VITALIST MATERIALISM - MINING LIFE

Intro

Vitalist Materialism - Mining Life is a concept that updates the humanistic bases of Marxism and the philosophy of Hegel, dialectics and Eurocentric discourse. What the concept of **Vitalist Materialism**, taken from Rose Braidotti, raises, is a re-enactment of Marxist aesthetics in a context of technological studies. The research aims to create a critical basis for the practical development on the expository level to reformulate the role of contemporary art and the current museum. Based on art and technology relations, the proposal goes beyond pure digital art, based on innovation and scientific evolutionary progress, and here the artistic-technological practice is put in the relational context of the posthuman, presenting the **Vitalist Materialism** as a critical aesthetic and new geopolitics of media art.

Vitalist Materialism. Philosophical references

Vitalist Materialism emerged during the nineteenth century when vitalist theories of *life* were contrasted with mechanistic and materialist hypotheses regarding the nature of *life*. According to philosophers and biologists, **Materialism** understood *life* as inherent to organisms and a mechanical function that could be scientifically explained. **Vitalism** formed a cohesive view of the world as one living organism in which the property of *life* was present in all living things, but not inherent.

After repudiating atomism, **Margaret Cavendish** described a new theory of matter, **Vitalist Materialism**, according to which there are three "degrees" of matter: two self-moving and one inanimate. The varying inherent motions of matter give rise to particular creatures and phenomena. **Cavendish**'s development of **Vitalist Materialism** over time, between her first version (1653) and her last (1668) differed in the claim that parts of nature have free will, which was only transversally mentioned in her early presentations but became explicit in her later works. Similarly, **Cavendish**'s theory of occasional causation was not fully worked out until her last texts.

So **Vitalist Materialism** theories study degrees of matter, motion, free will, and occasional causation. According to these, **Vitalist Materialism** investigates the problems of incorporeal substance and magnetism. For example, while romantic scientists believed that galvanism and in the case of vitalists, magnetism, were the forces behind *life*, practitioners of alchemy sought power over nature through their experiments and how to transmute metals into gold. It is the case of **Cornelius Agrippa**, an early modern alchemist and advocate of high magic who described "the soul of the world", later appropriated by romantics and used as the *geist*, the world-organism and the force behind *life*. In this sense, alchemy held an essential place at the beginning of science, and the scientist became the new magician.

More recently, studies of **Vitalist Materialism** by **Jane Bennet** use art and politics to analyse **Spinoza**'s concept of vitality in human and non-human. To this definition, **Jane Bennet** adheres **Althusser**'s aleatory materialism and **Latour**'s description of objects as expressive actants and the concept of agency in Action Network Theory. **Jane Bennet** also takes **Heidegger**'s incalculability of the thing; **Foucault**'s productive power and works with the concept of extreme perception, original in **Bergson** as a subtractive perception process. **Jane Bennet** also develops categories of **Ian Hacking**'s philosophy of science according to transcendental nominalism (also dynamic nominalism or dialectical realism). Nowadays, **Jane Bennett** is one of the new materialisms' leading thinkers, who argues that non-human (and particularly non-biological) matter is imbued with a liveliness that can exhibit distributed agency by forming assemblages of human and non-human actors. **Bennett**'s *Vibrant Matter* argues that agency is only distributed and is never the effect of intentionality.

Bennett's "*thing-power*" exemplifies the ability of objects to manifest a lively kind of agency. She explains, "*Thing-power gestures toward the strange ability of ordinary, man-made items to exceed their status as objects and to manifest traces of independence of aliveness, constituting the outside of our own experience*". ***Vibrant Matter*** also brings to the foreground an extent but more latent history of vibrant or lively matter in Western philosophy. **Bennett** builds on the ideas of early twentieth-century critical vitalists, as well as the ideas of **Deleuze** and **Guattari**, to bring together materiality, affect, and vitalism.

Recently, **Pamela Richardson-Ngwenya** studies of sensitivity and awareness of the interactions and miscommunications involved between different vital agencies, brought her to express the possibility of a way of communicating through more-than-human materialities. Her vitalist geographical imagination is receptive and open to the liveliness of materialities and the significance of relational becomings. According to **Pamela Richardson-Ngwenya**, the perspective of **Vitalist Materialism** is aligned with geographical studies, opening the references to use a comparison between human actors and geographical entities, also reformulating the geopolitics in a more inclusive media art discourse.

