The Energy-Image

Towards a Revised Conception of the Image

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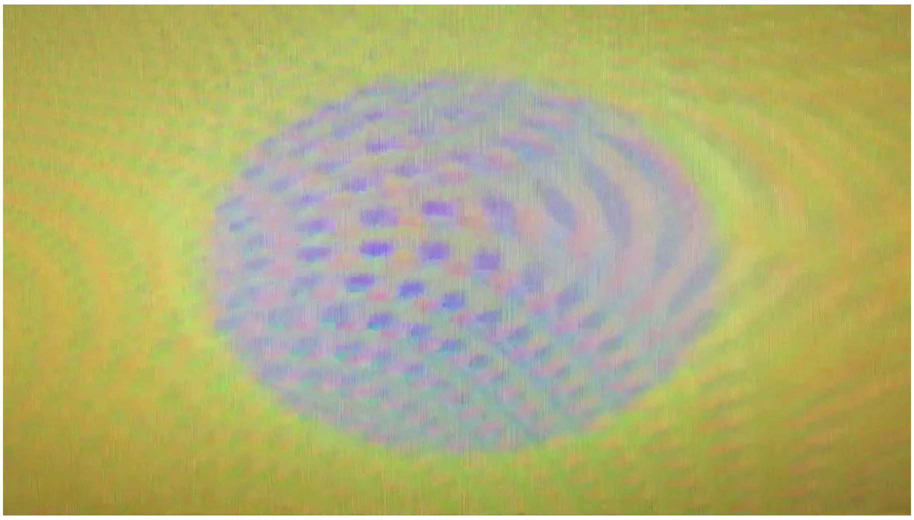
Abstract

The properties of the image in contemporary communication circuits are increasingly linked to a very specific material context, from the fossil fuels on which it depends, the fibreoptic cables and data centres through which it travels, to the devices that produce and reproduce it. Through the term "energy-image", I appeal to the finiteness of that which, despite being intangible, has a very precise environmental impact, in order to critically understand the complexities that surround the visual today. This image is increasingly accelerated, and it has broken with the linearity of its production to be recombined again and again into electricity, heat, light - but never detached from its ideological, colonial and capitalist heritage.

Keywords

colonialism; ecology; energy; fossil capitalism; image; infrastructure; photography.



Umbrico, P. (2014). *Sun/Screen* [Single-channel digital video]. Retrieved 30th August 2020: http://www.penelopeumbrico.net/index.php/project/sun-screen/

The world is changing, inevitably and critically, and so the way we understand, think and study must also urgently change. The perilous climate context that we inhabit undermines, directly, the modern way of looking at the world, a way which itself is obsolete and in need of revision. Photography, in particular - and its contemporary transformation into the image - is a discipline that is not being sufficiently analysed under an ecocritical lens. Some authors have pointed to new ways of categorising the image today, but very few take into account its relationship with the natural environment. Joan Fontcuberta talks about "post-photography" as a radical transformation of the image after the Internet, i.e. photography that questions the traditional conception of authorship and is characterised by its own uncontrolled proliferation, through rapid and ever-changing flows (Fontcuberta, 2017). Hito Steyerl goes a step further by asserting that the Internet's object par excellence is the "poor image", an image that shifts the focus of the portrayed object to become itself an object. An object marked by its drifts, by the compressions and decompressions to which it has been subjected (Steyerl, 2012). Trevor Paglen considers not only the image but also the devices, proposing the idea of "seeing machines". Many devices today include some type of camera, infrared sensor, code reader, etc., being able to produce images and expand their field of action (Paglen, 2014).

Bearing in mind all these reflections, and adding the ecological slant that was missing, I propose the concept of the "energy-image" as a new way of conceiving the image and its implications in the natural context. The Internet's digital image can no longer be considered as an incorporeal element, one which has no concrete material consequences on the environment. Thus, "energy-image" refers directly to the electricity that charges our mobile phones, to the excessive heat produced by data centres and to the light that runs through the fibreoptic cables under the ocean.

