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VERTICAL ATLAS

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VERTICAL ATLAS

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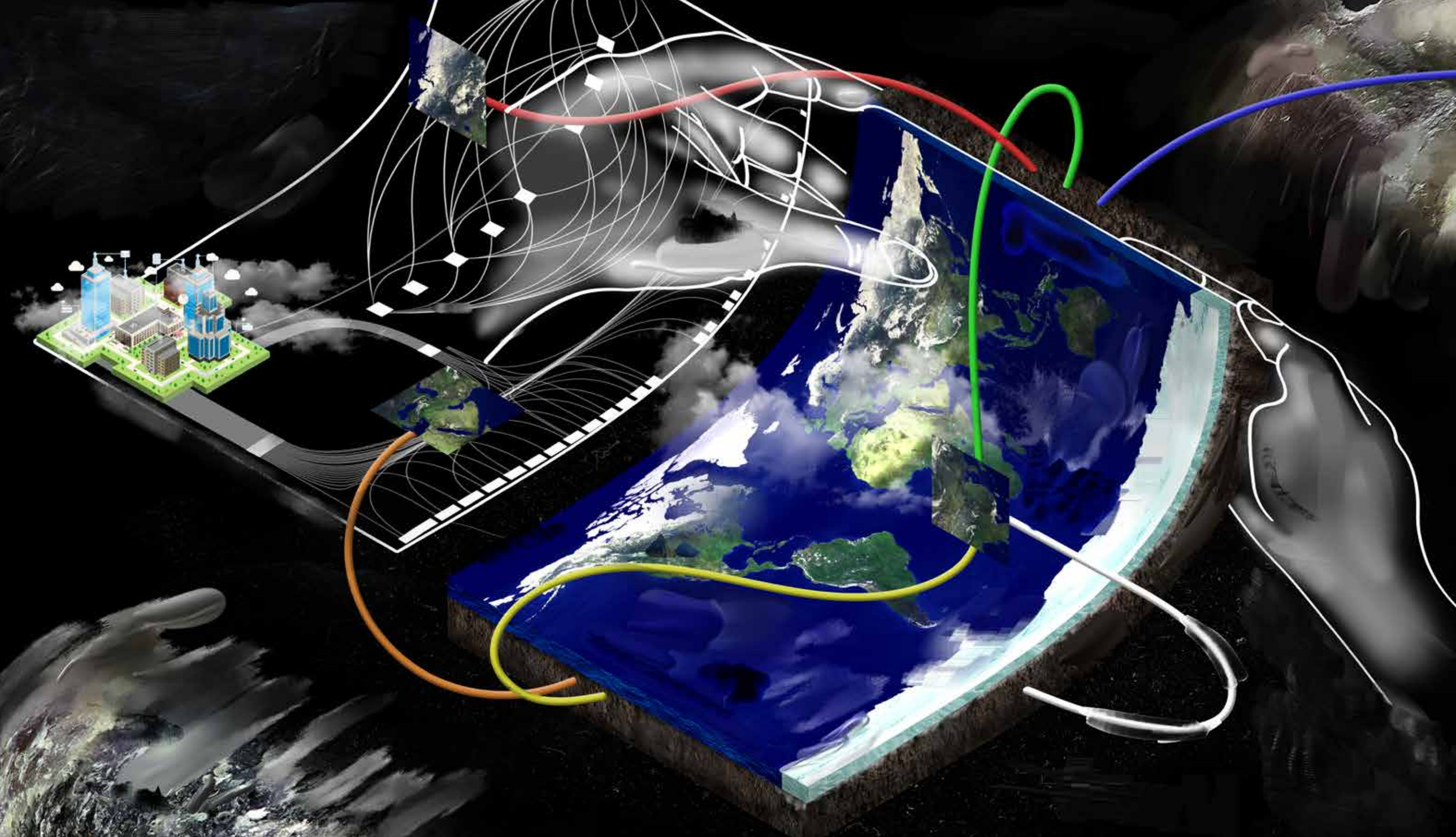
Vertical Atlas



Kévin Bray. ***Vertical Atlas***, 2018.

Contents

Introduction

Vertical Atlas started four years ago with the mission to create an atlas to help navigate the worldwide digital transformation and its complex effects at different locations and on a variety of scales. A group of artists, academics and technologists from various fields and places around the world collectively and individually researched, investigated, narrated and compiled their insights in this book. As such, it makes explicit the many exploratory paths and collective knowledge of people and communities working on redefining how technological worlds are seen and visualized. The contributions are from people who have all had different practical and personal experiences of the implications of the digital transformation and its global effects.

