ›They alone shall possess the earth who live from the powers of the cosmos.‹ Nothing distinguishes the ancient from the modern man so much as the former's absorption in a cosmic experience scarcely known to later periods. Its waning is marked by the flowering of astronomy at the beginning of the modern age. Kepler, Copernicus, and Tycho Brahe were certainly not driven by scientific impulses alone. All the same, the exclusive emphasis on an optical connection to the universe, to which astronomy very quickly led, contained a portent of what was to come. The ancients' intercourse with the cosmos had been different: the ecstatic trance [*Rausch*]. For it is in this experience alone that we gain certain knowledge of what is nearest to us and what is remotest from us, and never of one without the other. This means, however, that man can be in ecstatic contact with the cosmos only communally. It is the dangerous error of modern men to regard this experience as unimportant and avoidable, and to consign it to the individual as the poetic rapture of starry nights. It is not; its hour strikes again and again, and then neither nations nor generations can escape it, as was made terribly clear by the last war, which was an attempt at new and unprecedented commingling with the cosmic powers. Human multitudes, gases, electrical forces were hurled into the open country, high-frequency currents coursed through the landscape, new constellations rose in the sky, aerial space and ocean depths thundered with propellers, and everywhere sacrificial shafts were dug in Mother Earth. This immense wooing of the cosmos was enacted for the first time on a planetary

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[11]   Ibid., p. 107.

scale—that is, in the spirit of technology. But because lust for profit of the ruling class sought satisfaction through it, technology betrayed man and turned the bridal bed into a bloodbath. The mastery of nature (so the imperialists teach) is the purpose of all technology. But who would trust a cane wielder who proclaimed the mastery of children by adults to be the purpose of education? Is not education, above all, the indispensable ordering of the relationship between generations and therefore mastery (if we are to use this term) of that relationship and not of children? And likewise technology is the mastery of not nature but of the relation between nature and man. Men as a species completed their development thousands of years ago; but mankind as a species is just beginning his. In technology, a *physis* is being organized through which mankind's contact with the cosmos takes a new and different form from that which it had in nations and families. One need recall only the experience of velocities by virtue of which mankind is now preparing to embark on incalculable journeys into the interior of time, to encounter there rhythms from which they shall draw strength as they did earlier on high mountains or on the shores of southern seas. The ›Lunaparks‹ are a prefiguration of sanatoria. The paroxysm of genuine cosmic experience is not tied to that tiny fragment of nature that we are accustomed to call ›Nature.‹ In the nights of annihilation of the last war, the frame of mankind was shaken by a feeling that resembled the bliss of the epileptic. And the revolts that followed it were the first attempt of mankind to bring the new body under its control. The power of the proletariat is the measure of its convalescence. If it is not gripped to the very marrow by the discipline of this power, no pacifist polemics will save it. Living substance conquers the frenzy of destruction only in the ecstasy of procreation.«[12]

What we find here could be called a technophilosophical gnosis. »To the Planetarium« means to look upon the shattering of the oppressive forms of modern existence. For Benjamin, science and technology are the revolution and the reorganization of mankind as a planetary collective. The artificial living environment anticipated by Benjamin replaces the capitalist nation state and the family as fundamental symbolic structures of modern culture. Nature is no longer objectified and mastered by human knowledge. It emerges rather from latency in a non-subjective form of resonance. This is the reason why Benjamin uses the premodern term *physis* here. It is the altered or displaced return of an ancient question: In what way are we involved in the becoming of the cosmos as the entirety of what surrounds us and carries us along?

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[12]　Walter Benjamin: The Work of Art in the Age of Its Technological Reproducibility, and Other Writings on Media, edited by Michael Jennings, Brigid Doherty, and Thomas Y. Levin, Cambridge, MA 2008, p. 58f.

Forty years later, Buckminster Fuller in his book *Operating Manual for Spaceship Earth*, developed his concept of world planning and design thinking which points in the same direction:

»My own picture of humanity today finds us just about to step out from amongst the pieces of our just one-second-ago broken eggshell. Our innocent, trial-and-error-sustaining nutriment is exhausted. We are faced with an entirely new relationship to the universe. We are going to have to spread our wings of intellect and fly, or perish; that is, we must dare immediately to fly by the generalized principles governing universe and not by the ground rules of yesterday's superstitious and erroneously conditioned reflexes. […] The architects and planners, particularly the planners, […] have a little wider focus than do the other professions. […] At least the planners are allowed to look at *all* of Philadelphia, and not just to peek through a hole at one house or through one door at one room in that house. So I think it's appropriate that we assume the role of planners and begin to do the largest scale comprehensive thinking of which we are capable.«[13]

Fuller's enthusiastic concept of world planning was historically accompanied by a series of photographs taken by cameras on satellites and by astronauts of the Apollo program. The first issue of Stewart Brand's *Whole Earth Catalogue* came out in Fall 1968 and showed planet earth in color against a dark background on its front page. A similar picture appeared on the cover of *Life Magazine* in January 1969. These images materialized a view which had been repeatedly imagined during the previous years and decades, but they were also totally unexpected because they showed the globe for the first time without any political and cultural borders and as a dynamic system of oceanic and aerial currents. It thus appeared totally abandoned and solitary, lost in space. One should also mention the International Geophysical Year 1957/58 here, which marked the beginning of the satellite age and had the planet emerge in the form of an interdisciplinary research program.

