



Das Anthropozän – Von einer Beobachtungskategorie zu einem kategorischen Beobachtungsimperativ

Pascal Goeke
12. November 2020

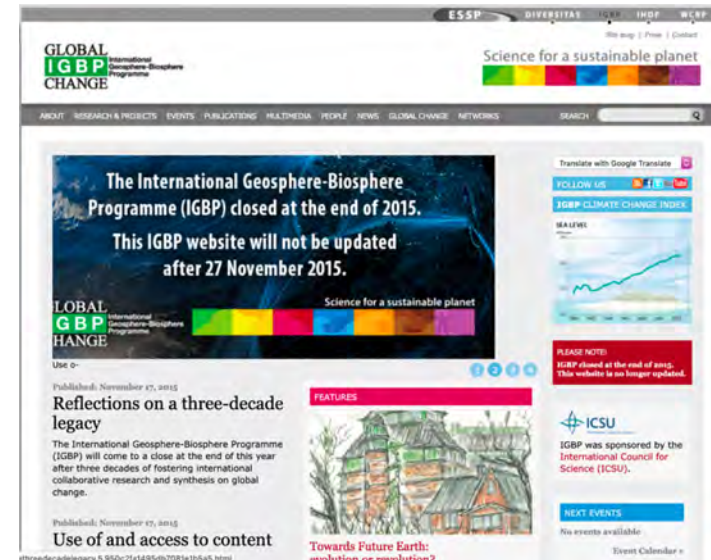
Gliederung

1. Das Anthropozän – Definitionen und Grundlagen
2. Eine kleine Erfolgsgeschichte der einfachen Vokabel
3. Erfolgsbedingungen und Elemente
 - a. Umweltliches Denken
 - b. Planetarische Perspektive
 - c. Transformationsimperativ
4. Fazit: Von einer Beobachtungskategorie zu einem kategorischen Beobachtungsimperativ

Schöpfungsmoment – 2000

- International Geosphere-Biosphere Program, Annual Conference 2000
- Paul J. Crutzen (*1933), Atmosphärenchemiker, Nobelpreisträger für Chemie (1995)

„the chairman mentioned the Holocene again and again as our current geological epoch. After hearing that term many times, I lost my temper, interrupted the speaker, and remarked that we are no longer in the Holocene. I said that we were already in the “Anthropocene.” My remark had a major impact on the audience. First there was a silence, then people started to discuss this. In the coffee break, somebody approached me and said I should patent the term. After my talk I looked to see whether the term Anthropocene had been used before. Indeed it had, by a limnologist of the University of Michigan, Eugene F. Stoermer.“ (Crutzen 2013)



<http://www.igbp.net/>

Crutzen, Paul J. und Christian Schwägerl (2013): ›A Huge Variety of Possibilities‹: Interview with Nobel Laureate Paul Crutzen on his Life, his Career in Research, and his Views on the Anthropocene Idea. In: Environment & Society Portal, (www.environmentandsociety.org/exhibitions/anthropocene/huge-variety-possibilities-interview-nobel-laureate-paul-crutzen-his-life (12.10.2015)).

Die Anthropozänthese

The "Anthropocene"

by Paul J. Crutzen and Eugene F. Stoermer

The name Holocene ("Recent Whole") for the post-glacial geological epoch of the past ten to twelve thousand years seems to have been proposed for the first time by Sir Charles Lyell in 1833, and adopted by the International Geological Congress in Bologna in 1885 (1). During the Holocene mankind's activities gradually grew into a significant geological, morphological force, as recognised early on by a number of scientists. Thus, G.P. Marsh already in 1864 published a book with the title "Man and Nature", more recently reprinted as "The Earth as Modified by Human Action" (2). Stoppani in 1873 rated mankind's activities as a "new telluric force which in power and universality may be compared to the greater forces of earth" [quoted from Clark (3)]. Stoppani already spoke of the anthropozoic era. Mankind has now inhabited or visited almost all places on Earth; he has even set foot on the moon.

The great Russian geologist V.I. Vernadsky (4) in 1926 recognized the increasing power of mankind as part of the biosphere with the following excerpt "... the direction in which the processes of evolution must proceed, namely towards increasing consciousness and thought, and forms having greater and greater influence on their surroundings". He, the French Jesuit P. Teilhard de Chardin and E. Le Roy in 1924 coined the term "noösphere", the world of thought, to mark the growing role played by mankind's brainpower and technological talents in shaping its own future and environment.

The expansion of mankind, both in numbers and per capita exploitation of Earth's resources has been astounding (5). To give a few examples: During the past 3 centuries human population increased tenfold to 6000 million, accom-

panied e.g. by a growth in cattle population to 1400 million (6) (about one cow per average size family). Urbanisation has even increased tenfold in the past century. In a few generations mankind is exhausting the fossil fuels that were generated over several hundred million years. The release of SO_2 globally about 160 Tg/year to the atmosphere by coal and oil burning, is at least two times larger than the sum of all natural emissions, occurring mainly as marine dimethyl-sulfide from the oceans (7); from Vitousek et al. (8) we learn that 30-50% of the land surface has been transformed by human action; more nitrogen is now fixed synthetically and applied as fertilizers in agriculture than fixed naturally in all terrestrial ecosystems; the escape into the atmosphere of NO from fossil fuel and biomass combustion likewise is larger than the natural inputs, giving rise to photochemical ozone ("smog") formation in extensive regions of the world; more than half of all accessible fresh water is used by mankind; human activity has increased the species extinction rate by thousand to ten thousand fold in the tropical rain forests (9) and several climatically important "greenhouse" gases have substantially increased in the atmosphere: CO_2 by more than 30% and CH_4 by even more than 100%. Furthermore, mankind releases many toxic substances in the environment and even some, the chlorofluorocarbon gases, which are not toxic at all, but which nevertheless have led to the Antarctic "ozone hole" and which would have destroyed much of the ozone layer if no international regulatory measures to end their production had been taken. Coastal wetlands are also affected by humans, having resulted in the loss of 50% of the world's man-

groves. Finally, mechanized human predation ("fisheries") removes more than 25% of the primary production of the oceans in the upwelling regions and 35% in the temperate continental shelf

regions (10). Anthropogen well illustrated by the communities that leave sediments. The effects include modification of the cycle in large freshwater cur in systems remote sources (11-13).