LIGHT

The desire to conquer darkness and impose light was already present in the post-Renaissance project of the Enlightenment. As a response to Catholic obscurantism and monarchical hermeticism, scientific knowledge sought to serve as an illuminating beacon. Both the human and natural fields are presented, under this perspective, as potentially classifiable and conquerable by scientific reductionism. As such, the light metaphor is rendered literal, as seen in technological innovations such as electric lighting or the camera, the paradigmatic tool of the modern.

> Photographs are the results of a diminution of solar energy, and the camera is an entropic machine for recording gradual loss of light. No matter how dazzling the sun, there is always something to hide it, therefore to cause it to be desired. (Smithson, 1996, p. 373)

Sticking with the scientific approach, a direct relationship can be established between solar energy and the camera itself, with all its entropic traits, as noted by Robert Smithson. Photography has been subject to different forms of energy since its invention, and this reliance is today more critical than ever. In order to understand what an image implies nowadays, we must thus acknowledge the interdependencies that are generated between said image and fossil fuels. Georgiana Banita, in the glossary of terms *Fueling Culture: 101 Words for Energy and Environment*, proposes the concept "energy-photography". She defines this as the photographic practice that represents motifs from the fossil economy, such as oil wells and coal mines, and so it manages to close a circle between the seized landscape, the camera's use of solar energy, and the photosensitive film's oil-derived composition (Banita, Photography, 2017, p. 263). But here I wonder whether the mere representation of landscapes marked by extractivism can justify ascribing these critical qualities to photography today, bearing in mind that the infrastructure of energy capitalism extends far beyond the sources of fossil exploitation, and also that photosensitive film is no longer the main photographic medium. By updating the term to "energy-image", I am not seeking to describe a specific practice, but rather to revise how we read an entire visual system that is increasingly complex and, as I have already mentioned, ever more subordinated to multiple energy-based and material needs.

The lack of light, throughout the development of the discipline of photography, was always confronted as a problem to be cleared up. The unwanted shadow, enemy of vision and knowledge, had to be subdued by an energetic-luminous deployment, powerful enough to allow for a "correct" exposure that would adapt the shades of the image to the human perceptual range. Darkness, the enemy of photography, has even become a selling point when marketing new smartphones that, through more sensitive chips and more complex processing protocols, seek to achieve maximum image quality in dimly lit environments. With the profusion of "night mode", round-the-clock clarity impends.

Comparison between two images taken by an iPhone XS and a Google Pixel 3, respectively, in a low-light environment, emphasising the "Night Sight" processing technology developed by Google. See: Levoy, M. (2018, 14th November). *Night Sight: Seeing in the Dark on Pixel Phones*. Retrieved 30th August 2020, from Google AI Blog: https://ai.googleblog.com/2018/11/night-sight-seeing-in-dark-on-pixel.html

After the arrival of the digital image, not only is it necessary for the photo to be exposed, but the device's screen must also be illuminated, a paradigmatic interface for the consumption of "energy-images". In autumn 2019, in their presentation of the coming season's products, Apple announced the Apple Watch Series 5.[1] The main selling point for this smart watch was that it never turns off, always displaying the time on its LED screen. The darkness of a device's inactive screen is a limitation, now solved with this "Always On" technology, an ideal light flow that shines on even while you sleep, just in case you stir awake in the middle of the night. Limiting our range of vision, preventing us from seeing beyond our own atmosphere and depriving great swathes of the world's population of the chance to contemplate the cosmos —the excess of artificial light is now the norm, both day and night, and it reaches all kinds of places via handheld mobile devices. Darkness seems to have been reduced to a vague fantasy, easily overcome by our smartphone's flash, at any time, or by the blueish glow of our digital screens. Razmig Keucheyan claims that the "extremely clear" night skies violate what is, or should be, a basic right to darkness. Having control over light makes it easier, given the human being's limited night vision, to react to any danger that lurks in the shadows —and it also allows for the dilation of production cycles. However, excessive lighting, especially in metropolitan demographic centres (Falchi, et al., The new world atlas of artificial night sky brightness, 2016), leads to constant hyperstimulation.