It was then the dawning of the »planetary age«[14] as Greek–French philosopher Kostas Axelos calls it in allusion to Hölderlin and Heidegger. »According to the Greeks«, Axelos explains by referring to etymology, »the essence of the ›planetary‹ lies in an errant wandering […]. The full meaning of the Odyssean adventure, and not only of this adventure, is alluded to in the opening verses of that epic quest: ›O Muse, tell me of the deeds of that many-sided man, / who journeyed off so far after the destruction of sacred Troy, / who saw and learned the cities and ways of

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13   R. Buckminster Fuller: Operating Manual for Spaceship Earth, Zurich 2017, pp. 66–67.
14   Kostas Axelos: Introduction to a Future Way of Thought: On Marx and Heidegger, Lüneburg 2015, p. 122, under: http://meson.press/wp-content/uploads/2015/04/9783957960061-Axelos-Future_Thought.pdf (8 October 2017).

many peoples, / and on the seas suffered such pain in the depths of his heart / to save his soul and the return of his companions.‹ Human beings are struck and driven on by the being of a *physis*, by destiny, by the lightning bolts of Zeus, *plazómenoi*, and they are continually living in wandering errancy, in an odyssey. They are *plánetes*: they are the errant ones.«[15]

In the planetary age, grand narratives of knowledge and progress have been replaced by the control loops of cybernetic systems. Their »wandering errancy« marks a transition (or a return) from transcendental philosophy to cosmology (in a Heraclitean sense). Similarly, the mediocene marks a transition in the field of media studies from deconstruction to epistemic realism. Today, the concept of »media« refers to the scientific and technological practices covering the entire domain of human existence, not only on a semiotic but also on a physical and microphysical level. So instead of marking a new turn or paradigm, the mediocene is first and foremost a statement of affairs. It proclaims that science and technology have reframed human life on earth as a whole and have replaced the culture-historical scale with a cosmic one.

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[15] Ibid., pp. 124–125 (translation slightly modified by Hans-Christian von Herrmann).

Toxic Money

Economic Globalization and its (Edible) Currencies

Karin Harrasser

In this article, I discuss the dynamics of currencies, of media of exchange, from two angles: a perspective of longue durée and as an ecology of practices. I will examine historically specific versions of general purpose money, money for universal use, such as the Spanish Silver-Peso and the U.S. dollar, and relate these to self-restricting currencies: currencies that are more tightly knit into the »web of life,«[1] cultural systems, local economies and ecologies. I will assess the toxic effects of generalized media of exchange in the *Capitalocene*[2] and discuss the interplay of situated money-regimes with generalized, globalized media of exchange. The first figure in my discussion is »edible currency«. Later, I will discuss currencies that are more closely linked to products of consumption than common general purpose money (e. g. coupon-currency and vouchers), money that is not primarily part of the sphere of exchange, but can rather be assigned to an ecology of practices, which preserves and form the organism and its preconditions.[3] I argue that economic practices and theories froms the early modern period onward are entangled with the need to come to terms with crises and contingencies of colonial economies and ecologies. The very pharmacological character of money—concerning the question how and in what contexts money figures as a neutral medium of exchange, a benevolent operating technology, or a potentially toxic medium—is discussed in two historic periods: monetary politics in the early modern period and the 20th and 21st century monetary crisis as it is embedded in post- or neo-colonial global finance politics.

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1 Cf. Jason W. Moore: Capitalism in the Web of Life: Ecology and the Accumulation of Capital, New York 2015.

2 Cf. ibid.

3 On Isabelle Stengers' concept of an ecology of practices cf. Karin Harrasser and Katrin Solhdju: Wirksamkeit Verpflichtet. Herausforderungen einer Ökologie der Praktiken, in: Zeitschrift für Medienwissenschaft 14/1 (2016), pp. 72-86; Anna Echterhölter: Im Zweistromland der Geldentstehungstheorie. Neutralität und quantifizierte Schuld bei Karl Polanyi und David Graeber, in: Thomas Macho (ed.): Bonds. Schuld, Schulden und andere Verbindlichkeiten, München 2014, pp. 343-366.

1. Prelude with two vignettes

Fig. 1: Bumper Sticker

(1) In my childhood, I encountered the so-called »Cree Prophecy« everywhere. This proverb says: »Only when the last tree has been cut down, the last fish been caught, and the last stream poisoned, will you realize you cannot eat money.« This »prophecy« appeared as an incisive sticker on dashboards, bicycles and in bathrooms within the «alternative» milieu of my parents. It articulated in condensed form a core belief of the anti-consumerist eco-movement, although nothing in it indicates that it is actually of First Nations origin. Instead there is rather a substantial indication that it is a retrojection of the destructive appropriation of nature over the course of the various waves of colonization.

(2) The chocolate bar with the alluring name *Maya Gold*, produced and marketed by the British candy company Green & Black's, was the first commodity to use the now widespread international Fair Trade designation in 2004.[4] The brand operates in semantic registers that are indebted to the recent development of a market for sustainable and fair trade high-quality foods, to the long history of interest in exotic stimulants, and to resurfacing knowledge about the major function of cacao in classic Aztec and Maya culture. The cacao tree was traditionally associated with death as the source for the renewal of life. Cacao, mixed with maize and/or other seasonings, was consumed by the indigenous elite as part of a diverse range of rituals. Cacao beans were also used as currency and were collected as tribute by urban power centers. The Spanish invaders continued this tradition, but cacao-growing declined with the reduction of the indigenous population. In the 20th century, cacao became a cash crop again. In Belize, the origin of the beans for *Maya Gold*, it was revived as an im-

Fig. 2: Organic Maya Gold

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4   Patricia A. McAnany and Satoru Murata: From Chocolate Pots to Maya Gold. Belizean Cacao Farmers through the Ages, in: Cameron L. McNeil (ed.): Chocolate in Mesoamerica: A Cultural History of Cacao, Gainesville, FL 2006 , pp. 429-450: 436.

portant source of income for the *campesinos*, although under the rough conditions of prices dictated by the world market. The growing of cacao, therefore, has a long and complicated history in the very region in which Green & Black's cacao is farmed nowadays.