The editorial team decided to call this a "vertical atlas," as it tries to make visible the different realities that are stacked on top of each other in ways that are inextricable. *The Stack* (2015) by Benjamin Bratton was the primary inspiration for this book and provides a useful model that helped us investigate the many social, political, cultural and environmental implications of the digital transformation on people and societies.[1] These range from the immediate impact on the users of the technological systems to developments on city level to the extraction of the resources that built the digital infrastructures.

This book is not an atlas in the sense of a collection of colonial maps of the earth, drawn from the center of power, but is rather a tool that enables the comparison, correlation and juxtaposition of very different realities—this is reflected in the variety of forms these maps take: diagrams, interviews, essays or artworks.

It is not the goal to create a unified presentation of the world, but rather the opposite: to question the smooth globalized

'mono-technological' sphere that is so often promoted by Big Tech as being our shared reality and singular future. Yuk Hui invented the concepts of cosmotechnics and technodiversity to encapsulate a multitude of deeply different techno-cultural experiences, subsumed by and entangled in digital transformations. Going beyond the mere proliferation of technological gadgets and systems, technodiversity involves rediscovering forgotten techniques as well as new ways of dealing with technology based on different purposes and ways of experiencing the world.[2] The exciting diversity of research journeys in this book show us not only the multiplicity of technological realities around the world but also invites us to imagine our digital future in new ways.

How to map the digital realities?

Cultural, economic and political structures have become mixed, overlayed, infiltrated, enhanced and undermined by new technological structures that together span the entire world. The computer in the palm of our hands is an entry point to systems that link lithium mines in Chile to offshore Russian data servers, to fiber-optic submarine cables in the Atlantic to freeports in Singapore, to corporate-owned satellites in orbit, to a burgeoning quantity of IP addresses and petabytes of data.

Navigating these technological realities—as in coming to terms with what is where and how parts relate to other parts and to bigger wholes—has become increasingly difficult. Also, the default instrument for navigating—the geospatial map—does not appear to be up to the task of providing insight into this technological, political and material sphere.

Geographical representation does not yield useful insights into or an overview of the entanglements of digital and physical structures. It cannot render the new folded, fractal borders that are created in digital space, nor does it properly represent how digital national borders materialize in places such as

the cobalt mines in Congo that are owned by Chinese state-run companies, or in digital interfaces intended to discourage immigration. Cities as well as states are becoming increasingly non-local digital platforms, while cloud platforms have assumed roles that traditionally belong to governments, such as providing proof of identity and access to infrastructures.

There is also an underlying issue with cartography in general. Maps have for centuries been a tool in the service of existing power structures. Cartography was vital to systematizing the Western colonial project and in turn reflected and codified its effects. Current corporate-run mapping systems such as Google Maps are designed to serve the needs of global and local market powers, and in doing so reflect once again a singular, implicitly normalized perspective that has inherited these traits of the colonial project.

At the same time, maps fail to capture the lived realities that often counter any universalizing imperative. The many initiatives where people build their own infrastructures, or develop alternative organizational forms, all evince other kinds of world-making both with and against technology.

So, how then to navigate the non-universal, fractal scape of altered realities with non-local borderlands? Clearly, other kinds of maps are needed to guide us through these new formations in hybrid spaces.

Editorial principles

MULTIVOCAL—MULTIFOCAL

Vertical Atlas proposes a multifocal as well as multivocal approach, meaning that not one standardized perspective informs the depictions of the world. Rather, the project adopts different perspectives and techniques in order to acknowledge realities from different cultural and political perspectives and different biological and machinic embodiments. Breaking

down the problematic, yet all too common, logic of universal and linear technological development, it aims to shift focuses to regions, actors and voices that do not fit the universal narrative, but rather challenge and repurpose it for a more pluralistic vision of digital technologies.

SCALES

Vertical Atlas is organized by a logic of successive multidimensional scales of actors in the technological sphere. The book opens with maps relating to the scale of the individual human body and then zooms out to the scale of local platforms, cities, the nation state and its nonlocal borders, cloud platforms, infrastructures, earth observation and mining, to cosmological frames. As can be seen, this scaling is not a smooth process—each scale accommodates different techno-political structures and particular qualities of frictions.