> Ce qui était à l'origine un progrès, l'éclairage public et intérieur, qui a permis une diversification et un enrichissement sans précédent des activités humaines nocturnes, s'est transformé en nuisance. [What was originally progress, public and indoor lighting, which allowed unprecedented diversification and enrichment of nocturnal human activities, has become a nuisance.] (Keucheyan, 2019, p. 7)

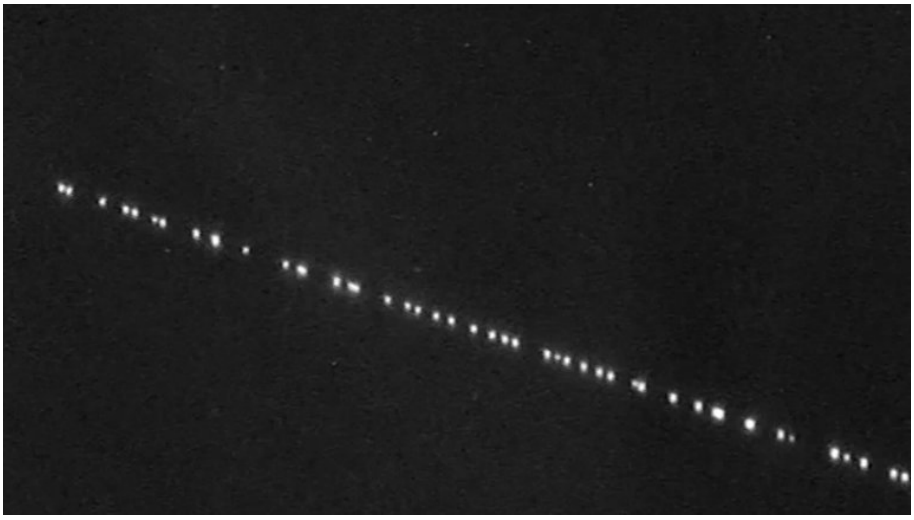
Light, although immaterial, can also be a form of contamination. In an environment that would otherwise be dark, the excessive presence of artificial light can compromise health, alter ecosystems, and affect the aesthetic perception of the landscape, resulting in light pollution. The artist Jamie Allen, concerned about the impact of the light from screens, in the urban context, carried out the *Refractive Index* project in nine cities throughout the United Kingdom. Using tailor-made software, he studied how various public multimedia screens affected their environment. Several light patterns follow one another while a camera captures, from the perspective of the screen, how this light bounces off the neighbouring elements, measuring, as indicated by the title, their "refractive index".

Allen, J. (2013) *Refractive Index* [Public intervention]. Newcastle: The NewBridge Project. Retrieved 30th August 2020: http://www.jamieallen.com/refractive-index/

The physical and psychological effects of excessive brightness on our bodies are more than proven: a poor assimilation of melatonin (the sleep hormone), a mismatch of life cycles, increased stress, etc. From the 1960s onwards, artificial lighting was dominated by the incandescent bulb, which emits warm and low intensity wavelengths, but this bulb has since given way to high intensity discharge lamps - a source of clinical or blueish wavelengths. Furthermore, we also now take the problem home, quite literally, since the screens of our multimedia devices, which allow us to consume the "energy-images", emit very blueish tones by default. Humans and other mammals are greatly affected by these cold light spectra due to the ganglion cells in our retinas. These cells detect excess light and suppress melatonin, and they are highly sensitive to blueish and purplish tones (Navara & Nelson, 2007, p. 216).