Considering these major and still growing man activities on earth and at all, including seems to us more than emphasize the central in geology and ecology use the term "anthropocent geological epoch. current human activities over long periods. According to Berger and Loure (14) anthropogenic emission may depart significantly from human behaviour over the next 50,000 years.

To assign a more specific date to the onset of the "anthropocene" seems somewhat arbitrary, but we propose the latter part of the 18th century, although we are aware that alternative proposals can be made (some may even want to include the entire holocene). However, we choose this date because, during the past two centuries, the global effects of human activities have become clearly noticeable. This is the period when data retrieved from glacial ice cores show the beginning of a growth in the atmospheric concentrations of several "greenhouse gases", in particular CO_2 and CH_4 (7). Such a starting date also coincides with James Watt's invention of the steam

„more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term 'anthropocene' for the current geological epoch“ (Crutzen/Stoermer 2000: 17).

Die Anthropozänthese

Geology of mankind

Paul J. Crutzen

For the past three centuries, the effects of humans on the global environment have escalated. Because of these anthropogenic emissions of carbon dioxide, global climate may depart significantly from natural behaviour for many millennia to come. It seems appropriate to assign the term 'Anthropocene' to the present, in many ways human-dominated, geological epoch, supplementing the Holocene — the warm period of the past 10–12 millennia. The Anthropocene could be said to have started in the latter part of the eighteenth century, when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane. This date also happens to coincide with James Watt's design of the steam engine in 1784.

Mankind's growing influence on the environment was recognized as long ago as 1873, when the Italian geologist Antonio Stoppani spoke about a 'new telluric force which in power and universality may be compared to the greater forces of earth,'

referring to the "anthropogenic era". And in 1926, V. I. Vernadsky acknowledged the increasing impact of mankind: "The direction in which the processes of evolution must proceed, namely towards increasing consciousness and thought, and forms having greater and greater influence on their surroundings." Teilhard de Chardin and Vernadsky used the term 'noosphere' — the 'world of thought' — to mark the growing role of human brain-power in shaping its own future and environment.

The rapid expansion of mankind in numbers and per capita exploitation of Earth's resources has continued apace. During the past three centuries, the human population has increased tenfold to more than 6 billion and is expected to reach 10 billion in this century. The methane-producing cattle population has risen to 1.4 billion. About 30–50% of the planet's land surface is exploited by humans. Tropical rainforests disappear at a fast pace, releasing carbon dioxide and strongly increasing species extinction. Dam building and river diversion have become commonplace. More than half of all accessible fresh water is used by mankind. Fisheries remove more than 25% of the primary production in upwelling ocean regions and 35% in the temperate continental shelf. Energy use has grown 16-fold during the twentieth century, causing 160 million tonnes of atmospheric sulphur dioxide emissions per year, more than twice the sum of its natural emissions. More nitrogen fertilizer is applied in agriculture than is fixed naturally in all terrestrial ecosystems; nitric oxide production by the burning of fossil fuel and biomass also overrides natural emissions. Fossil-fuel burning and agriculture have caused substantial increases in the concentrations of 'greenhouse' gases — carbon dioxide by 30% and methane by more than 100% — reaching their highest levels over the past 400 millennia, with more to follow.

So far, these effects have largely been caused by only 25% of the world population. The consequences are, among others, acid precipitation, photochemical 'smog' and climate warming. Hence, according to the latest estimates by the Intergovernmental Panel on Climate Change (IPCC), the Earth will warm by 1.4–5.8 °C during this century.

Many toxic substances are released into the environment, even some that are not toxic at all but nevertheless have severely damaging effects, for example the chloro-fluorocarbons that caused the Antarctic 'ozone hole' (and which are now regulated). Things could have become much worse: the

concepts

The Anthropocene

The Anthropocene could be said to have started in the late eighteenth century, when analyses of air trapped in polar ice showed the beginning of growing global concentrations of carbon dioxide and methane.

ozone-destroying properties of the halogenated hydrocarbons have been studied. If it had turned out to be chemically like bromine, it would have been a round phenomenon, of the Antarctic spring by wisdom, this catastrophe would not have developed.

Unless there is a global meteorite impact, a global climatic emergency — mankind's environmental future is a daunting task. It lies with engineers to guide society towards a more sustainable future. The Anthropocene requires appropriate human scales, and may well be accepted, large-scale projects, for instance to 'tread on terra incognita'. Paul J. Crutzen is at the Max Planck Institute for Chemistry, PO Box 1060, D-55128 Mainz, Germany, and the Scripps Institution of Oceanography, University of California, San Diego, 9500 Gilman Drive, San Diego, CA 92093-0432, USA.

FURTHER READING

Marsh, G. P. *Man and Nature: Earth as Modified by Human Action*. Cambridge, Massachusetts: Harvard University Press, 1965.

Crutzen, P. J. & Stoermer, E. (Eds.) *The Anthropocene*. Royal Swedish Academy of Sciences, Stockholm, 2000.