The question of how ecological issues came to receive widespread acknowledgement in large part due to the marketability of organic consumables (at least in Austria and Germany), is not the central issue here. My question is rather: How are consumption and money in tension with each other and how are European economic discourses (and subsequently, patterns of consumption) shaped by and acted out through the observation and manipulation of non-European economies?

The tension between the necessity of food intake and money as a medium of deferral and exchange is quite evident. The necessity to eat is probably *the* most universal and inclusive approach to interpreting humanness or para-humanness. It implies an understanding of (para)humanness as a shared fate of mortals that includes non-humans. Money and currencies on the other hand are clearly part of the cultural sphere: money relates, expands, and enables an individual life; it is a mediating operator. The tension this article deals with is more often investigated in in social and cultural anthropology than in economic theory. Cultural anthropology holds that a myriad of material-semiotic actors bring forth, enclose, and shape an individual life; parents (genealogy), cultural and ecological environment, institutions (from the maternity hospital to the state)— all these participants or »shareholders« of an individual mortal life are substantially more present in anthropological monetary theories than in the scientific discipline of economics. As has been demonstrated in many ways, money, even in its most profane or technical form, refers back to these culturally differentiated relations.[5] Hence, we may be able to discern, alongside eco-apocalypticism and Rousseauian exoticism, something else in the famous sticker's proverb: the deep melancholy of money, which carries the mark of a history of violence and deeply unequal exchange. It is a reminder passing from hand to hand (or nowadays from server to server) of the fact that each individual life is limited. The anthropologist Meyer Fortes[6] has pointed out a circumstance that is enlightening in a perplexingly simple way, and his considerations have guided my reflections on money and consumption. He says that the activities we call »cultural« in most cases relate additively, serially, or cumulatively to the individual body while they also form a social environment; they

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[5] Cf. Thomas Macho (ed.): Bonds. Schuld, Schulden und andere Verbindlichkeiten, München 2014; Christina von Braun: Der Preis des Geldes: Eine Kulturgeschichte, Berlin 2012; David Graeber: Debt: The First 5,000 Years, Brooklyn, N.Y. 2011; Marcel Hénaff: Le prix de la vérité: Le don, l'argent, la philosophie, la couleur des idées, Paris 2002.

[6] Cf. Meyer Fortes: Kinship and the Social Order: the Legacy of Lewis Henry Morgan, Chicago 1970.

therefore represent an *expansion* of the individual. By contrast, eating is something everyone can only do for him or herself, it is a task that cannot be delegated; it is an instance of *concentration*. This does not mean that food consumption does not have a cultural, social, or technological shape, involving a plethora of collective actions and forms of knowledge—in extreme cases, it can even be fully carried out technologically. Nor does this assertion deny that the act of food intake is a material exchange that takes place in a rather cosmic dimension (no energy from the sun means no growth, no plants, no animals, no food). But *the act itself* is strictly linked to the one individual organism and is therefore not *transferrable*, with the (admittedly very significant) exception of the shared nourishment of mother and child.[7] Eating is also a highly time-sensitive act; it is only *deferrable* to a lim-ited extent and thus in existential tension with social processes, which—as a rule—tend towards durability. If we thus look at practices of consumption from a media-toxicological perspective,[8] we will have to acknowledge that eating is a very spe-cific practice of relating and mediating: not only is it more existential and need-based than many other cultural practices, it also *concentrates* a vast ecological and political network in an individual organism. Money, on the other hand, is the essential extending and expanding medium, linking economies and ecologies in space and time; and it is quite obviously a potentially toxic medium. I will there-fore scrutinize money as a risky entity and as an instrument of power.

It is important not to forget the »poisonous character« of silver-money in the Spanish colonies in the early modern era—the historical constellation I will ad-dress—is far from being metaphorical: mining in South America, e.g. in Potosí, not only destroyed the basic resources of the First Nations, but was also extreme-ly destructive for the health of the miners—not only because of the horrific work-ing conditions in the silver mines, but particularly because of the excessive use of quicksilver in the extraction process. Although the Spanish crown was never able

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7 The fact that this organism is itself dividual because it consists of diverse metabolic sub-systems does not essentially affect the following thoughts; although one could certainly speculate about whether an active approach to the circumstances of digestive cohabitation might not also cause us to rethink theories of consumption. If it is not humans with their own will to decide what they want to eat, but rather a conglomerate of human organism, bacteria, chemical processes, habits, and forms of knowledge, how then is one to describe a decision about consumption?

8 The approach of toxic media currently being developed at the Intermedia Research Stu-dio at the University of Alberta focuses on media ecologies and de/colonial knowledge regimes. Cf.: https://www.ualberta.ca/sociology/about-sociology/news/2017/april/toxic-media-ecologies-symposium-critical-cultural-practices-in-the-age-of-alternative-facts (23 December 2017). For a related perspective on film cf. Heike Klippel, Bettina Wahrig and Anke Zechner (eds.): Poison and Poisoning in Science, Fiction and Cinema: Pre-carious Identities, London 2017.

to stabilize its national finances with American silver, it was the very substance that shaped the world-market. Silver was practically the only commodity that could garner interest on the Chinese market and it thereby enabled *global* trade. The world market is, so to speak, literally built on the mercury poisoning of the Andean First Nations.