Another author who questions principles of vitalism is **Alexander Wilson**, who argues about how can the matter be the principle of the non-thinking? Moreover, how subjectivity answers to this relation? Indeed, he asks about how the new materialism's goal come to terms with the non-living origin of life? In this sense, he puts on the question on how to recognise how *dead materials* are always in some sense incipiently alive? This position as vitalist is also known as a panpsychist neomaterialism, which emerges from the recently developed theory of consciousness as integrated information in Tononi. Contrary, **Alexander Pope** positions himself in relation to competing mechanist and vitalist philosophies, disavowing the capacity of matter to "move", "to express" or "to possess agency".

This consideration of *dead materials* in the chain of *Life's* production is connected to media archaeology. It is also interesting for this research as a deconstruction of physical industrial processes in the assembly of technology, where reverse engineering is used as a methodology towards understanding materialism, within an analyst perspective which compiles an extensive philosophical explanation in the relationship between *Life*, minerals, biology, nature and technology. Following considerations of **Vitalist Materialism** about *dead materials,* discussion of minerals, mineralogy and "*mineralism*" (as a proposal here to amplify materialism related only to mineral resource extraction) bring to light how the earth is considered a resource in the age of Anthropocene, a standing reserve for extraction policies. For example, the geoscientific data collected by Geoscience Australia's Exploring for the Future program uses the world's largest airborne electromagnetic survey to reveal more mineral potential detecting gold, copper, nickel, lead, zinc, manganese, cobalt, platinum-group and rare-earth elements. The Airborne Electromagnetic data collected through mapping mineral and groundwater resources techniques uses transmitters and receivers as well as aircraft sensors to collect data several hundred meters below ground. In relation to this, some properties of the *dead materials* detected by electromagnetism experiments propose a transversal understanding of matter, behaviour and communication.

Vitalist Materialism also includes the notion of a "force of things" when "vitality of matter" is insufficient to explain the relationality of matter. Moreover, and allying with posthumanism studies, **Vitalist Materialism** proposes new ethical responsibilities and sensibilities which displace politics. This neo-vitalist approach is set to the understanding of nature and the human subject challenging the limited engagement with the historiography of scientific metaphors and allying with the wider

ethical and political tensions engendered by a contemporary recourse of vitalist ontologies. This posthumanist conception of matter as a lively agency also produces a reengagement with both the material realities of everyday life and broadens towards the geopolitical and socioeconomic structures. In so, economic, environmental, geopolitical, and technological are under the perspective of a **Vitalist Materialism** towards the ethics of *Life* in a more holistic, non-mechanical approach of the life sciences, such it happens in organicism and posthumanism. **Vitalist Materialism** is also relative to the Cartesian expression of the "*man as the measure of all things*", and implements according to the concept of agential realism in **Karen Barad**.

Another position in **Vitalist Materialism** is represented by **Rosi Braidotti**, who revises ideas from post-structuralist theory. Rather than **Giorgio Agamben**'s bare life (*Zoe*), her re-reading of **Spinoza** and **Deleuze** and **Guattari** leads her to formulate a *Zoe* that is the potentiality of all matter to form transversal connections or networks with all other matter. In ***Homo Sacer*** (1995), **Agamben** argues that the Western biopolitical distinction between political and non-political life (what he calls *bios* and *Zoe*, respectively) can be traced to antiquity. It is the connection of sovereign power to biopower that distinguishes for **Agamben** a crucial cut between beings with no legal status, humans included, and beings with the privilege of legal rights. So, **Braidotti** revises critical vitalism and biopolitics alike to argue that posthuman subjectivity is a *Zoe* with an immanent potential for self-assembly along transversals, or the tendency of all living matter to form associations with other material systems. Posthuman subjectivity, therefore, raises important ethical questions, since it is neither bound to the individual subject nor singularly human. Moreover, this research takes the critical point of view against biogenetic capitalism, which transforms *Life* into an economic resource to control under data gathering policies.

So, **Mining Life** (second part of this proposal **Vitalist Materialism - Mining Life**) expresses concern about techno-surveillance capitalism and abuse of power of hyper-structures such as industrial-scale operation data centres consuming huge amount of electricity, and server farms consisting of thousands of computers which require a large amount of power to run and to keep cool. Furthermore, in cryptocurrency networks, mining is a validation of transactions. Cryptocurrencies operate according to a public database which is known as a blockchain. The process of recording and verifying these transactions is known as mining. Cryptomining has grown exponentially in the last few years, but cryptomining energy consumption has made it too. For example, Bitcoin's energy usage is vast that it cannot be ignored, and, in general, cryptocurrency uses as much CO_2 a year as 1m transatlantic flights. It should be taken seriously as a climate threat. In other words, cryptocurrency mining surpasses energy consumption of entire countries, and so, it urges to spread awareness about the potential environmental costs for mining cryptocurrencies.