Clark, W. C. & Munn, R. E. (Eds.) *Development of the Biosphere*. Cambridge University Press, Cambridge, 2001.

Vernadsky, V. I. *The Biosphere*. Amsterdam: Elsevier, 1985.

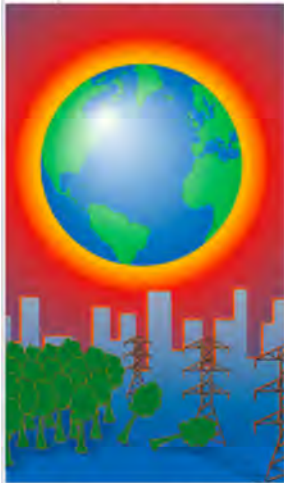
Turner, B. L. et al. *The Earth System: A Holocene Perspective*. Cambridge University Press, Cambridge, 2004.

McNeill, J. R. *Something New Under the Sun: An Environmental History of the Twentieth-Century World*. W. W. Norton, New York, 2000.

Houghton, J. T. et al. (Eds.) *Climate Change 2001: The Scientific Basis*. Cambridge University Press, Cambridge, 2001.

Berger, A. & Loutre, M.-F. *C. R. Acad. Sci. Paris 323* (1997), 1–16.

Schellnhuber, H. J. *Nature* 402, C19–C23 (1999).



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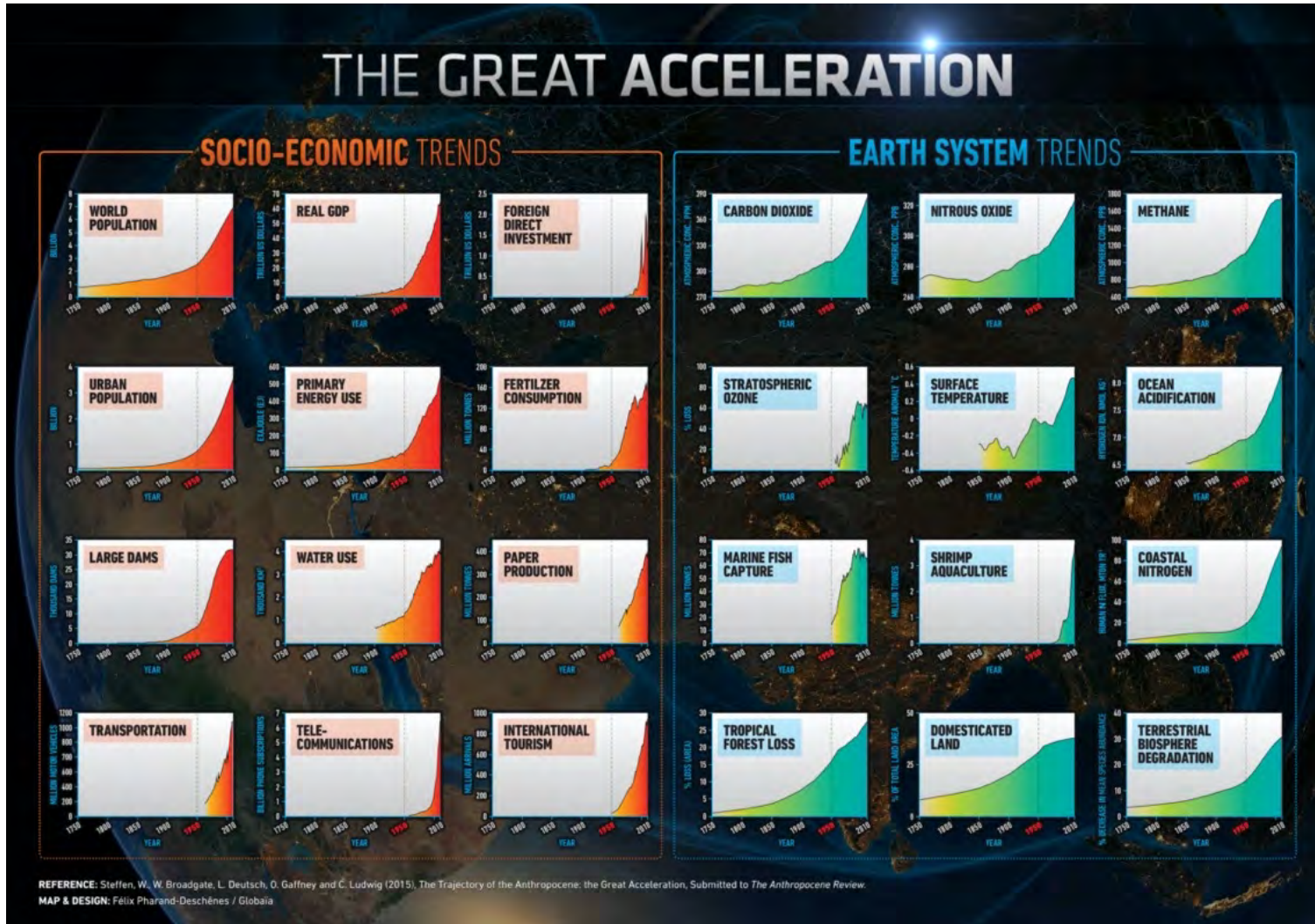
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„For the past three centuries, the effects of humans on the global environment have escalated. Because of these anthropogenic emissions of carbon dioxide, global climate may depart significantly from natural behaviour for many millennia to come. It seems appropriate to assign the term 'Anthropocene' to the present, in many ways human-dominated, geological epoch, supplementing the Holocene — the warm period of the past 10–12 millennia.“ (Crutzen 2002: 23)

Anthropozän

Mit Anthropozän wird die jüngste Epoche der Erdgeschichte bezeichnet. Das wesentliche Merkmal dieser Epoche im engeren Sinn ist, dass die menschliche Gesellschaft zum bedeutsamsten erdsystemischen Faktor geworden ist. Daher wird man die Existenz der Menschheit auch dann noch erkennen können, wenn die Menschheit selbst ausgestorben ist und nicht mehr Zeugnis ihrer eigenen Existenz ablegen können.

