3,000 Years of Apocalypse. Ambivalent Relations Between Mining and Culture with Particular Regard to Uranium

Grit Ruhland is an artist whose work combines a conceptual, epistemic approach with societal, environmental and scientific topics. As part of her doctoral research at the Bauhaus University Weimar, Ruhland explored the impact of uranium mining on the landscape of East Germany. In the following text, she refers to the importance of mining for past societies since the Stone Age, connecting this to the controversial cultural associations which underground exploitation nurtured in societies up to the present. At the turn of the 21st century, with uranium extraction having opened a new Nuclear Age, Ruhland points to the importance of balancing mining narratives to design solutions to the complex environmental anxieties of the present.

In the last decades, only a few cultural studies scholars have reflected conceptually (rather than just in technical terms) on the relationship between mining and culture. Hartmut Böhme explored the semantics of the underworld (*Unterweltsemantik*)[1] and found connotations not only in concepts of imagination and maternity (*Magna Mater*), but also in those of the lowly (*das Niedere*), the evil (*das Böse*), the uncanny (*das Unheimliche*) and the frightening (*das*

1 Hartmut Böhme, "Unterwelten: Topographien des 'Unüberschaubaren Seelischen Höhlensystems'", Dagmar Kift. ed. *Schriften Des Fritz-Hüser-Instituts Für Literatur Und Kultur Der Arbeitswelt*; Bd. 32, *Bergbaukulturen in interdisziplinärer Perspektive Diskurse und Imaginationen* (September 2018), 187–98, 188.

Angstmachende). Mining takes place in the dubious realm of darkness to harvest minerals and fluids that man claims for his use and needs. Is it because of these "dark" connotations that in the public opinion mining tends to be attributed to "the others"?

English	German
base	*Boden*
earth	*Erde*
floor	*Grund*
ground	*Land*
land	*Untergrund*
soil	*Terra*
terra	*Erdreich*
underground	*Erdboden*
chthonic	*chthonisch*
underworld	*Unterwelt, unterirdisch*
Hades	*Hades*
hell	*Hölle*
netherworld	*Jenseits*
Orcus	*Orkus*
Mining terminology	***Bergmannssprache***
underground	*Unter Tage*
ground	*Gebirge*

Being one of the most important foundations of past and present societies, mining is equally as important as for example agriculture, transport and housing. It is a bromide that every digitally active person is using, a technology that requires a range of products derived from the sophisticated exploitation of the ground. However, mining is often criticised more harshly than other industries and sometimes even described as evil itself. Does the darkness of the mine influence the perception of mining? On the other hand, the mining community is quite aware of its meaning and expresses pride in their work, even though mining traditionally adverserly affects miners. The large study "In the shadow of coal", which explores the psychological well-being of workers in coal-related industries in England, even uses the expression "curse of natural re-

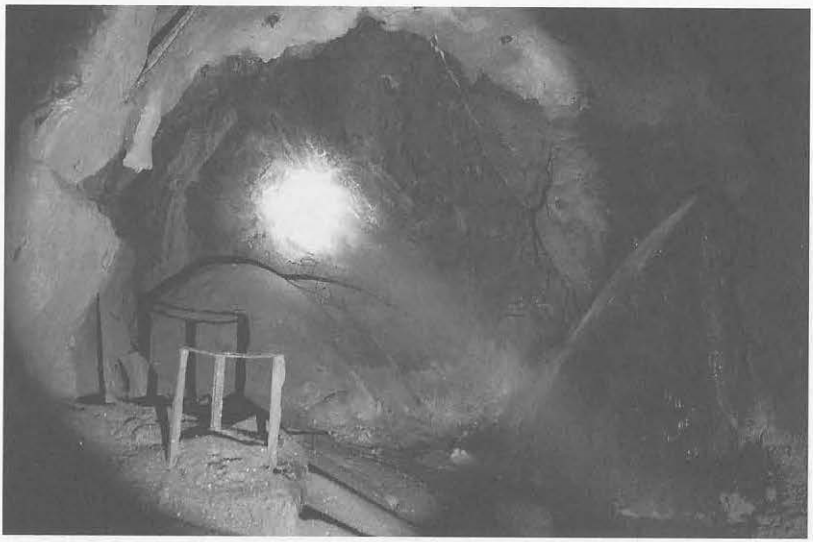
On top of the Uranium waste rock pile "Schmirchauer Höhe", Germany, 2016