Vitalist Materialism. A curatorial Proposal

Entering an age of mass extinction brought on by excesses of industrial production and consumption, technological exploitation and obsolescence become transformative situations of the human social system. Economically and ecologically, these processes face disruption from one hand, but disaster on the other. If planned obsolescence makes new devices to appear in the market, the same disruptive economy implies a massive environmental catastrophe, which involves transforming the landscape into a landfill, as technology and innovation are directly connected to resources exploitation.

However, DIY artists, hackers, makers, and critical agents reflect on the technology's role in reshaping the world's economic and ecologic horizons. Ecology and personal and social relationships become an integral force and a critical proposal to promote alternatives to the techno-capitalist

industrial society, following **Guattari**'s *Three Ecologies*. Therefore, art is considered an alternative model, with the transformation of the industrial process, which is also happening in individual entrepreneurs. However, in this same context of late-capitalism (tardo-capitalism logic, or techno-capitalism), any alternative practice is also subsumed in the economic system, as **Lazzarato** expresses through concepts of precariousness, intellectual work, immaterial labour, and new subjectivities which are totally under the influence of cybernetics and computer control. There is almost no anti-capitalist approach because this requires the structural organisation of political and economic systems founded on networks, servers and other technological deployments. Technology has been created under a scrupulous dependence on scientific objectifying of hyper-structures (technoscientific laboratories, for instance), which result extremely hard to disbelieve, doubt, dissent, leaving the confronters impressed, without power and resources to contest and dispute their authority, as **Bruno Latour** refers in his parabola of counter-laboratories and science-in-the-making. Also, in **Jonathan Kemp**'s words, thus makes alternatives subsumed to capital. But, there is still an *in potentia* within capital for cultivating rival forms of production based around what is called "commons-based peer production" (or "social production"), based in hacking and open source methodologies, but their arguments consistently fail to surmount the structural similarities with late capitalism. The labour invested in producing free software is given publicly. Then, as the efforts and end-products of cooperation and collaborative production can be readily appropriated and framed by capital, and it is again an expression of a new form of labour rather than a rival to capital itself, so any rival form ultimately operates in a manner subsumed under capital's organisational form. Although subsuming processes in tardo-capitalism, individuals are using their newly expanded practical freedom to act and cooperate with others in ways that improve the practiced experience of democracy, justice and development of a critical culture and community, where collaboration and self-organization are shared across both business and free software / open hardware, as declared by **Yochai Benkler**. In this regards, the collaborative practices at the intersection between art, science and technology and making use of hacking and DIY methodologies are set to criticise the phenomena of planned obsolescence produced by ICT companies and the dynamics of desire towards technological devices by consumers.

Vitalist Materialism – Mining Life is contextualised along theories and aesthetics that follow recent discussions concerning cultural politics of the environment, ecological contexts of contemporary media, and debates concerning the Anthropocene. Following **Nathan Ensmenger**'s *An Environmental History of Computing*, the research considers new ways to understand how computing intersects with the environment, from the mining of minerals essential to the construction of digital devices to the massive amounts of water and energy used to generate virtual commodities to the pollution associated with the production and disposal of electronics.

Primary focus and interests of this research rely on ecological transition, geopolitics, the posthuman, the human-nature dichotomy, biodiversity, cultural diversity, self-sufficiency, race and gender and intersections between ecology, feminism, and practices that challenge ways of engaging the world of humans and non-humans. Likewise, the discourse is similar to curatorial projects developed in the framework of the Anthropocene theory about how technology is affecting the environment. This theoretical reference is core in the research which is continually searching for conclusions within the relations in between technology and nature. Moreover, the interest in mineral materials fit with the theory of media archaeology by **Jussy Parikka**, **Benjamin Gaulon**'s project *Recyclism*, as well as the collaborative practices at the intersection between hacking and the DIY production. Other titles interesting for the research are the concept of Anthropocene in **Timothy Morton**, **James Bridle** and *New Dark Age*, *On The Future* by **Martin Rees**, and **Rose Braidotti** with *The Posthuman*.