The Great Acceleration



Anthropozän als Formel

Traditionell

$$\frac{dE}{dt} = \int (A, G, I)$$

dE = development of the Earthsystem

dt = development time

A = astronomical forces (z.B. Sauriersterben)

G = geophysical forces (z.B. Atmosphäre)

I = internal dynamics (z.B. Cyanobakterien vor 2,5 Milliarden Jahren und das Gift Sauerstoff, Große Sauerstoffkatastrophe)

Anthropozän

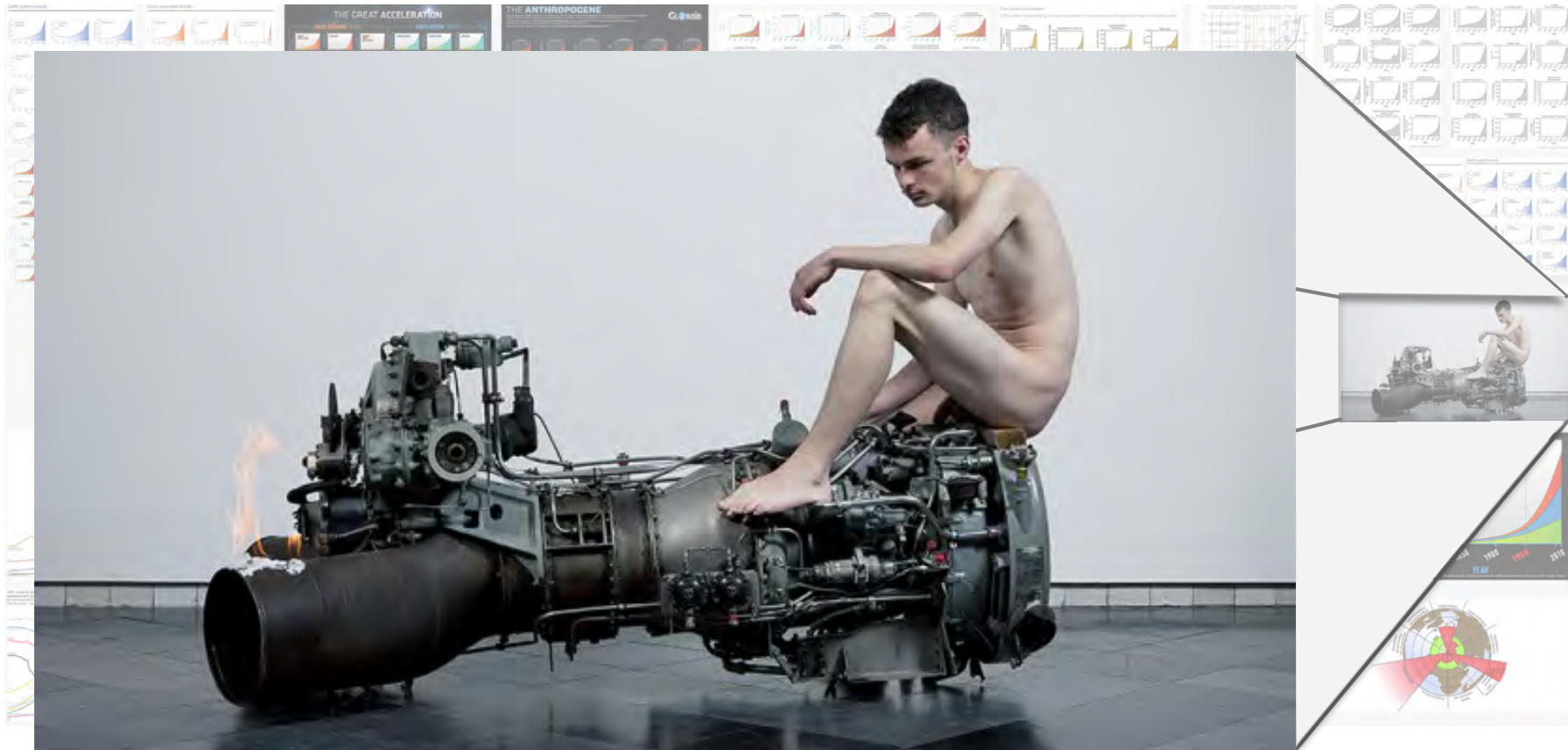
$$\frac{dE}{dt} = \int_{(A, G, I \rightarrow 0)} (H)$$

H = human society

Anthropozän und die Erdsystemwissenschaften

„The Earth System is defined as the integrated biophysical and socioeconomic processes and interactions (cycles) among the atmosphere, hydrosphere, cryosphere, biosphere, geosphere, and anthroposphere (human enterprise) in both spatial – from local to global – and temporal scales, which determine the environmental state of the planet within its current position in the universe. Thus, humans and their activities are fully part of the Earth System, interacting with other components.“ (Rockström et al. 2009, 32)

Technik



Roger Hiorns – Untitled, 2011. Courtesy of Corvi-Mora, London, Luhring
<https://anti-utopias.com/newswire/taipei-biennial-2014-the-great-acceleration/>