FRICTIONS

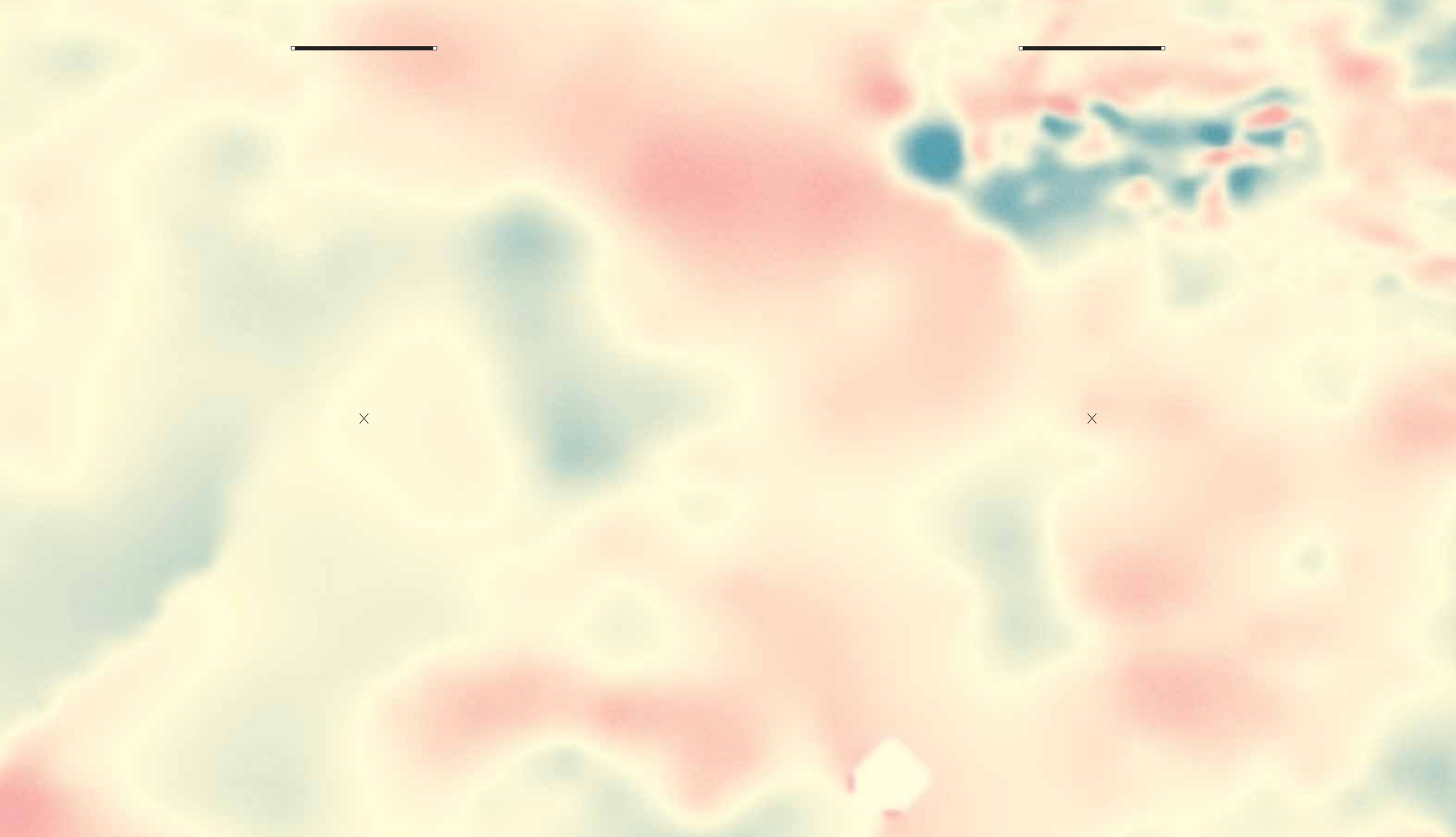
This atlas does not aim to depict the entirety of the landscape of the technosphere. Instead, each of the maps focuses on a particular friction or fault line that reveals a characteristic dynamic. Some maps explore how frictions between the citizen and the user play out, others focus on the simultaneous overlap as well as the incongruence between the nation state and the cloud platform. Yet others work with the metaphysical dimensions of cosmotechnics—how assumptions about the nature of reality shape the functions of technologies and vice versa.

Ultimately, *Vertical Atlas* is a book, a solidified, stabilized distillation of highly dynamic phenomena. As a book that took some time to create, it does not try to capture so much the fleeting now, as a photograph would, but is better compared to a film—to a composed sequence of shots from different angles and distances.

Vertical Atlas contains both visual and textual maps. It consists of new and original artworks, photo series and contributions from leading artists. Some are detailed charts; others are larger speculative drawings in diverse media and aesthetics. There are journalistic texts, poetic essays, historical studies and more academic articles.