The impact of light pollution on fauna and flora is especially delicate. Both on a macro scale, when the night sky is besieged by halos of urban light, and on a micro scale, for example by the surplus of illuminated gadgets, with inescapable consequences on many ecosystems. Birds and insects are most affected, as well as amphibians —they all rely on natural light cycles to survive. This includes their orientation —being drawn to or repelled by the light— and their reproduction, communication and hunting (Longcore & Rich, Ecological light pollution, 2004). Moving away from an anthropocentric perspective, most of the animal kingdom, proportionally, exhibits nocturnal behaviours. That which for us implies a time for rest and repose, for many non-human creatures means the exact opposite.

Associations such as the IDA (International Dark-Sky Association), founded in 1988, have been fighting against light pollution for several decades. They propose alternatives, such as less aggressive public lighting systems, that use warmer tonal spectra or softer and more delimited light beams. This organisation recently issued a statement[2] in response to the launch of 60 satellites aimed at expanding Internet coverage in rural and sparsely populated areas. This megalomaniac project, called *Starlink*, by the company SpaceX, plans to launch, after this first round, thousands of similar satellites into "low Earth orbits", i.e. orbits less than 2,000 kilometres from the Earth's surface. The IDA objects to this —because of the closeness to the Earth, the set of satellites is visible to the human eye. In addition, due to their metallic surfaces and solar panels, the latter of which, as well as collecting light, then reflect it back to the earth, they prove excessively bright. They compete in brightness with the actual stars, and, if the planned launches are executed, they could outnumber the stars visible to the naked eye, as seen from our planet. The *Starlink* project, as well as other similar plans striving to advance towards hyper-connectivity, pose a worrying threat to the integrity of the night sky, which is no longer only haunted by the luminous halo of large cities, but also by the numerous objects that radiate light from the firmament itself.



A constellation of Starlink satellites, seen in the night sky over the Netherlands, about 24 hours after being launched into orbit by SpaceX on 23rd May 2019. See: Hall, S. (2019, 1st June). *After SpaceX Starlink Launch, a Fear of Satellites That Outnumber All Visible Stars*. Retrieved 30th August 2020: https://www.nytimes.com/2019/06/01/science/starlink-spacex-astronomers.html

CABLE

> The energy characteristics of the ICT ecosystem are quite unlike anything else built to date. Turning on a light does _not_ require dozens of lights to turn on elsewhere. However, turn on an iPad to watch a video and iPad-like devices all over the country, even all over the world, simultaneously light up throughout a vast network. (Mills, 2013, p. 15).