Datierung

Table 1 | Potential start dates for a formal Anthropocene Epoch

Event	Date	Geographical extent	Primary stratigraphic marker	Potential GSSP date*	Potential auxiliary stratotypes
Megafauna extinction	50,000–10,000 yr BP	Near-global	Fossil megafauna	None, diachronous over ~40,000 yr	Charcoal in lacustrine deposits
Origin of farming	~11,000 yr BP	Southwest Asia, becoming global	Fossil pollen or phytoliths	None, diachronous over ~5,000 yr	Fossil crop pollen, phytoliths, charcoal
Extensive farming	~8,000 yr BP to present	Eurasian event, global impact	CO ₂ inflection in glacier ice	None, inflection too diffuse	Fossil crop pollen, phytoliths, charcoal, ceramic minerals
Rice production	6,500 yr BP to present	Southeast Asian event, global impact	CH ₄ inflection in glacier ice	5,020 yr BP CH ₄ minima	Stone axes, fossil domesticated ruminant remains
Anthropogenic soils	~3,000–500 yr BP	Local event, local impact, but widespread	Dark high organic matter soil	None, diachronous, not well preserved	Fossil crop pollen
New–Old World collision	1492–1800	Eurasian–Americas event, global impact	Low point of CO ₂ in glacier ice	1610 CO ₂ minima	Fossil pollen, phytoliths, charcoal, CH ₄ , speleothem δ ¹⁸ O, tephra†
Industrial Revolution	1760 to present	Northwest Europe event, local impact, becoming global	Fly ash from coal burning	~1900 (ref. 94); diachronous over ~200 yr	¹⁴ N: ¹⁵ N ratio and diatom composition in lake sediments
Nuclear weapon detonation	1945 to present	Local events, global impact	Radionuclides (¹⁴ C) in tree-rings	1964 ¹⁴ C peak§	²⁴⁰ Pu: ²³⁹ Pu ratio, compounds from cement, plastic, lead and other metals
Persistent industrial chemicals	~1950 to present	Local events, global impact	For example, SF ₆ peak in glacier ice	Peaks often very recent so difficult to accurately date§	Compounds from cement, plastic, lead and other metals

For compliance with a Global Stratotype Section and Point (GSSP) definition, a clearly dated global marker is required, backed by correlated auxiliary markers that collectively indicate global and other widespread and long-term changes to the Earth system. BP, before present, where present is defined as calendar date 1950.

* Requires a specific date for a GSSP primary marker. †From Huaynaputina eruption in 1600 (refs 78, 79).

§ Peak, rather than earliest date of detection selected, because earliest dates reflect available detection technology, are more likely influenced by natural background geochemical levels¹⁰¹, and will be more affected by the future decay of the signal, than peak values.



Erfolg und Bedeutung einer Vokabel



Verbreitung der Vokabel Anthropozän

- ›**Willkommen im Anthropozän**‹ –
Unsere Verantwortung für die Zukunft der Erde
- Deutsches Museum München
- 5. Dezember 2014 bis 30. September 2016



Verbreitung der Vokabel Anthropozän

- **Yes Naturally – How art saves the world**
- Kunstmuseum Den Haag
- 16 March 2013 till 25 August 2013



Verbreitung der Vokabel Anthropozän

- ›UMWELT IM GESPRÄCH‹
Eine Veranstaltungsreihe des Forschungsnetzwerkes Umwelt der Universität Wien in Kooperation mit dem NHM Wien
 - UMWELT IM GESPRÄCH: Mikrobiom und Umwelt: Wie der Mensch von „seinen“ Bakterien abhängt
 - UMWELT IM GESPRÄCH: Das Ende der Natur? Leben im Anthropozän



Verbreitung der Vokabel Anthropozän

- **Österreich 25 Euro Niob Die Zeit Anthropozän im Zeitalter des Menschen HGH 2018**



Sinngeschichtliche Umwendungsbewegung

Drei Aspekte des Anthropozäns als Marker und Treiber einer sinngeschichtlichen Umwendungsbewegung

- i. Umweltliches Denken
 - ii. Planetarische Perspektive
 - iii. Transformationsimperativ
- Schreiben Sie sich die drei Dimensionen auf und versuchen Sie die Dimensionen im Trailer wiederzufinden