This publication is the result of a four-year collaboration between Hivos and Het Nieuwe Instituut. It builds on the research by the Digital Earth fellows and the findings of six Vertical Atlas research labs by Het Nieuwe Instituut in Rotterdam as well as six Digital Earth workshops in Dakar, Beirut, Paris, Dubai, New Delhi and Moscow. For more information on the outcomes of the research labs, visit verticalatlas.net and digitalearth.art.

1 Benjamin H. Bratton, *The Stack: On Software and Sovereignity*, 2015.
2 Quoted from *Planetary Thinking*, an interview with Yuk Hui by Anders Dunker. November 2021 in *Kunstkritik*.



Grosse Fatigue

CAMILLE HENROT

What do a frog, an iPhone, a YouTube tutorial and an encyclopedia have in common? They are all part of an everyday digital reality. The world is dominated by information that is presented to users in an undifferentiated and non-hierarchical way—and it overwhelms them. In the desktop video *Grosse Fatigue*, Camille Henrot takes the viewer on a journey through the depths of the Internet via the user's personal desktop. We see a stream of consciousness in which natural phenomena, memes and the latest iPhone have become analogous chunks of information—and thus no longer differ in any way. Any sense of scale or context has disappeared; there is only digital information and a directionless movement through it that responds to the user's minimal attention, expressed in clicks and viewing time. In an attempt to build encyclopedic knowledge in this limbo, the user clicks their own world together: global, hyper-local and nowhere all at the same time. The universal availability of multiform information paradoxically causes a narrowing. New information is always the same—previously selected content is always offered in different guises. Preferences are constantly confirmed, making it impossible to change location or point of view.

Camille Henrot. *Grosse Fatigue*, 2013. Video (color, sound) 13 min. © ADAGP Camille Henrot. Courtesy of the artist, Silex Films and kamel mennour, Paris/London.

The Phone Changed Everything

NANJALA NYABOLA

One of my favourite memes from the last few years shows two desks side by side: one desk, from as late as the 1990s, is littered with a calculator, telephone, computer, camera, fax machine, and other devices; on the other desk, a mobile phone. Both desks display the exact same functionality. But the mobile phone has the capacity to do the same things while also fitting into your pocket. More than just shrinking the effective mechanisms in the various objects on the first desk, the evolving technology of the mobile phone introduces new artefacts of decision-making by the people who manufacture, service, and regulate these devices. In a new era defined by connection and disconnection, the politics of the mobile phone brings many debates—surveillance, state power, the ethics of data collection, privacy, and more—into sharp relief.

Perhaps more than any other object, the mobile phone embodies the promises and the contradictions of the twenty first century. While contemporary objects are increasingly standardised in their production and global in their distribution, all objects collide differently with different societies, and every innovation looks different at various levels. This is the main argument of my book, *Digital Democracy, Analogue Politics: How the Internet Era Is Transforming Politics in Kenya*: you cannot understand how technology will affect a society unless you understand the society in question. Our societies are products of specific histories and relationships, and a new object will adapt to whatever cleavages it finds in those societies. Therefore, you cannot fully illuminate the politics of the mobile phone without understanding the pre-existing cracks and cleavages in the societies or social units that use that device. An object is more than its form—it also constitutes design and utility choices; moreover, it represents the interests and capacities of the person who uses it.

How can we map these dynamics effectively, thus capturing the social, economic and power dynamics that an object encounters, adapts to, aggravates and attenuates? Words are good, but images can help. What follows is a rudimentary breakdown of the political economy of the mobile phone, borrowing the tools of geography to illustrate how the object intersects with power at different levels of society.

The Individual

The SI unit of any society is the individual. It is the individual who buys the phone and turns it into a useful object that responds to their specific demands. Social behaviour is thus an aggregate of individual preferences and choices. But who do we acknowledge in the pivotal role of the individual when we talk about any piece of technology, especially the mobile phone? Our conversations about technology are shaped by power dynamics that obscure the specific experiences of individuals from various backgrounds. The unspoken politics of access, needs, and power lie beneath the conditions we accept as given.

We often assume, for example, that the mobile phone user is urban and educated, sometimes a teenager, almost always a man. How does our understanding change when the individual at the centre of our power analysis of the mobile phone is a woman, not a man? Consider the question of privacy. Apps that collect and monetise the private health information of individuals have routinely been challenged in both policy discourse and the law. Google has been sued in multiple judicial systems for collecting incidental health data from people's mobile phones; in Europe, they are now forced to seek the consent of the individual before using their data for other reasons.