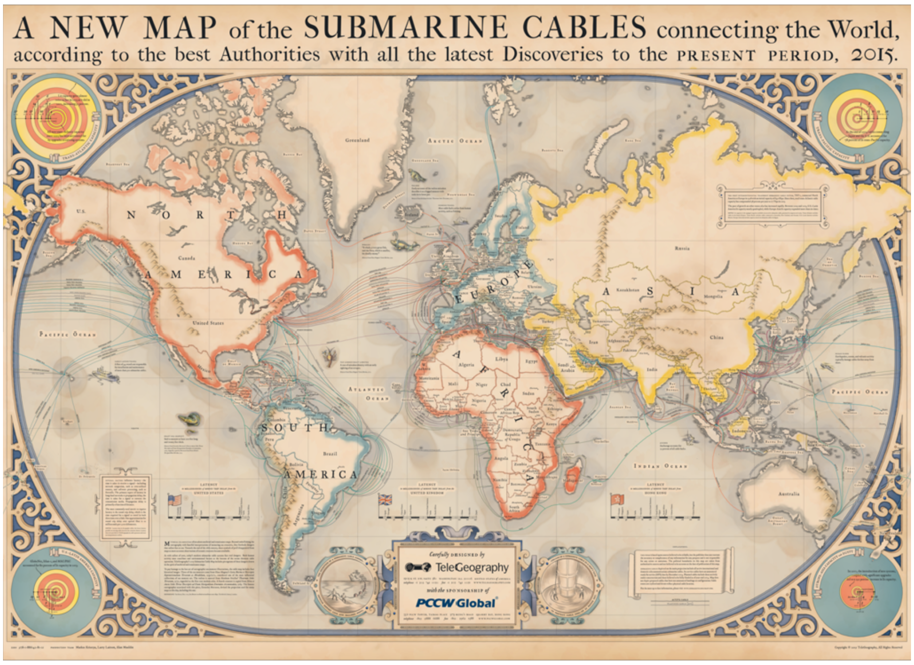
One of the main attributes of contemporary visual consumption lies in the triumph of the tele-transmitted image. This means that what we see not only affects our immediate environment, draining our phone battery, for example, but also that a series of actions —computational and mechanic— have had to be activated remotely, so that we can get to enjoy a given video or photo. The required sequence of protocols is certainly not self-sufficient; in fact, it consumes inordinate amounts of energy, and it requires a great volume of resources. Under this paradigm, we can no longer measure the image as a unit and analyse its whole in a quantitative way. The archetype of the autonomous digital image gives rise to the online visual "ecosystem",[3] an environment in which 1 or 1,000 files can take up 1GB, and deleting or creating new ones does not necessarily mean any significant change in storage. What really is difficult, and costly, is ensuring that the online digital context for these files remains active —the constant flow of data can never rest.

The kind of image we consume the most, i.e. the one generated digitally, and distributed online, only takes a visible and humanly readable form for a very brief moment of its existence. Most of the time, what we perceive as shape and colour fluctuates between different binary compressions and decompressions, driven by electromagnetic impulses in a framework of structures spread across the globe. And what form do these structures take? Nicole Starosielski reminds us that, despite the widespread conception that all information is now transmitted wirelessly via satellites and antennae, we actually live in a world more heavily wired than ever before (Starosielski, The Undersea Network, 2015, p. 9). Submarine fibreoptic cables, for example, carry almost all of the online traffic between continents. Therefore, the technological infrastructure that sustains the "energy-image" is overwhelmingly materialised, and affixed to the Earth. But also, and contrary to its seeming sustainability and durability, the economic, labour and environmental costs required for its updating and maintenance are incessant and very high, pushing this system somewhat closer to precariousness and rapid obsolescence.

Within her analysis of the submarine wiring system, Starosielski highlights two contradictory strategies adopted by the private entities that lay these cables, strategies which are used simultaneously, despite their being opposed. The first is "insulation", which seeks to protect the cable from the local ecosystem it disrupts. To do this, multiple protective layers are wrapped around the optical fibres, isolating them from any overly prominent marine ridges, strong currents, anchors or fishing nets, and any visits from unwanted organisms such as corrosive bacteria or even shark attacks. The second tactic explains, to some extent, these incidents. Through this tactic, i.e. "interconnection", the aim is to take advantage of the material features of the environment for the benefit of the cable itself, such as the use of the sea water's salinity to boost the transmission of electrical signals. Hence, many sharks, attracted by these electrical stimuli emanating from the cables, mistake them for potential prey and even bite into them.[4]