Willkommen im Anthropozän



<https://www.youtube.com/watch?v=VivH8AcdWuw>

Umweltliches Denken

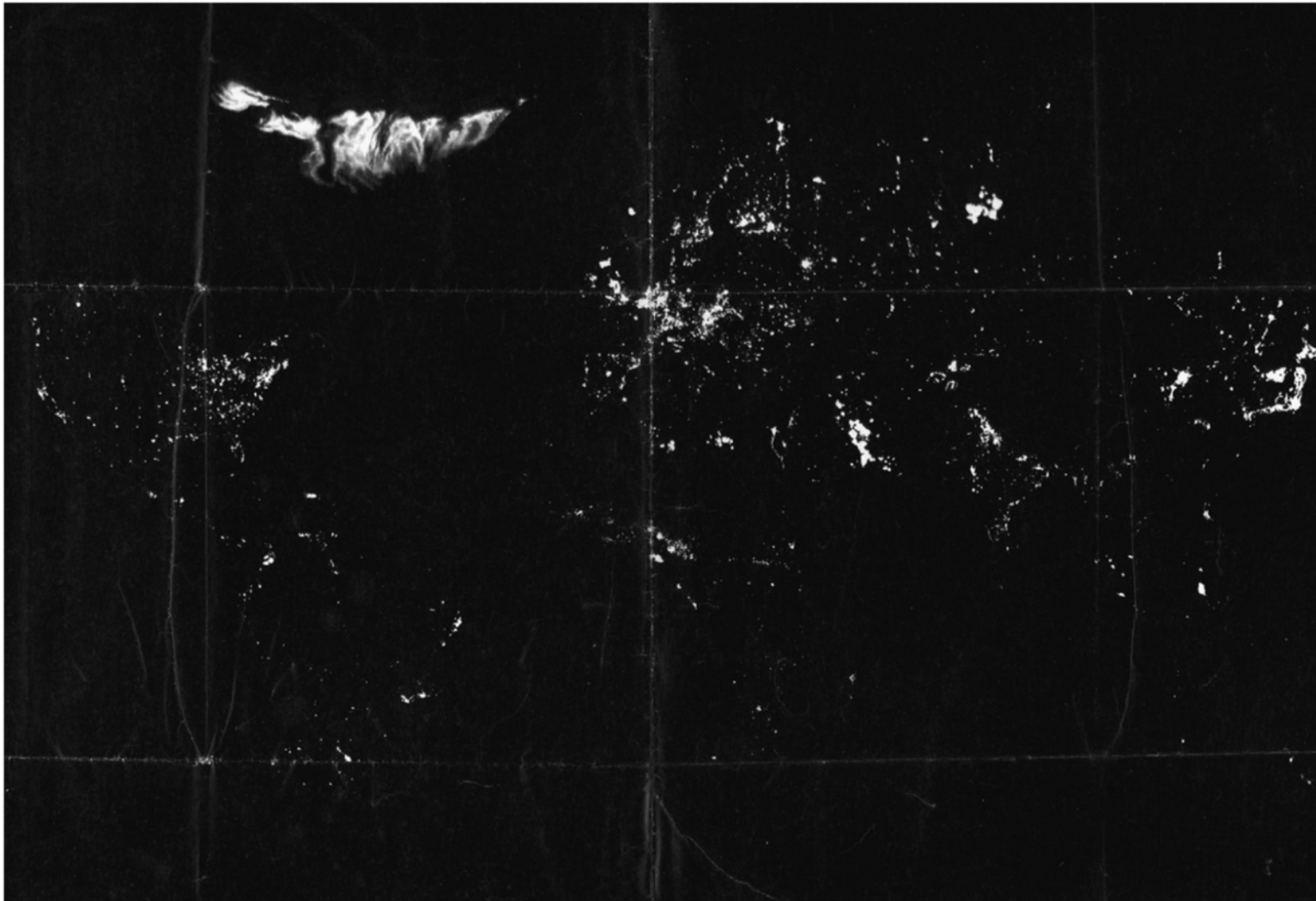
- Der Mensch wird als Hotel für Parasiten bezeichnet und zugleich wird anerkannt, dass der Mensch nur mit diesen Parasiten überleben kann.
- Die EU-Kommission betont, dass wir ohne Plastik nicht leben können, aber dass uns zu viel Plastik töten wird.
- Die Sprachwissenschaften stellen heraus, dass Sprach- und Kommunikationsmöglichkeiten Sozialordnungen mitgestalten und wir zugleich durch Sprache unsere Umwelten imaginieren.
- Und in Peter Wohllebens Buch über das Geheime Leben der Bäume wird der Wald als utopische Sozialgemeinschaft präsentiert.

Umweltliches Denken

Es geht um das „Ineinandergreifen von individuell-mentalenen, kollektiv-sozialen und umweltlichen Prozessen“ (Hörl 2011, 34).

„Das Weltbild dieser Gesellschaft stellt sich um auf eine *ökologische* Ordnung der Nachbarschaft, der keine prästabilisierte Harmonie, kein Supersystem, keine übergreifende Hierarchisierung ihre Regeln und ihr Maß gibt, sondern nur die Frage, in welchen Nischen wer und was ein Überleben hat.“ (Baecker 2007, 171)

Earth at Night (1986)



Earth at Night, Hansen Planetarium, Salt Lake City 1986.

Mönninger, Michael (2009): **Das umgedrehte Fernrohr. Die Fernerkundung der Nahwelt – vom Himmelsblick zur Erdbeobachtung.** In: *kritische berichte* 37(3), S. 94-101. S. 94