Vitalist Materialism - Mining Life analyses the exploitation of natural resources, and interested in the Anthropocene, denounces the necropolitics from the first world to the ex-colonies. Knowing that all ICT need minerals to be created, it is evident the dependence of any piece of hardware computing on this source of natural wealth that are minerals. Currently, computers need rare minerals and minerals. An investigation around the production channels of these technologies reveals that most of the minerals come from ex-colony countries that have been mistreated by colonialist policies. The Congo is currently suffering from post-national politics based on imperialist capitalism that is intensely technological and resulting from these policies are child exploitation, the emergence of guerrillas who control these mines, displacement of people, with consequent famine and unhygienic living conditions. In Congo, the red mines are not regulated by the government of the Congo. Contrary, the green mines are those that are subjected to government controls and issue certificates of authentication to the EU and US corporations. Curiously, most minerals arriving in the first world have not issued a certificate.

This reveals an interest in mineral materials which answers questions about media archaeology theory developed by **Jussy Parikka**. This dependence of the computational with the minerals transforms the geographical condition into a geological dimension. The interest of the materials lies in the so-called materialisation of the media, where geophysical elements express the scarcity of resources, the technological regimes, the geopolitics of labour, the planetary excavations, and the aftereffects of electronic waste. Moreover, media archaeology proposes a new understanding of linear history, ensuring that the category of *deep time* is affecting media archaeology devices. According to it, the materiality of progress is not linear as rationalism proposes, but a link between geological eras, understanding how most of the minerals and geological resources are the result of long-time processes.

Vitalist Materialism - Mining Life offers a critical position with the planned obsolescence in a techno-capitalist system and its unsustainable model of innovation. Allying with **Technological Sovereignty** and the **Degrowth Movement**, the research proposes an ethics of autonomy in regards to the tardo-capitalism logic. According to **Technological Sovereignty** which reminds of the contribution that each of us makes to the development of technologies, the movement proposes to rescue radical imaginaries, recovering history and collective memories, re-situating the selves to be able to dream and wish together the construction here and now of own infrastructures, including information, communication and expression. It is necessary to perceive the **Technological Sovereignty** in a much more extended context than computer technology. To ignore the set of environmental, political, economic and social crises that are imbricated in each other, or to resolve them in isolation or in conjunction with technology alone are equally aberrant options. It is already more than clear that **Technological Sovereignty** in itself will not change our inexorable course. Autonomous servers, decentralised networks, encryption, peer-to-peer, alternative virtual currencies, the sharing of knowledge, meeting places and cooperative work, constitute a wide range of initiatives already underway towards **Technological Sovereignty**.

So, if the **Technological Sovereignty** movement proposes an ethical model for the ICT infraestructures' use, the materialist part of the project is defended with the alliance to the **Degrowth Movement.** It proposes an autonomous perspective towards capitalism and the globalised world, through artivism, care revolution and climate justice based in the environmental movement and radical ecology democracy, proposing practices of food sovereignty which serves as a model for **Technological Sovereignty**. In addition, degrowth practices apply the principles of free software movement and policies of the commons, towards a solidarity economy and the unconditional basic income.

Vitalist Materialism. Artists' proposals.

Many are the current environmental issues, and some of them are directly linked to the overproduction of electronic and technological devices. Recent technological developments have undoubtedly produced an excessive amount of electronic waste (e-waste), due to the planned material obsolescence in the information technology industry. Moreover, it generates an exponential growth of e-waste with related implications in terms of management of discarded materials, recycling resources and impact on the environment as well as human health. Electronic and plastic materials of different nature and origin have been the object of artistic practices since at least fifteen years. The idea of considering electronic waste not as an obsolescent and worthless material, but rather as a potential creative element is being discussed in the contemporary artistic debate. There are many expressive possibilities offered by the creative practices of recycling and its possible applications in different productive fields, the art of course, but also product and fashion design, architecture, object-data integration practices in the Internet of Things, and augmented realities.

So, how do artists and curators work and address all these matters? How creative practices denounce the exploitation of natural resources?

Counting with the works of artists and collaborators, among other participants, this research appoints to different artists and collaborators to develop environmental and sustainable media art practices related to mining, DIY and hacking OS / OH.