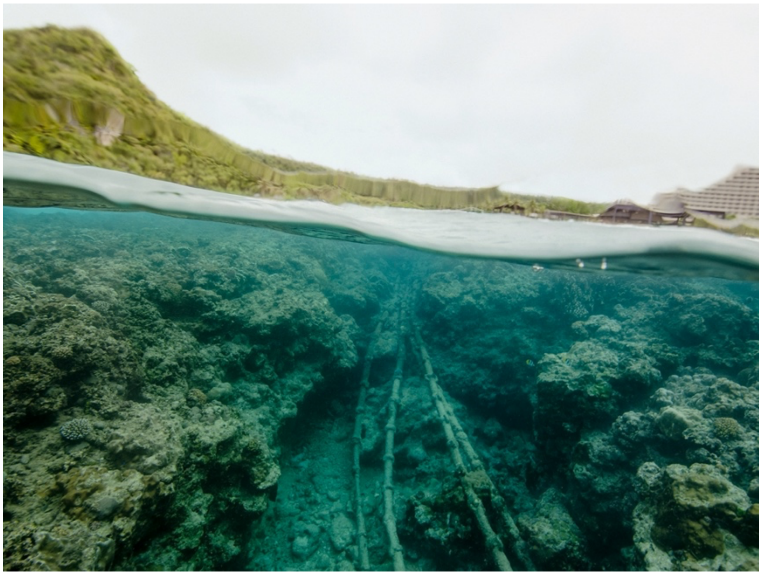
Meanwhile, we cannot overlook the historical implications that these global communication networks inherit from earlier systems. Submarine fibreoptic cables arise from, and in many cases reuse, the intercontinental connections forged between empires and colonies.

> The web of power that tied the colonial empires together was made of electricity as well as steam and iron (Headrick, 1988, p. 98).



2015 map showing the intercontinental submarine wiring connections, citing the aesthetics of medieval cartographies. See: TeleGeography. (14th January 2015). *Submarine Cable Map 2015*. Retrieved 30th August 2020: https://submarine-cable-map-2015.telegeography.com

The fibreoptic cables follow the same routes and dynamics as the preceding telegraph cables, even if they are now further privatised and better-adapted to the new demands for bandwidth, as required by services such as high-definition video streaming. This determines, very specifically, who has better access to online multimedia content, i.e. which countries control the supply and thus have the power to divert it or cut it off. The artist Trevor Paglen set out, in 2015, to investigate the physical locations of these undersea cables, in an attempt at documenting and exposing the network. Despite the important role of this layout in contemporary audiovisual communication, locating and visualising it is not a straightforward task. Their unexpectedly small calibre, as well as the vague coordinates that the maps assign to them, make finding these structures somewhat difficult. The expedition carried out by Paglen focused on the coasts of Florida, Hawaii and Guam, specifically looking for cables allegedly wiretapped there by the NSA (the National Security Agency of the United States), using documents from the Snowden[5] archive that alluded to these tappings, as a reference. The result is a variety of large-format photographs of ten different cables, along with collages of maps and documents pointing out the NSA's espionage, providing a detailed geographic and political cartography of the context of these submarine fibreoptic cables.



Paglen, T. (2015). Under the Beach (Tumon Bay, Guam) [C-print]. New York: Metro Pictures. See: Mallonee, L. (20th September, 2016). *Photos of the Submarine Internet Cables the NSA Probably Tapped*. Retrieved 30th August 2020: https://www.wired.com/2016/09/trevor-paglen-internet-cables-nsa/

The social and ideological construction of the digital cloud as something incorporeal and dematerialised is highly dangerous.[6] Data centres, such crucial nodes within this planetary wiring mesh, imply an exponential increase in energy expenditure, and any resulting profit margins are due to the huge demand that exists for them. In 2016, for instance, they accounted for 3% of global energy consumption (Bawden, Global warming: Data centres to consume three times as much energy in next decade, experts warn, 2016). With this data in mind, it is somewhat disconcerting to think that, just ten years ago, this network practically did not exist. Due to the formidable proliferation of online content in the last decade, technology companies are building data centres with increased capacity, and with the corresponding requirements for storage, connection and cooling. The physical location of these gigantic warehouses must provide sufficient space, high-capacity Internet connections and abundant energy resources. This last point, perhaps the most important, entails choosing countries where energy is cheap, where there are favourable tax concessions as well as natural features that allow for energy saving. This means territories with low temperatures, and there are even plans to occupy international waters,[7] which in addition to being a source of refrigeration, would also relieve companies of many legal restrictions. This is the case of macro-corporations like Facebook that, in an effort to get on board with "greenwashing", claim to encourage the design of more sustainable data centres,[8] while still choosing locations such as Ireland for its low taxes or Scandinavian countries for their cheaper energy, as well as relying on precarious labour.