sources".[2] Based on a sample of about 400,000 psychological tests, elevated levels of anxiety, depression and a decline in happiness as well as other signs of psychological distress were shown in those regions. The authors see precarious and dangerous working conditions as the cause of these effects, while speculating further if economically challenged persons were especially attracted to these industries.

Georgius Agricola, author of the first (pre-)scientific book on mining, *De Re Metallica*, already observed in the 16th century that it was often people who were under economic pressure, in particular those in debts, who signed up for the "new" mining business in the Saxon Erzgebirge.[3] During this time, mining in Central Europe was becoming a proto-industrial economy: unions, mining laws, supply chains, and investments were inventions that originated from this sector. Paulus Niavis, a layman interested in

2 Obschonka, Martin, Michael Stützer, Peter J. Rentfrow, Leigh Shaw-Taylor, Max Satchell, Rainer K. Silbereisen, Jeff Potter, and Samuel D. Gosling. "In the Shadow of Coal: How Large-Scale Industries Contributed to Present-Day Regional Differences in Personality and Well-Being." *Journal of Personality and Social Psychology*, 115 (5) (2018), 903–27.

3 Georg Agricola, *De Re Metallica Libri XII*: Zwölf Bücher Vom Berg- Und Hüttenwesen (VDI-Verlag, Berlin 1928. Wiesbaden: Marix, 1556), 3.



Inside Europes deepest mine "Pyhäsalmi", Finland, 2016

but also critical of mining, staged a fictional dialogue between two friends discussing investments in the mining Erzgebirge region in the late 15th century. While one seems quite confident in investing his hard-earned money in the new sector, the other is skeptical and compares this stake in mining to gambling.[4]

It goes without saying that the beginning of mining occurred much earlier, sometime in the Stone Age, even though the exact dating is subject to speculation. An ochre mine called "Lion Cavern" in Swaziland, dated to 43,000 BCE, is regarded as the oldest mine worldwide.[5] Nazlet Khater 4, an ancient flint mine in Egypt, dated to 30,000 – 35,000 BCE, contained the skeleton of the first (un-)known miner.[6] Furthermore, mining has never been only a local business — European palaeolithic miners traded silex over distances up to 600 km.[7] Given that this is a rather common mineral, it is assumed that these kinds of trades enabled palaeolithic knowledge transfer, technological progress and social networking.[8]

Böhme believes that until the modern age, mining was accompanied by rituals that determined who had access to the ground and, therefore, limited exploitation.[9] The aforementioned sources from the early modern period, Agricola and Niavis, still document warnings not to violate the ground below the Earth's crust since it was thought to be purposely hidden from human sight and access. Furthermore, both texts preserve the early opposition to mining and describe all sorts of conflicts with other types of land-use.

Again, these concerns were not raised here for the first time. Plinius the elder in his *Natural history* elucidates technologies and

4 Paulus Niavis,"Iudicium Iovis Oder Das Gericht Der Götter Über Den Bergbau: Ein Literarisches Dokument Aus Der Frühzeit Des Deutschen Bergbaus", translated by Paul Krenkel. 3 (Berlin: Akademie-Verlag, 1953), 40.

5 Gerd Weisgerber, "Zur Entdeckung Der Farben Rot, Grün Und Blau", in *Historia Archaeologica*. Festschrift Für Heiko Steuer Zum 70. Geburtstag, 3-40 (Berlin/New York: de Gruyter, 2009), 12.

6 Helmut Wilsdorf, *Montanwesen: Eine Kulturgeschichte. Sammlung Kulturgeschichte* (Leipzig, 1987), 10. Pierre M. Vermeersch, Etienne Paulissen, and Gilbert Gijselings. "Jungpaläolithischer Hornsteinbergbau in Ägypten", *Der Anschnitt: Zeitschrift Für Montangeschichte*, 43, no. 2 (1991), 50–62. 54.