2. Cacao. *Moneda para tomar*[9]

A notable case in which consumption and money as exchange equivalent coexist in one medium was Central American cacao.[10] Cacao was an important part of the ritual life of the Maya and Aztecs. It was both a food and drug, which Linnaeus' scientific classification *Theobroma cacao*, »food of the god«, succinctly reflects. Since the cacao tree grows in the forest shade, the plant was associated with death as a source for the rejuvenation of life. In addition, both the cacao tree and the beverage found their way into Catholicism: Representations of cacao trees feature prominently in Mexican depictions of the Paradise Garden and the consumption of cacao became an object of hot theological dispute: Would drinking chocolate break the fast or not? Was it to be considered an ordinary drink or a sinful stimulus for the senses?[11] The communal consumption of cacao (together with other intoxicants) was an element of the extravagant and wasteful festivities at the Aztec court, which were described by Hernán Cortés and Bernal Diaz de Castillo before they destroyed them. These descriptions were the basis for all kinds of subsequent European fantasies about indigenous luxury.[12]

Cacao beans were used as money in the Aztec civilization. Along with other goods, they were given as a tribute to regional and imperial rulers, and their production was regulated locally. Beans were an everyday means of payment, but were also used in long-distance-trading and outlasted the first phase of colonization. In Nicaragua they were in use until the 19th century. Beans were stored in numbered amounts (24,000 beans per sack) and exchanged at a relatively stable

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9 »Drinkable money«.

10 Cf. Cameron L. McNeil (ed.): Chocolate in Mesoamerica: A Cultural History of Cacao, Gainesville, FL 2006.

11 Manuel Auguilar-Moreno: The Good and Evil of Chocolate in Colonial Mexico, in: Cameron L. McNeil (ed.): Chocolate in Mesoamerica: A Cultural History of Cacao, Gainesville, FL 2006.

12 Cf. Yolanda Gamboa: Consuming the Other, Creating the Self. The Cultural Implications of the Aztecs Chocolate from Tirso De Molina to Augustín Moreto and Pedro Lanini Y Sagredo, in: Mindy Badía and Bonnie L. Gasior (eds.): Crosscurrents: Transatlantic Perspectives on Early Modern Hispanic Drama, Lewisburg, PA 2006.

rate, which fluctuated according to distance from the place of production. As a general medium of exchange the cacao beans were efficient: they have a relatively high exchange rate per part by weight, they are easy to transport and divide up, they have a long shelf-life, but cannot be stored indefinitely, which—in addition to their renewable properties—increases the »liquidity« of cacao money. Their consumability was seen as an advantage by the first European observers because it prevented inflation. The currency could become unstable if a ruler, e. g. Moctezuma II, had too many beans in his warehouse (it was said to contain 1 trillion beans) so that when faced with looming inflation they could neither be quickly consumed or put into circulation. However, Europeans came down on the side of the beans, as the account of Peter Martyr d'Anghiera's attests—although he emphasized not the stable value of the cacao beans, but rather how their consumability and limited shelf-life automatically discouraged the hoarding of money: »Oh, blessed money which yieldeth sweete and profitable drinke for mankinde, and preserveth the possessors thereof free from the hellish pestilence of avarice because it cannot be long kept hid underground.«[13] After the European arrival, the bean currency stabilized further because now large numbers of beans could be exported to Europe and storage no longer endangered their value. The Aztec warehouses were of course cleared out and additional production capacities were created by the *encomenderos*. Immediately upon arrival in Mexico in 1519, Hernán Cortés had a cacao plantation laid out, which was initially not for exporting the crop but for literally growing money. In this way, cacao maintained its value during colonial times as a small-scale de facto currency. The introduction of the Spanish silver currency, the *peso,* turned out to be complicated (not only in contrast to cacao beans but also to gold, which was in use in Mesoamerica as an exchange equivalent), because silver was used for everyday objects like sandal soles until the *Conquista.* It possessed little prestige and was not widely accepted.[14]

This is why, at the beginning of the 16th century, Peter Martyr saw in the cacao bean currency not an embodiment of the excess and luxury of an exotic society as Georges Bataille later did, but rather an embodiment of a quasi-ecological principle of self-limitation. He did not comment on the actual Mesoamerican practices, however, in which everyday consumption, ritual, and monetary value overlapped, and about which we otherwise have only rudimentary information through the accounts of Cortés, Diaz, and the Codex Mendoza.

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[13] Peter Martyr quoted in Paul Einzig: Primitive Money in Its Ethnological, Historical, and Economic Aspects, Oxford/New York 21966, p. 175.

[14] Cf. J. Carson Brevoort: Early Spanish-Portuguese Coinage in America, Boston, PP 1885, pp. 4–6.

However, we know some bit about the frantic turnover of precious metals that held Europe in thrall back then. This was the backdrop of Martyr's »economic-ecological« argument. Money—gold and silver—had taken on a menacing character in the perception of many European observers: the precious metals came from overseas in large amounts and disappeared rapidly into channels outside state control, beyond the knowledge of laypeople and the learned alike. The European ruling houses, especially the Spanish crown, were chronically short of money because state budgets, the build-up of administrative systems, and, in particular, repeated involvement in wars swallowed up vast amounts of the new wealth. State expenditures of the early modern period were financed in part by taxes, but a substantial amount of property lay in the hands of the church, which was exempt from taxation, and increasingly in the hands of private entrepreneurs. In order to finance their risky ventures, such as equipping ships and launching wars, the European ruling houses were obliged to borrow from private banks. It thus is impossible to separate banking from state financial concerns in Europe from the 12th century onwards. With a view to this constellation, Joseph Vogl has conclusively shown that the modern state developed not *in opposition to* but rather *in concert with* the modern financial system.[15] Due to the entanglement of the Spanish economy with banks and creditors, it sometimes happened that silver ships arriving in Seville from South America were already completely mortgaged and the entire cargo went directly to banks in Genoa or Augsburg. Although Spain boasted huge quantities of silver in the Habsburg period, it did not help the state increase its wealth or maintain a stable treasury. This was the case even though the Spanish crown held a monopoly on silver mining and the silver trade, and controlled the famous silver fleet through the *Casa de Contratación*. Once again, the administration of the huge territory swallowed up enormous sums and Spain was involved in various expensive military conflicts. In addition, since the market was flooded with silver, the *peso,* the first global currency, steadily lost value: approximately 50% between 1540 and 1640. Tax revenues were also not adjusted for inflation, which resulted in the crown taking in ever-smaller values despite levying the same rates. There was also an unmanageable black market. Officially, between 1503 and 1660, 181 tons of gold and 16,887 tons of silver arrived in Spain. Estimations that take smuggled and embezzled quantities into account calculate these figures as roughly 300 tons of gold and 25,000 tons of silver.[16]