Earthrise (1968), Apollo 8



Earthrise, 24.12.1968

<http://100photos.time.com/photos/nasa-earthrise-apollo-8>

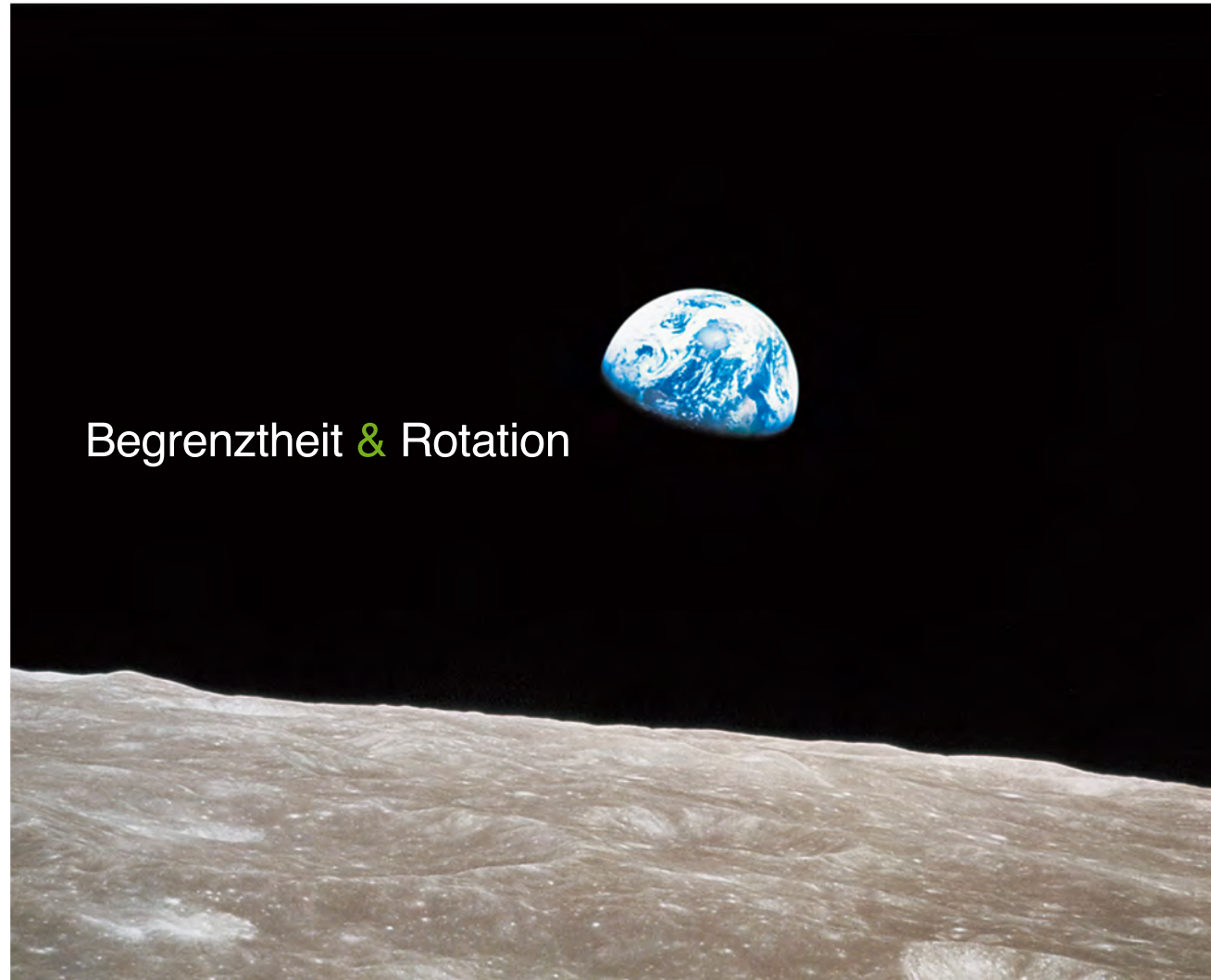
Blue Marble, 1972, Apollo 17



Das umgedrehte Fernrohr

- Lunar Orbiter (1966): „Der Anblick, ‚dass am Himmel des Mondes die Erde steht‘, war nur die anschauliche Vollendung der Lehre von Galileo Galilei und Nicolaus Copernicus: dass die Erde nur ein kleiner Wandelstern unter den unzähligen Planeten im Kosmos ist“ (S. 96)
- Earth at Night (1986) „Menschheit erblickt zum ersten Mal das Licht ihrer eigenen Welt“ (S. 96)
- Google Maps (2005): „Manfred Schneider feierte diese Bilder bereits als ‚die stärkste *public relation* der globalisierten Welt‘ und als ‚neues Zeitalter totaler optischer Raumbeherrschung‘, die den Weg zu ‚künftigen Echtzeitvisionen von allem‘ bahne.“ (S. 99)
- Drei Perspektiven/Revolutionen
 - I. Vormoderner Himmelsblick
 - II. Satellitengestützte Erdbeobachtung
 - III. Individualisierung mittels Google