Until recently, however, certain particularly invasive apps have escaped serious scrutiny because they provide services tailored for women. Period tracking apps, for example, are able not only to collect vast amounts of individual health data but also to make incredibly accurate extrapolations and predictions regarding one's personal life. These apps have been selling user information to bigger online players with little oversight, despite the obvious potential for harmful consequences for the user in the long run, for instance, in their access to health insurance. By 2020, none of the major period tracking apps can confirm that the data they collect is only used to track periods—seemingly reserving the right to use them for something else...

Kenyan researcher Brenda Sanya pushes us to think critically about how underlying political dynamics can affect the use of mobile phones, as well as how the use of mobile phones can unsettle existing social concepts. For example, how does our understanding of "literacy" change when we see nominally illiterate rural women learning to use text-based USSD mobile money systems?[1]

The Community

Every individual, unless they are a hermit, is part of a community, connected to the people who enter, exit, and affect their lives. At the community level, therefore, objects intersect with power through connections and disconnections, social hierarchies, and ideas of belonging—especially in the case of objects like the mobile phone, whose entire purpose is to connect people to one another more intensely.

In Kenya, the mobile phone's impact on rural-urban connections has been especially acute. In sociological terms, Kenya would be described as a "dual system," in which people migrate to urban areas and leave families in the countryside. This sets up a domestic system of dependence and remittances, for example, where families in rural areas are dependent on regular cash infusions from urban-dwelling wage employees to meet their subsistence needs. The origins of Kenya's dual system can be traced to the British colonial period (1895–1963), when the levying of oppressive poll and hut taxes compelled black men to move to urban areas in search of wage employment, while the institution of racist policies forbid those men from living with their partners and families in the apartheid towns.

An object is more than its form—it also constitutes design and utility choices; moreover, it represents the interests and capacities of the person who uses it.

Traditionally, families relied on twice-yearly visits or informal systems to send money home. Some used money orders or postal orders to make the transfers, incurring prohibitively high fees from predatory finance companies like Western Union and Money Pay. But the mobile phone changed everything, particularly in 2006 with the launch of Safaricom's M-Pesa, the first mobile money system in the world. This new

USSD system allowed individuals to send money instantly all over the country, and gave recipients the options either to keep the money in deposit as pre-paid airtime credits—freeing up other money in the household budget—or to withdraw the money as cash from a Safaricom dealer.

Today, Kenya's market for mobile money (dominated by three large mobile companies) is per capita the largest in the world. In 2017, the volume of mobile money transactions in Kenya was equivalent to one-third of the national GDP. The system was enormously popular and successful in its adoption by communities, but it also shifted community dynamics in the country considerably. Large banks that once charged exorbitant fees for even the simplest transactions have been forced to completely overhaul their business model; some big players, like Barclays, have shut down altogether. Mobile money has put tremendous power in the hands of small and medium enterprise owners—the majority of whom, in Kenya, are women—to negotiate not only with banks and other financial institutions, but also with the government itself.

Significantly, in Kenya's dual system, the mobile money platform has reduced the need for the biannual rural-urban migrations that were becoming not only prohibitively expensive but also unsafe, given the general awareness that people within that travel profile were likely to be carrying significant amounts of cash. During the 2007 post-election violence and the 2020 Covid-19 crisis, when urban areas in Kenya were locked down to outside visitors, mobile money systems were a lifeline for rural communities who could still access their remittances. The mobile phone has sustained lives through some of the most difficult moments in the country's recent history.

The mobile phone today is ground zero for Kenya's intense political contests.