For example, **Tin Dozic**, *Goldrush* focuses on the presence of gold in the personal computer and suggests an alchemical activity – the extraction of this valuable metal from electronic waste that was once also a status symbol. Computer parts are dissolved, and the gold is purified by Aqua Regia, resembling an alchemist's process as old as the 8th century.

BJ Nilsen, *UGOL* is part of a more massive project called *ORE*, an art project revolving around mining and its impact on society and cultural relevance. *UGOL* touches upon the logistical side of coal, in this case where the coal is travelling by train from the Kuznetsk basin in southwestern Siberia via Murmansk and from there reloaded and shipped out internationally.

Alejandra Pérez Núñez, *Antarctica 1961-1996* is a sound installation initially commissioned by the Museum of Contemporary Art in Rome (MACRO) for the exhibition "Otros Sonidos, Otros Paisajes". The work aims to contribute to the displacement of dominant forms of human 'truth' in which the imperceptibility of the non-human is remaindered as inaccessible and insignificant. Moreover, the artist creates a map as a tool to point out where the mineral resources in Antarctica are located. Due to factors of extreme climate change, the scientific explorations towards the South Pole area are becoming more interested in the emergence of rocky mountains, which will be used shortly as extraction sites for the benefit of post-technological capitalism.

This is Congo, a film by photographer and director **Daniel McCabe**, delves into the illegal mineral trade and cyclical violence marring the Democratic Republic of Congo. The film begins in 2012, as a rebellion mounts in the North Kivu region and closely follows the rise, tumult and fall of the conflict and its direct effects on the nation and its inhabitant over a three-year journey.

Tatjana Gorbachewskaja & **Katya Larina**, *Nikel Materiality* explores the mining town of Nikel through the prism of the unique material substances that it has created. The story of Nikel is that of a place that transformed the natural environment, seemingly no longer dependent on its geographical, geological or atmospheric attachments to the Earth. The materiality of the artificial

organism of the city started to interact directly with the natural conditions of the unique Arctic climate and ecosystem, forcing Nikel's artificial materiality to adapt to survive.

Dani Ploeger, *Hi-Tech Wound* (2015), which results from a collaboration with a group of scientists and cultural theorists with whom the artist participated in an e-waste recycling labour on a dump-site in Lagos, Nigeria. Afterwards, a wound occurred on his arm. It got infected: electronic waste performed on the artist body.

Mother Disorder, *Performance / Concert Crystalline* is a response to societal pressures to be functional and the process of therapy for mental disorders. Incorporating contact microphones into the flesh at points of previous self-harm, **Mother Disorder** generates music via a loop. The crystal being awakens, silenced. Shard and flesh indistinguishable, they find their body alien and uninhabitable. Quartz pieces seemingly too familiar lie in front of them. Desperate for understanding and spurred by their surrounding onlookers, the crystal being violently shed. Clear Quartz has been used since ancient times, as it was believed to be a source of power and energy. While this is believed on an intuitive level, modern measuring equipment has proved this to be correct. Clear Quartz Crystal clusters are powerful amplifiers of energy and are often used in healing rooms by alchemical healing practitioners.

Catherine Hyland, the author of *Lithium Mining | Atacama Desert*, travelled to the salt flats of the Atacama Desert in Chile to photograph the environmentally contentious production of lithium—the metal used to power everything from smartphones to Teslas. Chile is the only country in the world where water resources and management are entirely privatised, and SQM, the lithium company, photographed by **Hyland** in her series, currently owns the water rights for the region. Companies like SQM are increasingly at the centre of environmental debates around water, accused of exploiting the natural resource in regions that in drought or prone to water scarcity. To create lithium, they are drying out rivers, streams and wetlands.

More abstractly, **Paul Prudence** investigates about shapes and forms in mineralogy which influence the rendering of computer graphics. **Paul Prudence** is an audiovisual performer working with generative video and abstract soundscapes. In the essay *The Algorithmic Writing of Stones: A Cybernetics of Geology*, Prudence takes Roger Caillois' *The Writing of Stones* (1970) as a trigger for lithic scrying in the age of cybernetics and algorithms.

Waad AlBawardi's video *The Hidden Life of Crystals* presents crystallisation as the process of transition of a substance from a liquid state with a disordered molecular arrangement to a solid crystal state with an organised internal structure. Crystallisation is a widely occurring natural phenomenon, with crystal formations found from snowflakes to minerals. Crystal growth of chemical compounds can be observed on a microscopic scale with the aid of polarised light, which through its interaction with the birefringent crystalline material, uncovers a surreal landscape of beautifully intricate molecular assemblies, exposing patterns reminiscent of plant growth and large geological formations. The resulting colours highlight the microscopic patterns formed by crystal growth and inform about the organisation of crystals.