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15 Cf. Joseph Vogl: Der Souveränitätseffekt, Berlin/Zürich 2015.
16 Cf. Barbara H. Stein and Stanley J. Stein: Edge of Crisis: War and Trade in the Spanish Atlantic, 1789–1808, Baltimore, MD 2009; Stanley J. Stein and Barbara H. Stein: Silver, Trade, and War: Spain and America in the Making of Early Modern Europe, Baltimore, MD 2000.

In this light, it is understandable that Baltasar Gracián viewed the shower of gold and silver arriving from the New World with suspicion. Gracián, a learned Jesuit, was the author of the *Oráculo manual y arte de prudencia* (*Art of Worldly Wisdom*, 1647), which presents teachable and learnable rules for individual behavior in complex relationships, developed in his late work *El Criticón* (*The Critique*, 1657) a broadly more skeptical view of the possibility of rational behaviour, especially with regard to economic practices that he regarded as one of the reasons for the observable crisis.

The text's structure serves as a model for the transmission of knowledge from an older man to a younger one, in which procedures and processes are translated into allegories and images. Transatlantic trade and financial life are addressed quite early on in the book, namely on the beach at St. Helena, then an important transit point for the Castilian fleet and base for the slave trade. The two protagonists, Critilo and Andrenio, are at the beach and see something far out on the horizon:

»[*Critilo*:] Dost thou not see, said he, yonder afar off? What is it you see? I see, said Andrenio, some wandring Mountains, or winged Sea-Monsters, or else some Clouds. No, said *Critilo,* they are Ships, though you have said aptly in calling them Clouds; for they rain Gold into *Spain*.«[17]

In the echoing of *nubes/naves (clouds/ships),* it becomes evident that the contingent dynamism Gracián assumes in »natural« processes, which are discussed earlier in the book, also pertain to economy in particular: cloudy uncertainty and unmanageability have decidedly increased with the expansion of the empire into the New World.

In the second book of *El Criticón*, an entire chapter (the third crisis) is dedicated to the catastrophic logic of indebtedness of the *Siglo de Oro.* The financial speculators find themselves in golden prisons and have already squandered their future. The *Criticón* is therefore also a book about the origin of the indebted person in an era characterized by an influx of silver and gold that nevertheless could contribute nothing to the nourishment of the individual. The book is also about the origin of a type of person who tries to control the future through speculation and in the process entraps himself evermore in the unmanageable present. In the context of this paper it is noteworthy that Gracián presented this type of person as an undead being. The venturer and the speculator in Gracián eats and drinks money: »Ways and means have now been found for making gold edible and drinkable; […] one man has even discovered the art of making broth from doubloons,

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17 Baltasar Gracián: Das Kritikon, Frankfurt am Main 2004; Baltasar Gracián: The Critick, translated into English by Paul Rycaut, London 1681, pp. 44-45.

and they say it is so hearty it can wake the dead (the idea to extend life seems quite foolish though).«[18] The speculator/money eater no longer fits into the salvation formula, according to which he must prove himself worthy for eternity by his earthly deeds; instead of achieving eternal life after death, the speculator is forever undead. Gracián depicts financial speculation, in its anticipation of future profit, as an affront against providence and its attendant ethics of postponement. As a result, it leads—and here Gracián approaches a Messianic political theology—to imprisonment in the present, without hope for redemption, unless gold can indeed be made edible.

Both Gracián and Martyr link the need for somehow limiting monetary transactions to the concentrating act of consumption; both idealize self-restricting practices to be morally more valuable than the economic regime they experienced in Spain at that time. This idea has been rejuvenated in the 20th century with studies in the anthropology of economy. It is interesting to see how the idea of limitation and self-limitation reappeared in discussions about currencies that border on consumption.

3. »Primitive Money« and International Financial Politics

In a 1967 essay about money as a general medium of exchange and so-called »primitive currencies«, Mary Douglas discusses the differences and analogies between their principles and practices.[19] In general, one would assume that money as a generalized medium of exchange tends towards relationships of cross-border fluidity, exchange, and market competition, while local currencies (»coupon money« or vouchers, only used for acquiring certain goods: coupons for butter, coffee, cigarettes) put group-specific social control functions in place and have a stabilizing effect on society. The acquisition and circulation of »coupons«—Douglas' object of study were the raffia cloths of the Lele in the Congo designated for wedding-related transactions—are more strictly controlled within the community. Such vouchers and local currencies are not a general equivalent of value but rather can only be used by certain individuals for the acquisition of certain goods or services. Douglas emphasizes, however, that even modern currencies have »coupon qualities« in that they are socially controlled and have a controlling effect. Not only do individuals imbue money with (personal, symbolic, cultural) value (such as an

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[18]   Translation from German by Laura Freeburn (passage not translated in the Rycaut edition).

