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DIGITAL

How does the digital reshape the material realm?

SHANE DENSON

How is the digital implicated—and how does it implicate us—in a redistribution of energy and agency within a new global politics of Earth and its environments? The answer, like the digital itself, is necessarily multifaceted and multiscalar, and any attempt to come to terms with our present situation and future prospects will have to account for the various dimensions of the digital and its transformations of media, technology, the environment, and life itself. Both in our daily activities and in the organization of planetary-scale systems, the digital has become an unavoidable presence and infrastructure for **action**. A first step in articulating a politics for our planetary future therefore lies in identifying digitally mediated interlinkages among actions, agencies, and energies across multiple scales.

We might take a cue from Charles and Ray Eames's film *Powers of Ten* (1977), which famously zooms out from the human-centric **scale** of a 1 m^2 overhead view of a couple relaxing on a picnic blanket. The visual scope gradually widens, marking out each order of magnitude (10 m^2, 100 m^2, 1,000 m^2, etc.) as the camera rises to encompass the city, Earth, and ultimately the observable universe (at 10^{24} m^2). Then the camera reverses course and zooms back in at the level of the couple before plunging deeper, displaying microscopic views of skin cells and their structures, and then descending to the subatomic level of protons and quarks. *Powers of Ten*, an analog film produced with support from IBM,

has inspired a variety of digital remakes and homages, including the computer-generated opening sequence of *Contact* (1997) and the iPhone app *Cosmic Eye* (2012), not to mention the interactive platform Google Earth. Apparently, digital media sees itself called upon to re-create the Eames's film in order to demonstrate the superior imaging power of computational visual effects. However, the power of the digital is not limited to re-creating an analog spectacle; indeed, when viewed today on a digital platform like YouTube rather than projected from celluloid, *Powers of Ten* evokes the transformative power of the digital as a radically multiscalar, ecological force.

Consider, therefore, this quotidian scene: I turn on my laptop, open an internet browser, navigate to YouTube, and play *Powers of Ten*. Beyond the visual spectacle itself, my viewing of the video sets a variety of things in motion, drawing a widening set of circles and pointing to a broad ecology of media, power, and politics. Simply using a computer requires energy; when my laptop's **battery** is depleted, I will have to reconnect it to a power source. Infrastructural dependencies start to multiply: the wiring in my house leads to a local transformer, which, by way of overhead lines or underground cables, is connected to a power plant that converts fossil fuels, nuclear reactions, or **renewable** resources into usable energy. The plant is in turn connected to a larger grid, regulated and coordinated digitally to ensure uniform regional coverage. Wide area synchronous grids provide power across multiple states, countries, or even continents, but they are susceptible to ecologically as well as politically induced failures, as evidenced in February 2021, when an ice storm brought the Texas Interconnection to its knees, in no small part because the grid is isolated from the larger Eastern and Western Interconnections in order to exempt the state from U.S. federal regulations on interstate power sharing.

As such networks are increasingly updated to smart grids, promises of more environmentally friendly systems of energy production and distribution are balanced by a greater reliance on IT infrastructures. This dependence opens the door to specifically digital vulnerabilities, including hacking and other cyberattacks like the Stuxnet virus that targeted the Iranian nuclear program or the ransomware attack that shut down the Colonial Pipeline on the U.S. East Coast in May 2021, when Russian hackers netted several million dollars in cryptocurrency—another vector in the increasing confluence of digital computation, ecological burden, and political-economic power. Cryptocurrencies are "mined" by computers competing against one another to solve mathematical problems, effectively turning **electricity** into digital money; in 2021, the carbon footprint of Bitcoin, the most prominent of these currencies, was more than twenty-two million metric tons of CO$_2$ per year.[1] Meanwhile, the annual

emissions created by YouTube's servers and infrastructures account for another ten million metric tons of CO_2, to which I contribute when I play a video.[2] Silicon Valley, which promotes an image of technologies that are light and clean as a "cloud," is in fact very dirty: its energy demands contribute to ecological disasters like California's record wildfires of 2019 and 2020 while exacerbating the direct geological impacts of **mining**, fracking, and atomic waste.

Thus, zooming out from my individual interaction with *Powers of Ten* on YouTube reveals this action to be inextricable from the digital as an expansively planetary force. Indeed, the digital is an integral part of what environmental scientist Peter Haff has termed the "technosphere," an emerging quasi-autonomous system not unlike existing geological paradigms (including atmosphere, biosphere, or lithosphere), upon which it depends for resources.[3] The digital is part of a global "technological metabolism" that encompasses the entire planet—and beyond.[4]

But to fully understand the ramifications of this digital metabolism, we need to follow *Powers of Ten*'s lead and zoom back into our scenario. What else is happening, on a more minuscule level, when I watch a video on YouTube? Pixels flicker on my screen, while the video codec's algorithmic operations take place behind the scenes. Wi-Fi signals bounce around me before reaching my device, which communicates with the digital platform in a collaborative effort to optimize images via buffering and real-time adjustments to resolution and bitrate. Also invisibly relayed across the internet connection are valuable data about my viewing history, social media activity, recent purchases, and political affiliations. At the root of all this activity are streams of electrons, voltage differentials that course through my computer's mineral components, including rare earth materials mined in real-world war zones, thus anchoring the digital firmly in a material politics of *power* in its various senses.

These invisible operations bypass my subjectivity as viewer; they are both smaller and faster than I could ever hope to perceive, but they link back inevitably to the larger circles we have observed already, inscribing my actions into a new digital politics of the earth.

See also: **Documentary, Music, Online, Storytelling**

Notes

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DOCUMENTARY

Why is uncertainty useful?

THOMAS PRINGLE

Truth and falsity, fiction and nonfiction, are common terms in documentary studies. Revisiting theoretical questions about the medium's claim to observational veracity, documentary scholars point to debates about climate change as **evidence** of a post-truth era in the history of media.[1] Both documentary media and climate change are discourses that make evidentiary assertions about reality. They are also socially contested expressions of realism, for better and worse.[2]

Documentary studies and the energy humanities are both concerned with *uncertainty* as an epistemological concept that names incomplete public confidence in mediated expertise that people rely on to understand environmental risk. Uncertainty, as a problem for climate change criticism, creates demands for scholarship addressing *how* specific uses of fossil fuels contribute to global warming. Uncertainty is also at stake in questions about *how* documentary media navigates the camera's inscription of reality alongside the social construction of what counts as a true or false representation. In the convergence between these discourses, uncertainty involves theoretical questions about how energy use, and the naturalization of energy within culture, can be documented with veracity while also recognizing that the mediated realism of such evidence is social, situated, and motivated.

In "Documentary Uncertainty," Hito Steyerl asserts that "uncertainty" is the "principle" of modern documentary media, as "our belief in the truth claims articulated by anyone, let alone the media and their documentary output, is shaken."[3] Modern documentary recognizes the gradient veracity of living in uncertain anthropogenic environments, in which carbon emissions in one site can contribute to irruptive natural disturbances in places far away. Steyerl registers how the proliferation of **digital** devices capable of producing visible

Power Shift

Keywords for a New Politics of Energy

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