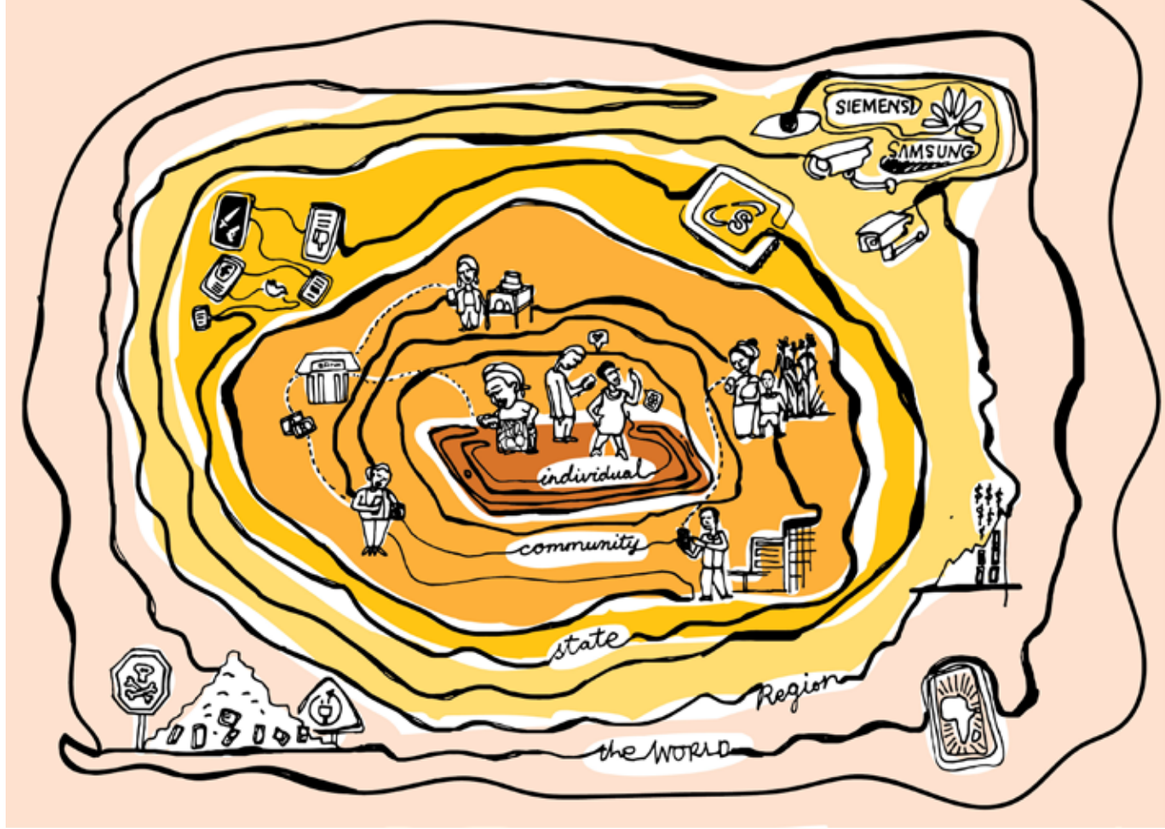
The State

A nation is nothing more than a network of communities pushed together by history and kept together by a shared understanding of that history, even as the margins of that shared history are routinely challenged by groups outside power. But the nation-state, as the product of many different ideas coalescing into a cohesive and distinct praxis, can equally be studied as an independent actor in its own right. A state is more than the sum of the individual actors that speak or act on its behalf: it draws a line between political, economic and social choices, distinct from the institutions and people that represent it. The choices of the state as a unified body do not always align with the best interests or practices of the individuals that make up the state.

This perhaps explains why, in Kenya, the national interest towards mobile phones seems to constantly pull away from the interests of the citizens. As an object, the mobile phone has become the vehicle for the state to advance some of its worst instincts, including punitive taxation regimes and surveillance leading to arbitrary arrests and detention. The government of Kenya is the largest shareholder in Safaricom, which controls more than 85% of the market share in the Kenyan mobile telecommunications space; as such, the state has a direct financial interest in Safaricom's profitability. But research has confirmed that the state is not just a silent partner in Safaricom; in 2016, the police confirmed to the UK digital rights charity Privacy International that if they want private customer information from Safaricom, all they have to do is ask.

Moreover, Kenya is a state deeply fragmented along class and ethnic lines, and every election year results in political violence instigated by powerful people trying to disrupt the vote. Mobile phones have also been implicated within this system in relation to the dissemination of hate speech in the 2007 and 2017 elections. The National Cohesion and Integration Commission, formed in 2008 with the task of preventing the dissemination of hate speech, has also used mobile phones as a platform for promoting peaceful dialogue, but they concede that they cannot track or trace everything that gets produced.

In the 2017 election, the advent of new media platforms like Facebook and Twitter showed how far politicians with money were willing to go to influence political opinions via their mobile phones. U.S.-based political consulting companies received tens of thousands of dollars in business from Kenyan politicians to create and push harmful content against their opponents for these platforms. Meanwhile, local politicians in hotly contested regions purchased (or otherwise acquired) phone numbers of their constituents in order to hound them with messages demanding their votes.



Nzilani Simu. *That Thing In Your Hand: Thinking About Users Through a Different Framework of Power*. 2021. Pen on paper and digital coloring.