[19]   Mary Douglas: Primitive Rationing: A Study in Controlled Exchange, in: Raymong Firth (ed.): Themes in Economic Anthropology, London 1967, pp. 119-147.

inheritance from grandma that can only be spent on a special purchase), but Douglas also conceives international exchange prices as analogous to coupon economy. *Within* a national economy people trust the self-regulating powers of general purpose money plus the market, but *between* nations there are of course regulations in place, regulations that are entangled with economies of debt stemming from colonial times. This comes with devastating consequences for local or regional economies, as could be observed in Argentina in the 2000s and in Venezuela today: the one-to-one exchange rate with the U.S. dollar caused a truly toxic situation, in which poverty and scarcity are *an effect* of surplus production elsewhere.

Not surprisingly, the entire complex of vouchers and international money politics was recently condensed in a currency named after a meal: *patacones* are double-fried flatbreads made of *plátanos*, at the same time *patacón* is the name for an Argentinian substitute currency in use from 2001 to 2006, the period of the country's most extreme financial crisis. The *patacones* were a crisis currency, an answer to state bankruptcy. *Patacones Nr. II* were issued as bonds with 7% interest in the province of Buenos Aires in order to equalize the salaries of public employees, at first against the resistance of their potential recipients. *Patacones Nr. II* could be used to pay taxes and other fees but at the peak of the crisis were also used in Buenos Aires and the surrounding regions as a payment method for nearly all goods. Thus, at McDonald's you could order a »Patacombo« or you could buy a car with *patacones*. The *patacón* was a currency complementary to the Argentinian peso, which, due to its one-to-one exchange rate to the dollar had played a central role in causing the economic breakdown. Because of the fixed exchange rate with the dollar, Argentinian goods first became too expensive on the world market in the years before the state bankruptcy, which led to constant trade deficits. Secondly, there were rising government debts incurred in equalizing this situation. These credits became ever more expensive because of the negative prognoses for the Argentinian economy, and the national debt continued to rise. And thirdly, the *peso* lost the trust of the Argentinian people: many tried to exchange their money or save up U.S. dollars, which intensified the downward spiral of the *peso*. All these factors taken together led Argentina to declare bankruptcy in late 2001 (and due to private investors' claims the debts are still not settled); private and corporate accounts were frozen and at times there were no Argentinian pesos in circulation at all. In this situation, the *patacones* (their official name was *Letra de Tesorería para Cancelación de Obligaciones de la Provincia de Buenos Aires*) came onto the scene alongside other crisis currencies such as the *crédito*, which was issued by an association of bartering circles. The substitute currencies were instruments that allowed economic life, practically still intact, to continue and basic needs to be met while the official currency was scarce. After 2006, the *patacones* were adjusted for inflation and collected; they can now be acquired at a very high price by those interested in numismatics.

How did the *patacones* acquire their name? In Argentina, the word *patacón* has been a general and colloquial use for »money« since the 19th century, alongside *plata* (silver). And indeed, the Argentinian silver currency of the 19th century was called the *patacón*.[20] These shiny, round *patacones*, are where the name of the coin comes from: the flatbreads shining with fat symbolize wealth just as the coins do. In this colloquial usage of *patacón*, there is also a sense resonance of worthless, counterfeit, or fictional money. *Patacones* were reliably in use for years, but they were also considered strange, an amusing form of currency that was *actually* worth nothing. *Patacón* also comes from the Arabic *batakká* (for *window*) and therefore points to the *deep history* of monetary globalization. The expression was used prominently by a popular comic figure in Argentina, Patoruzú, a Tehuelches chief (from Patagonia) with superpowers, created by Dante Quinterno in 1928. Besides his physical strength he is distinguished by his generosity: bundles of money are always bulging out of his pant pockets. Most of his cartoon adventures have to do with the avarice and meanness of his opponents, which is why the word *patacones* often sounds comical.

In the term *patacón*, which was only later officially printed on the bonds, monetary fiction is on display in full color. It is telling that monetary fiction actually structures the approach to money even when the urgent task was ostensibly to regulate and stabilize functional procedures. Even when the response to a crisis requires measures such as a devised substitute currency, these rational procedures are manifestly captured by processes of fictionalization that are sometimes benign, sometimes malign. And to be sure, the surplus meaning of labels—even in situations of dire urgency, or perhaps especially in them—emphasizes the fictional character of money. In Argentina, this extended to the production of parody paper money showing Patoruzú at shakes with laughter; it was issued by the »Republica Manodura« or »Republic of the Hard Hand«.

Fig. 3, Patoruzú on a Two-Patacón Bill.

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[20] The name *Argentina* actually originates from the word *silver,* and therefore bears with it the colonial history of the relentless exploitation of the continental silver deposits.

Patacones can therefore be considered both a result of the crisis and a cultural reflection of the crisis and its causes. Even in a situation of scarcity and intense pressure to act, such semantic processes do not come to a standstill, as a rational theory of money would claim. In contrast, the *Patacón* was a relatively successful, stable parallel currency, anchored in consumption, *because* it was able to carry the semantics of money (its silver wealth, its reference to native luxury, and the fictional character of money as such).