Furthermore, data centres operate under a very inefficient logic, since most of the energy they consume is not invested in the service they offer but rather in security mechanisms that aim to avoid possible congestion or short circuits. The issue here is not only their reliance on non-renewable fossil sources. Even if "cleaner" energy is adopted across the board, the volume of electricity that will be required in the coming years, if this trend continues, will in any case push the world's energy system to its limits.

SCREEN

Digital visual culture is rapidly accelerating, and it consumes more and more, thus becoming less and less sustainable - something it never actually was in the first place. It seems that, right now, the flow of images sustains the world, or somehow makes sense of it as it is. Information and communications technologies partake in the voracious consumption of energy and materials, and this is generally accepted and even encouraged - there is nothing impeding this dizzying growth, and hardly anybody is questioning the economic investment, unlike in other sectors. Digital images constantly require and use up energy. The screens themselves, on computers, tablets, smartphones, etc., are what consume most of the device's battery, relative to the other components. The rendering of the processed information into light not only turns every element displayed on the screen into an image in a certain way, but this is in fact the machine's greatest expenditure of energy. Also, today's screens are brighter than ever, with greater definition, built for larger images with higher resolution. The energy-based dependence on unsustainable and polluting raw materials such as coal, oil or natural gas is perhaps one of the most invisible aspects of network technology. Carolyn Elerding criticises what she calls an "aesthetics of invisibility", typical of digital culture and the conception of the

Internet. Aesthetics has been a key factor in computing all along, managing to establish cultural parameters of hygiene and invisibility which have hidden and/or naturalised this dependence on energy.

> Every keyboard button you push, every screen you view, every ringtone you hear requires electrical energy (Parks, Energy-Media Vignettes, 2014).

We charge our devices on a daily basis, plugging them into the power grid, and yet even this unequivocal, seemingly blatant action does not raise any suspicions. Electricity has been abstracted and implemented to such an extent in our day-to-day lives that perhaps we just cannot fathom how much this service exploits and squeezes our planet. In his participatory project *5V*, Aram Bartholl tries to turn this dependency on its head by suggesting an alternative relationship between energy and technology. Around a campfire, he invites the public to sit down and charge their phones using devices designed by him, which convert the thermal energy of the fire into a 5-volt electric current, enough for charging. The energy is no longer invisible, but rather it takes shape before our eyes and we can directly connect the combusted material with the filling of the battery.

Bartholl, A. (2017). *5V* [Site-specific installation]. Münster: Skulptur Projekte Münster. Retrieved 30th August 2020: https://arambartholl.com/5v/

But who lit this fire? This is the question asked by Andreas Malm, alluding to the issue of responsibility for the planetary energy crisis. Contrary to the "anthropocenic" point of view, which points the finger at humanity as a whole, he poses a "capitalocenic" perspective, aimed at a much smaller number of responsible agents.

> Fossil fuels are by their very definition a condensation of unequal social relations, for no humans have yet engaged in systematic extraction of them to satisfy subsistence needs (Malm, 2016, p. 235).

He reminds us that the steam engine was not implanted by the "Homo sapiens sapiens", but by the British ruling class, followed by other Western powers. Furthermore, this technology did not lead to any significant increase in the levels of CO_2 in the atmosphere until practically a century later, thanks to the ensuing inordinate exploitation by these colonial forces, all around the world. Jason W. Moore, leading theorist of the "Capitalocene", goes a step further by claiming that natural exploitation is not only a consequence of capitalist development, but integral to it. He uses the concept "work/energy" to designate the not only human but "extra-human" or natural productive force that allows the capitalist order to be maintained and promoted (Moore, Capitalism In The Web Of Life: Ecology And The Accumulation Of Capital, 2015, p. 24). This "work/energy", he says, can be exploited, via its regulation in paid work, or else directly expropriated, as is the case of unrecognised female labour, slave labour, or the brute force of rivers, forests or oil wells.