Matterlurgy, *Radiophony 29* is a site-specific performance that was presented on an abandoned copper mine, *Klovakärrin kaivos* in Finland. The work combines performance, radio broadcast, installation and sound to foreground the social, political and material genealogies of copper and the radio. This iteration was 30 minutes in duration and pivoted around different areas of the mine. The performance included sonification of rocks, digital text, copper objects, spoken word, sounds from the environment and live broadcast.

The Otolith Group, *Anathema* (2011) is a contemporary Fantasia on the notion of the network and its inherent instability, where the organic networks of human relations and the crystalline lattices of silicon-based technologies intertwine and often tangle. *Anathema* re-imagines the microscopic behaviour of liquid crystals undergoing turbulence as a sentient entity that possesses the fingertips and the eyes enthralled by the LCD touch-screens of communicative capitalism. *Anathema* can be understood as an object-oriented video that isolates and recombines the magical gestures of dream factory capitalism.

Semiconductor, *Crystallised* is a series of digital mineral crystal animations generated and animated by sound recordings of ice crystals. Each structure takes on a different form, growing and evolving in exquisite detail. Mineral crystals reveal atomic structures in their rawest form and provide a window into the make-up of the physical world, where simple shapes come together to create intricate and complex formations. With this series of works, **Semiconductor** draws a parallel between these basic molecular structures and the building blocks of the digital world, which has become the prism through which we increasingly experience reality. The animations suggest pre-ordained patterns and order that appear to underlie everything and lead us to question our experiences of the very fabric of our world.

Revital Cohen & Tuur Van Balen, *H / AlCuTaAu* (2014) presents precious metals and stones which were mined out of technological objects and transformed back into mineral form. The artificial ore was constructed out of gold (Au), copper (Cu), tantalum (Ta), aluminium (Al) and whetstone; all taken from tools, machinery and computers that were sourced from a recently bankrupt factory.

Greg Orrom Swan, *A Measure of Minerality* (2018). Phosphorus is essential for life as we know it: It is used for energy transfer in animals and plants, it makes up the mineral in our bones, it is found in high concentrations in rock that is processed into agricultural fertiliser. Humans share the same elements as rock and fertiliser. Recognising this kinship between humans and nonhumans, in this cave-like installation a combination of atomised particles of phosphate rock, fertiliser, and mammal bone mineral rotate and flow past one another perpetually. Patterns form and reform, moulding, a reference to the cycles we are part of, woven with and about.

Zach Blas, *Contra-Internet* (2014–2018). Consisting of a queer science fiction film installation that includes live action and CGI, blown glass sculptures, and a single edition publication, *Contra-Internet* confronts the transformation of the internet into an instrument for state oppression and accelerated capitalism. Invoking a practice of utopian plagiarism, *Contra-Internet* appropriates queer and feminist methods to speculate on internet futures and network alternatives. Jubilee 2033 follows author Ayn Rand (Susanne Sachsse) and members of her Collective, including economist Alan Greenspan, on an acid trip in 1955. Guided by an artificial intelligence named Azuma, they are transported to a dystopian future Silicon Valley. As Apple, Facebook, and Google campuses burn, Azuma, reveals that Ayn has become a celebrity philosopher to tech executives, as her writings foster their entrepreneurial spirit. Amidst the wreckage, Rand and The Collective are introduced to the internet, observe techies being captured by anti-campus groupies, and bear witness to the death of Silicon Valley elite. Once inside an occupied office of Palantir Technologies, the group encounters Nootropix (Cassils), a contra-sexual, contra internet prophet, who lectures on the end of the internet as we know it. Seeking respite, Rand and The Collective find themselves at Silicon Beach, where chunks of polycrystalline silicon mix with sand and ocean.

Emma Charles *White Mountain* (2016). In the age of data, **Emma Charles'** *White Mountain* explores the vast interlocking structures of planetary computation and the material infrastructures that permeate the depths of the Earth's geology. *White Mountain* focuses on the Pionen Data Center in

Stockholm - a former Cold War-era civil defence bunker redesigned by architect Alber France-Lanord. Located 30 meters under the granite rocks of Stockholm, the hydrogen bomb proof subterranean hub has been constructed with direct references to science fiction films such as Silent Running, and the classic Ken Adams designed Bond-villain lairs. *White Mountain* explores the protected architecture of data and the value we place on digital information.