4. Conclusions

I set out with Meyer Fortes' strong argument that the act of eating is a cultural technique of *concentration* both in space and time, whereas money is a medium of *expansion* and *deferral*. I wanted to show to what extent the life-sustaining acts of concentration have become dependent on dynamics of expansion and speculation driven by colonial and neo-colonial financial interdependencies. As a result, currencies can easily become toxic even if national or local economies are sound; I proposed a *longue durée* perspective in order to grasp the deadly dynamics that today feed into ecological and political issues of great relevance. I would like to stress the necessity to de-ontologize and historicize observed differences—for example between »local currencies« in crisis economies and »generalized modern media of exchange« in a global marketplace. First of all, the idea that national currencies simply *are* generalized media of exchange based on a universally valid functional calculus must be bracketed; the present form of economics should rather be described as a local practice that has succeeded since the 16th century, in universalizing itself through violent means. We live in a time in which the toxic character of this specific practice is becoming ever clearer, since it is unable to organize collective living and dying on this planet in a satisfactory way.[21] This is why Jason Moore and others prefer the term *Capitalocene* to *Anthropocene* when approaching the risks and urgencies of the current situation. We presently sit at a planetary table that is highly endangered, together with many other kinds of living beings, humans and non-humans, those that eat and digest each other (mutually or unilaterally), and beings that enter into symbiosis with and modestly produce for others (some of whom do all of these at once). My final argument therefore is not in favor of edible money or voucher systems, but rather concerns rendering economics unthinkable as we know it, since consumption cannot be delegated and deferred, since it is about the richness and fragility of living and

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[21]   Donna J. Haraway: Staying with the Trouble: Making Kin in the Chthulucene, Durham/London 2016.

dying together, economic discourses and practices that disengage value from cor-
poreality, finitude, and historicity must necessarily become toxic. Practices and
discourses that delegate exchange to an allegedly neutral system of accounting,
like the neo-classical economic approach, are simply not good enough for our
current situation since they deny potential toxic effects by socializing private risk.
This we should no longer accept.

Picture Credits:

Fig. 1: Bumper Sticker, URL: https://www.linke-t-shirts.de (26 October 2017)

Fig. 2: Organic Maya Gold, URL: http://us.greenandblacks.com/organic-maya-gold-dark-choco-
late-bar-60-cacao.html (26 October 2017)

Fig. 3: Dos Patacones de la Banca de la Republica Manodura, URL: http://claryn.galeon.com/
politica.html (25 April 2018)

Abstracts

Jeffrey West Kirkwood
The Technological Fact of Counterfactuals

Optical media were instrumental in transforming the conception of facts, objectivity, and the »real.« This paper considers their role in structuring understandings of counterfactuals and states that could not be real. By returning to Ernst Mach's photographic ballistics experiments, writing on thought experiments (a term he coined), and his dispute with Max Planck about the nature of the *Weltbild*, the article shows that, despite his legacy as a positivist, Mach's epistemology of mechanical images opened a legitimate space of indeterminacy, contingency, and counterfactuality.

Elisabeth Bronfen
**Parallel Editing, Double Time:
MAD MEN's Time Machine**

This article looks at the way Matthew Weiner deploys double vision in his historical re-imagination of the 1960s in MAD MEN. At issue is both the way the past haunts the present on the diegetic level in the form of flashback sequences, as well as the way Weiner performs simultaneity by virtue of parallel editing, especially in the closing sequences of individual episodes. At issue also is the way stock footage of key historical events such as the moon landing is deployed so as to offer a further juxtaposition of present and past.

William E. Connolly and Colin Lang
Debate: Post-Truth

Recently, the effort to counter Fake News faced a counter attack: academic »postmodernism« and »social constructivism« it was said—because they say that facts are soaked in prior interpretations—are either purveyors of Fake News or set the cultural context in which it flourishes. They do so by undermining confidence in inquiry governed by simple facts. That is erroneous, argues William E. Connolly, because postmodernism never said that facts or objectivity are ghostly, subjective or »fake«. However, that what was objective at one time may become less so at a later date through the combination of a paradigm shift in theory, new powers of perception, new tests with refined instruments, and changes in natural processes such as species evolution. But the emergence of new theories and tests does not reduce objectivity to subjective opinion. Facts are real. Objectivity is important. But as you move up the scale of complexity with respect to facts and objectivity, it becomes clear that what was objective at one time may become subjective at another. Not because of Fake News or postmodernism. But because the complex relationships between theory, evidence and conduct periodically open up new thresholds.

Colin Lang in turn rhetorically asks if »fake news« or »alternative facts« are a new carnival and Trump its dog and pony show? The idea of »fake news« and »alternative facts« as a carnival could not only help to see the constructedness of the media spectacle, but also provides a new perspective on Trump as an actor who is playing a particular role in this carnival, and that role is not one that any of us would describe as presidential. Many in the popular press have assumed it is just what it looks like, an infantilized narcissist, a parody of some Regan-era New York real estate tycoon straight out of a Bret Easton Ellis

novel. The problem is that this description is all too obvious, and misses something fundamental about alternative facts, and the part that Trump is playing. A central assumption is, then, that the creation of alternative facts is one symptom of a more structural, paradigmatic shift in the persona of a president, one which has few correlates in the annals of political history. The closest analogy for his kind of performance is actually hinted at in the title of Trump's greatest literary achievement: *The Art of the Deal.* Trump is playing the part of an artist, pilfering from the tactics of the avant-garde and putting them to very different ends.

Georg Toepfer

From *Anthropocene* to *Mediocene*? On the Use and Abuse of Stratifying the Earth's Crust by Mapping Time into Space

The ›mediocene‹ is different from geological epochs insofar as it is not a story about physical deposits but about relational entanglement. The major change taking place in the mediocene is that the environment has become part of a singular managed global system. This innovation refers to a radical shift in the relationship between life and its environment: Media have coupled everything together to the point where there is no environment left, where the system is everywhere.

Das ›Mediozän‹ unterscheidet sich insofern von geologischen Epochen, als es nicht um physische Ablagerungen geht, sondern um relationale Verschränkung. Die wichtigste Veränderung im Mediozän ist, dass die Umwelt Teil eines einzigen verwalteten globalen Systems geworden ist. Diese Innovation bezieht sich auf eine radikale Veränderung der Beziehung zwischen Leben und Umwelt: Medien haben alles so miteinander verbunden, dass es keine Umwelt mehr gibt und das System überall ist.