Large corporations are still the biggest offenders when it comes to the impact on environmental balance, and they embody a privatised version of the historical colonial powers. Although many tech companies are boasting of their commitment to "carbon negative" or "zero emissions", as is the case with Microsoft,[9] the methodology they propose is somewhat deceptive. Instead of substantially reducing their consumption, they want to offset greenhouse gases by reforesting wastelands, making thus a dubious estimation of the CO_2 trapped by the vegetation to come. Given that online video streaming alone produced more than 300 tonnes of CO_2 in 2018, which is equal to Spain's entire emissions, or 1% of the global amount (The Shift Project, 2019), the image simply cannot be understood as something disconnected from its impact on the environment. An ecological perspective is required if we want to critically understand the "nature" of the image in the contemporary context, before its consequences make it too difficult for us:

> Carbon dioxide clouds the mind: it directly degrades our ability to think clearly, and we are walling it into our places of education and pumping it into the atmosphere. The crisis of global warming is a crisis of the mind, a crisis of thought, a crisis in our ability to think another way to be. Soon, we shall not be able to think at all (Bridle, 2018, p. 75).

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Notes

[1] See: Apple. (September 10th 2019). *September Event 2019 — Apple. Introducing Apple Watch Series 5*. Retrieved 30th August, 2020, from YouTube: https://www.youtube.com/watch?v=-rAeqN-Q7x4&t=2261

[2] See: International Dark-Sky Association. (29th May 2019). *Response to SpaceX Starlink Low Earth Orbit Satellite Constellation*. Retrieved 30th August, 2020, from International Dark-Sky Association: https://www.darksky.org/starlink-response/

[3] Carolyn Elerding highlights how paradoxical this term is when applied to the digital environment: "Conventional usage of terms like "ecology" and "ecosystem" in media theory to describe media "environments" begins to seem cynical in light of the consumer and industrial energy expenditure required to experience digital technology as weightless." (Elerding, 2016).

[4] See: Peñate, C. (16th June 1986). *Los tiburones causan daños al nuevo cable de fibra óptica entre Las Palmas y Tenerife*. Retrieved 30th August 2020, from El País: https://elpais.com/diario/1986/06/16/sociedad/519256808_850215.html. See also: Sudmike. (22nd April 2010). *Shark attack on subcable.wmv*. Retrieved 30th August 2020, from YouTube: https://www.youtube.com/watch?v=1ex7uTQf4bQ

[5] See: Canadian Journalists for Free Expression. (4th March 2015). Snowden Digital Surveillance Archive. Retrieved 30th August 2020, from Canadian Journalists for Free Expression: https://snowdenarchive.cjfe.org/greenstone/cgi-bin/library.cgi

[6] It seems paradoxical that the collection of suspended particles that make up a cloud weighs, on average, around 500 tonnes. See: MacDonald, F. (February 19th 2015). *This Is How Much a Cloud Weighs*. Retrieved 30th August 2020, from ScienceAlert: https://www.sciencealert.com/this-is-how-much-a-cloud-weighs

[7] See: Google LLC. (26th February 2007). *Water-based data center*. United States. Retrieved 30th August 2020, from Google Patents: https://patents.google.com/patent/US7525207B2

[8] See: Facebook. (14th January 2019). *Sustainable data centers*. Retrieved 30th August 2020, from Facebook Sustainability: https://sustainability.fb.com/innovation-for-our-world/sustainable-data-centers/

[9] Smith, B. (16th January 2020). *Microsoft will be carbon negative by 2030*. Retrieved 30th August 2020, from The Official Microsoft Blog: https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/