7 Zofia Sulgostowska, "Distribution of Flints during the Late Palaeolithic and Mesolithic in the Oder, Dnestr and Daugava Basins", in *Stone Age — Mining Age*, 469–74 (Bochum: Deutsches Bergbau-Museum, Institut für Montanarchäologie, 2006), 470.

8 Michael Baales, "Some Special Aspects of Final Palaeolithic Silex Economy in the Central Rhineland (Western Germany)", in *Stone Age — Mining Age*, 239–45, 244.

9 Böhme, "Unterwelten: Topographien Des 'Unüberschaubaren Seelischen Höhlensystems' ", 191.

impacts of Roman gold mining on the Spanish exclaves.[10] □ p.68 He criticises gold mining as an unnecessary business that causes vast environmental damage, leading him to the conclusion that the "miners gaze as conquerors upon the collapse of nature" (*spectant victores ruinam naturae*).[11] Even more so since Earth provides for all human needs above the ground, making the baleful "penetration of the inner parts" of the "bowls of Earth" obsolete.[12] The most prominent example of this metaphor can already be found in Ovid's *Metamorphoses*.[13] Iron in this case serves as an indicator to the last and devastating of the "Four Ages of Mankind", which had started with a golden, peaceful and delightful era. The prototype for this narration might be Hesiod with his *Work and Days*. Here again, according to the symbolism of metals, the social cohesion declines from the Golden to the Silver and Bronze Age, to culminate in the Iron Age in "sad misery".[14] Hesiod might have been one of the first "poet philosophers" who recognised the importance of mining for cultural-historical evolution.[15] Metals could, in this case, be regarded as "markers" of cultural epochs with increasing levels of decay.[16] It is assumed that the transition from the Bronze Age to the Iron Age was still remembered at that time and had an impact on the myths and world views of these societies.

The 20th century breathed new life into those ancient images about the end of the world — first and foremost through the appearance of the (heavy) metal uranium, a star *on the stage* of the Cold War and threatening a "doomsday" caused by atomic bombs or unintentional nuclear accidents. Several films are based on these narrations.[17] *Koyaanisqatsi*, meaning "life out of balance", could even be seen as a 20th-century version of the old legends. Based

10 Plinius, the Elder, *Natural History*, translated by Harris Rackham, Vol. 33. (London: W. Heinemann, 1938), paras 67–80.

11 Plinius, *Natural History*, 73.

12 Plinius, *Natural History*, 1–2.

13 Publius Ovidius Naso, *Ovid's Metamorphoses*, translated by Brookes More and Wilmon Brewer (Boston: The Cornhill Publishing Company, 1922), 125.

14 Hesiod, *Theogonie: Griechisch – Deutsch*, translated by Albert von Schirnding and Ernst Günther Schmidt. Sammlung Tusculum (Berlin: Akadamie-Verlag, 2012), 97.

15 Böhme, "Unterwelten: Topographien Des 'Unüberschaubaren Seelischen Höhlensystems'", 191.

16 Böhme, "Unterwelten: Topographien Des 'Unüberschaubaren Seelischen Höhlensystems'", 191.

17 Such as *Dr. Strangelove* (1964), *Stalker* (1979), *The Day After* (1983), *The China Syndrome* (1979) and a dozen versions of *Godzilla* since 1954.

on a Hopi prophecy,[18] uranium is directly addressed in the film.[19] While other metals were extracted with civilian purpose in early mining activities, uranium has been dug up for military purposes only, induced by WWII and the Cold War in the early Nuclear Age. Civilian use had to be developed subsequently, namely by the initiative "Atoms for Peace" (1954). Uranium mining is the basis of the whole nuclear fuel chain, followed by enrichment, power plants, nuclear weapons and nuclear waste. Even more covert are the cultural aspects of the nuclear industry. Environmental damage in uranium mining areas worldwide has been severe, and its land consumption is very high.[21] Once safely contained underground, uranium has now been laboriously extracted from the grounds, then concentrated and loaded in nuclear power plants that caused nuclear accidents, ignited in nuclear (test) bombs and is now, in its transformed state as radioactive caesium, strontium and plutonium, scattered around the globe, witness to a new geological age. The remains have to be contained for 10,000 up to 1,000,000 years in deep geological nuclear repositories — an impossible task, yet to be fulfilled. The doomsday clock remains "100 seconds before midnight".[22]