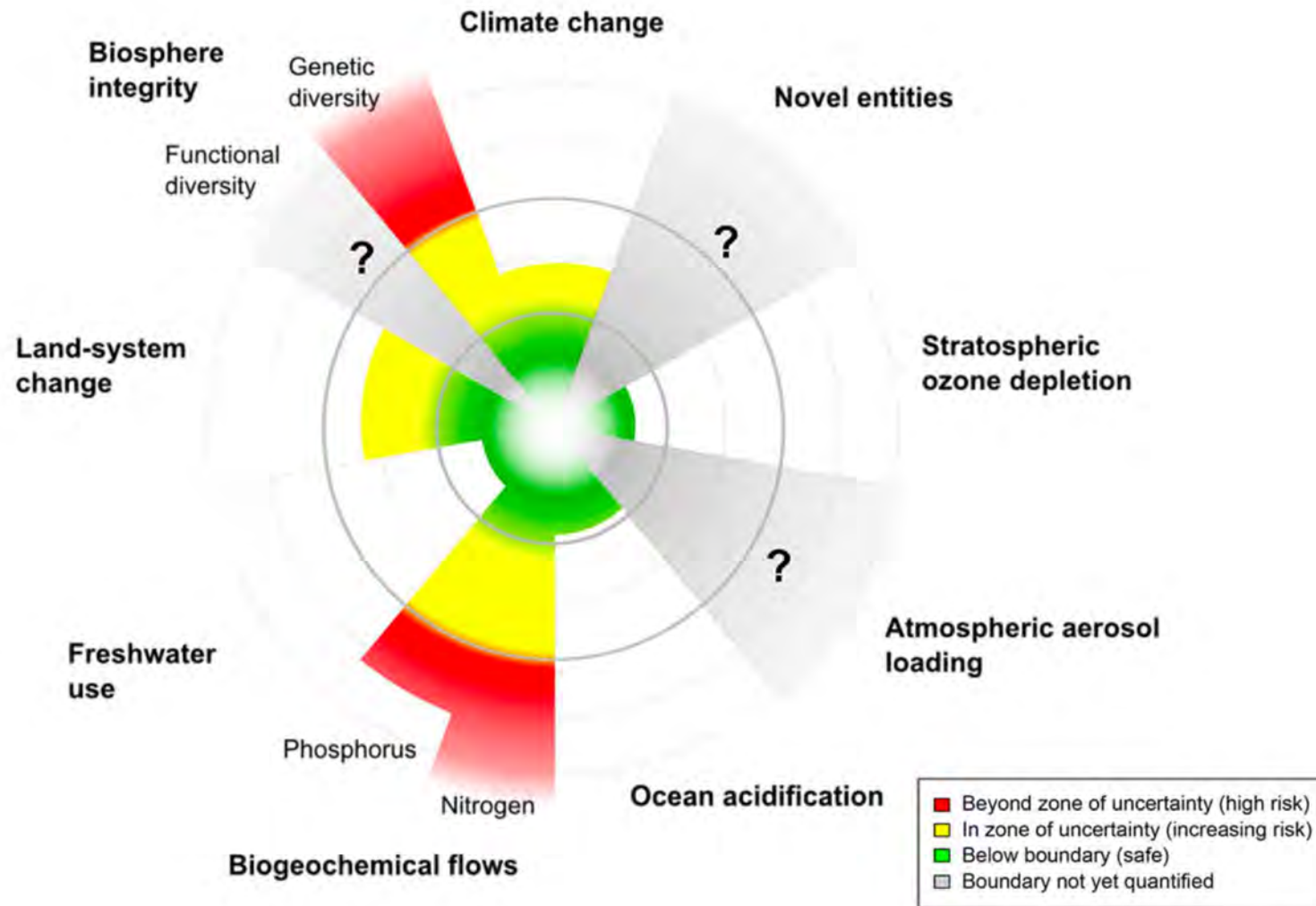
Earthrise (1968), Apollo 8



Earthrise, 24.12.1968

<http://100photos.time.com/photos/nasa-earthrise-apollo-8>

Planetarische Grenzen



Am 30. Mai ist Weltuntergang (von 1954)

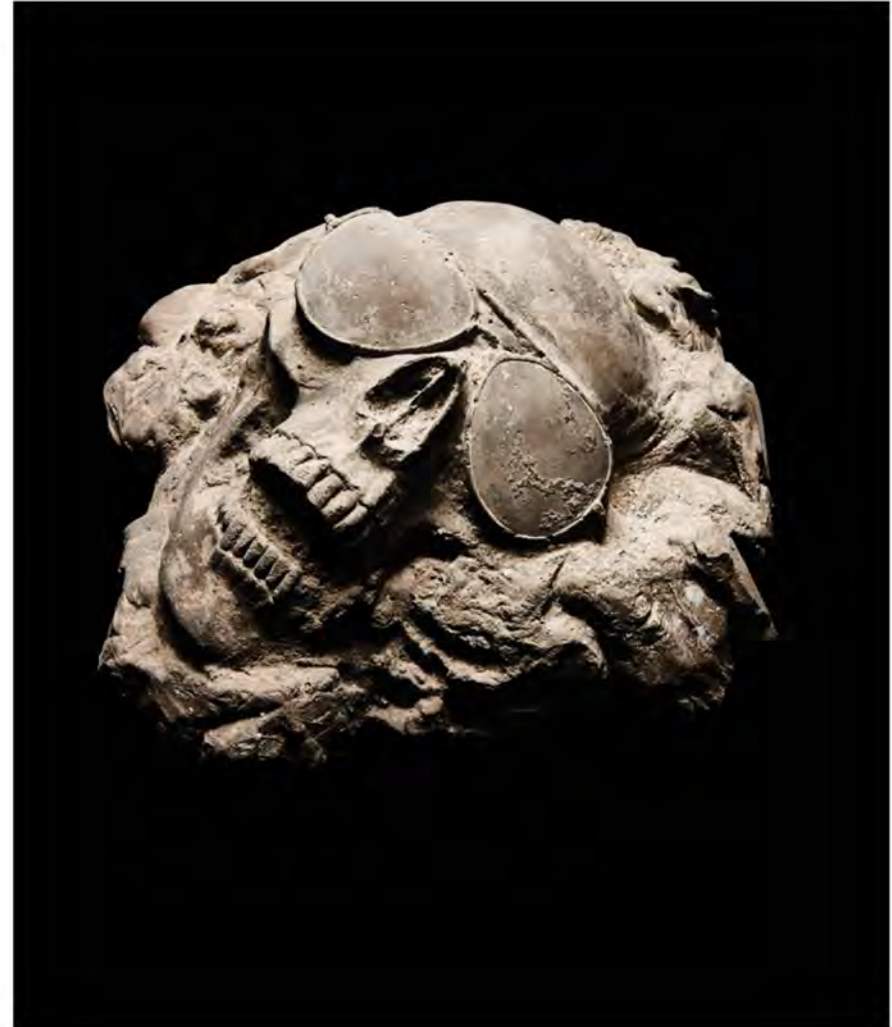


The Uninhabitable Earth

The Uninhabitable Earth

Famine, economic collapse, a sun that cooks us: What climate change could wreak — sooner than you think.

By David Wallace-Wells



Wallace-Wells, David (2017): **The Uninhabitable Earth. Famine, economic collapse, a sun that cooks us: What climate change could wreak — sooner than you think.** In: *The New York Times*. (<http://nymag.com/daily/intelligencer/2017/07/climate-change-earth-too-hot-for-humans.html>) (12.1.2017)).

Transformationsimperative



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Transformationsimperativ

Bedenke bei Deinen Beobachtungen stets die **Umwelt** als solche und in ihren unterschiedlichen Bedeutungen und Verbindungen zu Dir – Skalieren Dein Denken stets **planetarisch** und wisse um Dein Unwissen – Und handle stets so, dass die **Pfade**, die in die Misere der Gegenwart führten, verlassen werden!