Region

The mobile phone is more responsible than just about any other object for Kenya's unusual contemporary historical arc. Kenya is neither the largest nor wealthiest country in Africa by any metric, yet it is a current leader not only regionally but globally in Internet-related sectors—mobile money, Internet penetration and daily Internet use. Moreover, the vast majority of Kenyans (over 88% according to the last government survey) connect to the Internet through their mobile phones. This has had a knock-on effect on the country's place in regional politics. The rapid growth in ICT and related services has allowed Kenya to rebase its economy and emerge as a lower-middle income country, even if in material terms much of the country's population remains poor.

Today, Kenyan ICT professionals are highly sought after both regionally and internationally. The demand for mobile phones has drawn international investment from Samsung, Siemens, Huawei, and other manufacturers. But it has also attracted perni-

cious forms of investment from international companies that provide the state with the necessary infrastructure to implement surveillance and violate privacy. The global battle for telecommunications dominance has not skipped over Africa, and citizens of countries with large potential markets, like Kenya and South Africa, are stuck in the middle. In their competition to build Africa's ICT infrastructure, private corporations with decidedly national interests, like Siemens, Google and Huawei, are entering into uncomfortably close relationships with authoritarian regimes. The companies bidding to build technologies include not only those trying to help citizens, but also those facilitating governments in tilting the balance of power away from citizens.

Kenya, a few steps further down the path to a tech-based polity, can provide a great lesson for the rest of Africa. "Leapfrogging" is a myth: without a strong political and civil rights framework, ICT does not simply create "development"—rather, it opens up new avenues for exploitation.

The World

The mobile phone has opened up African societies for both the good and the bad. We are more connected to global discourses and better able to demand visibility on our own terms. We are able to challenge stereotypical narratives about who Africa is, who African women are. At the same time, we remain vulnerable to new forms of exploitation and consumption by more powerful nations. The most important material in the mobile phone is coltan, the mineral used in the semi-conductors that are the heartbeat of all electronics. Coltan is also a major part of the story of cycles of violence in Eastern DRC, fuelling death, destruction and displacement in East Africa. The DRC is one of the world's largest producers of coltan—as is neighbouring Rwanda, which has no coltan deposits of within its own geography. It is at the heart of shadowy regional networks of expropriation and consumption.

The proliferation of mobile phones all over the world is also part of the growing problem of e-waste, one of the fastest growing types of waste across the world. According to UNEP, in Africa e-waste increases by 20% each year, particularly as wealthier countries sell their e-waste to landfills in Africa in the guise of recycling. Plenty of used electronics cannot be reused or recycled, and some of their materials are extremely toxic. It speaks to the power dynamics between rich and poor countries that African landfills as e-waste destinations sustain a broader pretext of advancements in recycling while posing such harmful consequences to local inhabitants.

*

Objects are products of human obsessions and interests. Their trajectories through our lives and our societies reflect the choices we make and the processes in which we invest. It was a choice to set up a path for the mobile phone based on endless consumption and rapidly mounting waste; we could have chosen otherwise. But the socioeconomic dynamics of capitalism—a system that we have created—encourage choices that prioritise the financial profits of a handful of countries over the lives and welfare of people on the "other side of the world." The politics of the mobile phone are contested precisely because they look different depending on who is understood as the user and what level is being examined. All of these contested narratives—the good, the bad and the ugly—are true, and the elevation of certain narratives into universal truth remains a product of our choosing.

May, 2021

1 "USSD (Unstructured Supplementary Service Data) is a communications protocol for mobile phones that allows for real-time two-way data exchange, such as for mobile web browsing, location-based services, and mobile payments."

Sorry For Real

TABITA REZAIRE

We see a hand holding a smartphone: perhaps the most ubiquitous experience that demonstrates the extent to which everyday life has become intertwined with digital technology. Yet this familiar image soon becomes strange and uncomfortable: the Western world is calling. What would it have to say? In the 3D animated video work *Sorry For Real*, Tabita Rezaire questions the disproportionate power relations that underlie the global digital infrastructure. In the work, the Western world has left a voicemail message asking for forgiveness for its violent history of slavery, colonialism and the ongoing exploitation of other continents. A robotic voice gushes a torrent of apologies; meanwhile, text messages arrive on the iPhone the West is calling. The messages respond to this torrent with cynicism, anger and disbelief. Our technological reality, and the digital infrastructure we use every day, is leading to structural inequality worldwide. The users can't cope with it anymore, but what alternatives do they have? Is it still possible to decolonize the infrastructure that is dominated by Western ideas?

Tabita Rezaire. *Sorry For Real*, 2015. Holographic Projection, HD Video, 16min 58s.