Nina Möllers

Materializing the Medium: Staging the Age of Humans in the Exhibition Space

The article takes the world's first exhibition on the geological and philosophical concept of the Anthropocene, »Welcome to the Anthropocene«, Deutsches Museum (2014-2016), as a starting point for initial theoretical reflections on the potential and limitations of exhibitions as media and designers of the Mediocene. On the basis of a discussion of image deployment, use of space and the materiality of objects, exhibitions are analyzed as ›slow media‹.

Jussi Parikka

Medianatures

The article outlines the concept of *medianatures*. The term is a neologism and in debt to Donna Haraway's rather eloquent and important coinage *naturecultures* that already functioned to mark the constant co-becomings of supposedly separated spheres of nature and culture. Medianatures is a further elaboration that elaborates the tie between the earth materialities that are mobilized for technological infrastructures, visual technologies, applications and devices, and the onto-epistemological stance that then feeds back into understanding those planetary scale earth materialities in the first place: the techniques of vision, observation, calculation, and circulation that are part of the governance of the earth and its various localities.

Birgit Schneider

Entangled Trees and Arboreal Networks of Sensitive Environments

The article discusses how current mediated conditions change nature perception from a media study perspective. The article is based on different case studies such as the current sensation of atmospheric change through

sensible media attached to trees which get published via Twitter, the meteorologist Amazonian Tall Tower Observatory and the use of gutta percha derived from tropical trees for the production of cables in the history of telegraphy. For analysing the examples, the perspective of »media as environments« is flipped to »environments as media«, because this focus doesn't approach media from a networked and technological perspective primarily but makes productive the elemental character of basic »media« like air, earth and water.

Gabriele Schabacher
Abandoned Infrastructures. Technical Networks beyond Nature and Culture

In the discussion of the Anthropocene, infrastructures play an eminent role as expression of man's deep interference with nature. They mediate the planet by fundamentally shaping the relation between man and environments with long-lasting effects. While infrastructures are understood as stable formations, they need constant care to function properly. Against this background, the paper analyses abandoned infrastructures with respect to their precarious state between nature and culture, between life and death, fragility and stability.

In der Diskussion des Anthropozäns spielen Infrastrukturen eine herausragende Rolle als Ausdruck des tiefen Eingriffs des Menschen in die Natur. Sie vermitteln den Planeten, indem sie die Beziehung zwischen Mensch und Umwelt mit langfristiger Wirkung grundlegend gestalten. Während Infrastrukturen als stabile Formationen verstanden werden, brauchen sie ständige Pflege, um richtig zu funktionieren. Vor diesem Hintergrund analysiert der Beitrag verlassene Infrastrukturen in Bezug auf ihren prekären Zustand zwischen Natur und Kultur, zwischen Leben und Tod, Fragilität und Stabilität.

Hans-Christian von Herrmann
Odyssey without Nostos, or, From Globe to Planet

We are witnessing a return of cosmology in 20th and 21st century thinking. It is cosmology in the ancient greek sense of the word which addressed the entirety of what surrounds and carries us. Another term for this ongoing transformation is the ›planetary‹ which isn't simply a synonym for the ›global‹. The planetary means a kind of boundless pervasion based on science and technology and transposing planet earth and human life from a culture-historical to a cosmic scale.

Karin Harrasser
Toxic Money. Economic Globalization and its (Edible) Currencies

The article discusses the dynamics of currencies, of media of exchange in a perspective of *longue durée*. It explores the concept of ›toxic media‹ and of an ›ecology of practices‹ by tracing discussions on cacao as money and as consumable since the 15th century. Furthermore, historically specific versions of general purpose money, such as the Spanish Silver-Peso and the U.S. dollar are compared with to self-restricting currencies: currencies that are more tightly knit into the »web of life« (Jason Moore), into local economies and ecologies and into cultural systems. The article determines toxic effects of generalized media of exchange in the *Capitalocene* and discusses the interplay of situated money-regimes with generalized, globalized media of exchange.

Authors

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Samuel Butler (1835–1902) was a British artist, novelist and translator. His most notable works are the utopian satirical *Erewhon* (1872) and the semi–autobiographical novel *The Way of All Flesh* (1903). Butler's showed interest in Darwin's theories of biological evolution and in 1863, four years after Darwin published *On the Origin of Species*, he published a letter in a New Zealand newspaper called *Darwin among the Machines*. In this letter he compares human evolution to machine evolution, arguing that machines would eventually replace man in the supremacy of the earth.

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Colin Lang is the Editor in Chief of the German contemporary art magazine *Texte zur Kunst*. Main focuses of research: contemporary art and theory; sonic practices in the arts; media history and theory. He is currently at work on a manuscript that traces the development of electronic music as it emerged in, and out of, more traditional artistic contexts

(galleries/museums, theater) beginning in the 1960s.

Nina Möllers is program and events manager at BIOTOPIA – Naturkundemuseum Bayern, scheduled to open in 2024. From 2009 to 2018, she was researcher and exhibition curator at the Deutsches Museum where she curated the first large exhibition on the Anthropocene. Main focuses of research: cultural studies, Anthropocene and environmental studies, museum studies. Selected publications: Objects in Motion: Globalizing Technology (Washington 2016); (co-ed.) Welcome to the Anthropocene. The Earth in Our Hands (München 2015); Kreolische Identität. Eine amerikanische ›Rassengeschichte‹ zwischen Schwarz und Weiß. Die Free People of Color in New (Bielefeld 2008).

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Publics / Making Infrastructures Public (Wiesbaden, forthcoming); Workarounds. Praktiken des Umwegs, ed. together with Holger Brohm, Sebastian Gießmann und Sandra Schramke (Berlin 2017).

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