The **Crystal World Open Laboratory,** at CTM - Kunstraum Kreuzberg/Bethanien (2012), during Transmediale, presented Martin Howse, Jonathan Kemp and Ryan Jordan experiments, with **Ralf Baecker** showing his installation, **Irrational Computing**. During the Lab, participants and team undertake the recovery of rare and precious metals from a variety of electronic junk. In a further room, **Baecker**'s irrational computers consisted of five interlinked modules that use the different electrical and mechanical particularities and characteristics of crystals and minerals and, through their networking, form a kind of primitive macroscopic signal processor.

Moreover, research appoints diverse curatorial practices such as the exhibition *Life Itself* at **Moderna Musset**, Stockholm, 2016, and the publication edited on the same occasion. *Life Itself* answers to the question about life itself, which has remained a mystery since the days of Aristotle, despite countless attempts by scientists and philosophers to come up with a definition. Despite contemporary advanced theories about complex systems and the vertiginous potential of synthetic biology, we are still unable to determine what constitutes life. An attempt to address the question using an art exhibition, therefore, seems justified, if only to demonstrate ways of dealing with our incapability to find a satisfactory answer.

Another contemporary attempt to exhibit practices related to **Vitalist Materialism – Mining Life** is the curatorial project *The Metallurgical Ouroboros* (2018), with Stephen Cornford, Caroline Jane Harris, Samantha Lee, Victor Seaward and Rustan Söderling. The exhibition purpose is to show the processes of production and consumption in technology's materiality as a bio/geological nature. The nature of transmutation sees the technological artefact becoming the philosopher's stone – the archetypal symbol of alchemy – turning base metals and minerals into a new gold. This technological alchemy, or technomancy, drives modern consumerism and weaves the Earth's materiality with production, with 80% of the energy used in a computer's lifespan is during the production phase. Microprocessors can also contain over 60 chemicals and minerals, which is only one component of 100s in devices such as mobile phones or computers. These are purely geological entities that stretch over timescales represented by both the future and the past while in the present. This process has created a (un)natural Ouroboros created by entangled copper network cables, a modern day life cycle to be melted down in the cultural foundry.

Bibliography

Benkler, Yochai. 2006. The Wealth of Networks. Yale University Press. New Haven.

Bennet, Jane. 2010. Vibrant Matter: A Political Ecology of Things. Duke.

Boyle, Deborah. 2018. The Well-Ordered Universe: The Philosophy of Margaret Cavendish. Oxford University Press.

Braidotti, Rose. 2013. The Posthuman. Polity Press. Cambridge, UK.

Bridle, James. 2018. New Dark Age. Technology and the End of the Future. Verso. London, UK.

Ensmenger, Nathan. 2016. Dirty Bits. An Environmental History Of Computing School Of Informatics And Computing Indiana University.

Guattari, Felix. 2014. The three ecologies. London: Bloomsbury Academic.

Hache, Alex. 2014. Soberania Tecnologica. Dossier Ritimo. CC Creative Commons.

Kemp, Jonathan. 2013. The Crystal World: Executing a New Media Materialism. PhD Dissertation: University of Westminster.

Latour, Bruno. 1987. Science in Action. How to follow scientist and engineers through society. Harvard University Press. Cambridge, Massachusetts.

Parikka, Jussy. 2015. A Geology of Media. University of Minnesota Press. Minneapolis. London.

Parikka, Jussi. 2012. What is Media Archaeology? Polity Press. Cambridge, UK.

Rees, Martin. 2018. On The Future. Prospects for Humanity. Princeton University Press.

Richardson-Ngwenya, Pamela. 2013. Performing a more-than-human material imagination during fieldwork: muddy boots, diarizing and putting vitalism on video. Volume: 21 issue: 2. Cultural Geographies. SAGE Publications.

Wilkins, Emma. 2016. 'Exploding' immaterial substances: Margaret Cavendish's vitalist-materialist critique of spirits. British Journal for the History of Philosophy, 24:5, 858-877, DOI: 10.1080/09608788.2016.1210567

Wilson, Alexander. 2018. Beyond the Neomaterialist Divide: Negotiating Between Eliminative and Vital Materialism with Integrated Information Theory. Volume: 35 issue: 7-8. TCSA Theory, Culture & Society. SAGE Publications.