Mining as a societal phenomenon stands symptomatically and principally for the behaviour towards our fellow human beings and the environment. Conceptual metaphors matter in the reflection on the topic and should be revised. The apocalyptic version is a potent narrative that eclipses other perspectives. After 3,000 years of interpretations of mining as either glorious or doomed, it might be appropriate to develop a more complex narrative that analyses

18 Translated Hopi Prophecies presented in the beginning of the film read: "If we dig precious things from the land, we will invite disaster. Near the Day of Purification, there will be cobwebs spun back and forth in the sky. A container of ashes might one day be thrown from the sky, which could burn the land and boil the oceans".

19 Jorn K. Bramann, "Koyaanisqatsi", in *Educating Rita and Other Philosophical Movies* (Cumberland: Nightsun Books, 2009). Around 20:00 min images of uranium mining in the Navajo-Reservation occur, followed by an atomic explosion in New Mexico and people on the beach in front of San Onofre nuclear power plant.

20 Roland Posner. "Mitteilungen an die ferne Zukunft. Hintergrund, Anlaß, Problemstellung und Resultate einer Umfrage", *Zeitschrift für Semiotik 6*, no. 3 (1984): 195–227. Roland Posner suggested a classification into a prenuclear, early nuclear and high nuclear period (after 1945) Posner, "Und in alle Ewigkeit ..., Kommunikation über 10,000 Jahre", 219.

21 Achim Brunnengräber, "Ewigkeitslasten: Die 'Endlagerung' Radioaktiver Abfälle Als Soziales, Politisches Und Wissenschaftliches Projekt – Eine Einführung" (Baden-Baden: Nomos, 2015). The concentration in uranium ore is typically low — in order to produce 33 t of nuclear fuel, 400,000 t of uranium ore have to be extracted, 29.

22 Bulletin of the Atomic Scientists: https://thebulletin.org/doomsday-clock/current-time

options and resources rather than simply predicting the end of the world and either decides to just comfortably resign to it or dump the unwanted dark residues in someone else's territory. Othering and externalising mining is an easy escape — there has been harsh criticism for 3,000 years, yet the human crisis has not been solved. Rather it has become an environmental crisis. What we can learn from the ancient texts is not only the ability to see the immediate impact of mining, but also than an anthropological point of view is necessary so as not to reduce the question to purely technical and scientific approaches, but rather to consider the societal and symbolic impact of mining products. Especially the increased power, mainly through mining products in industrialised nations, calls for more awareness, respect and care towards other humans, other species and the abiotic matrix[23] to deploy human- and non-human rights and perform the "conceptual reconcilitation between nature and culture" anthropologist Veronica Strang suggests.[24] Art alone may not be a saviour since the solution is a societal issue, but I believe that it can contribute to exploring complex relations, enabling comprehensive experiences, dealing with paradoxical situations and producing knowledge beyond stereotypes. Part of my artistic research involved observing a dozen landscapes in (randomly selected) sites in the Post-(Soviet-)uranium-mining landscape in East Germany. I created a radio play that consisted of hours of recording in this historical landscape, combined with findings from participatory observation recorded in research journals, semi-structured interviews and field recordings over many years. This is obviously not the solution for the apocalypse. But hey, either we have already been living in it for three millennia, or it is just a narrative in dire need of an update.[25] ◉

23 The German language knows not only the term "biotope" (habitat), but also the equivalent term "geotope", related to geoheritage and geosite.

24 Veronica Strang, "Conceptual Relations: Water, Ideologies, and Theoretcial Subversions". In *Thinking with Water*, ed Cecilia Chen, Janine MacLeod, and Astrida Neimanis (Montreal & Kingston: McGill-Queen's University Press, 2013), 185-211

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