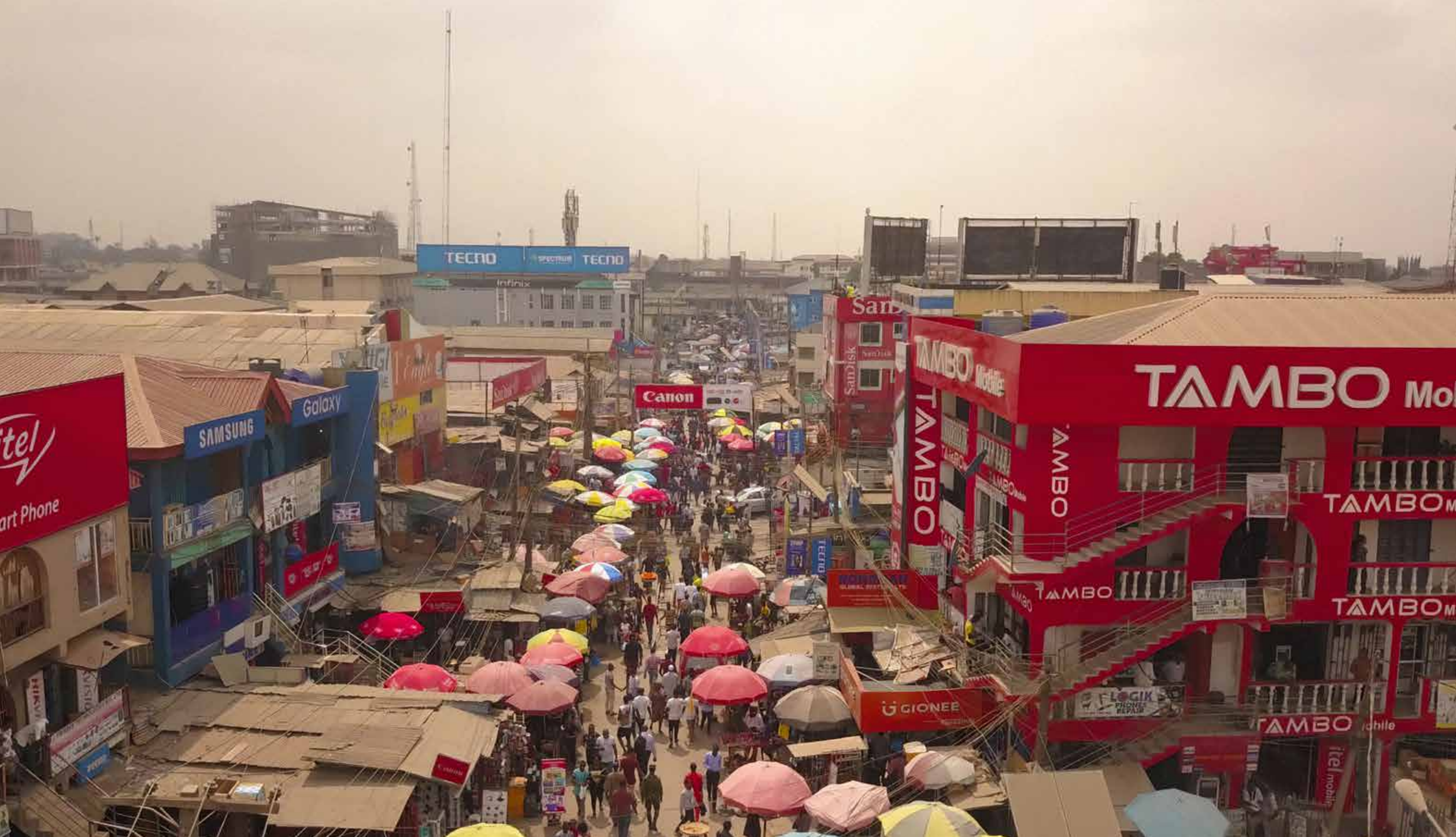
Handroid City

EMO DE MEDEIROS

The smartphone is a valuable accessory, a status symbol and an important product that is made and traded in the global economy. It has its own value chain: each phone contains raw materials that are sourced from all continents. Even before the phone is used, it participates in financial transactions on a global scale. The purchase of these technological artefacts is part of the value chain. Sales and repair dominate commerce in cities around the world. Emo De Medeiros' video installation *Handroid City* shows how this technological economy has taken over markets of large cities. We see drone footage of markets around the world, interspersed with close-ups of hands using, trading or repairing technological goods. Traditionally, street markets—different in each city, country and continent—play a major role in selling local products. But the new and pervasive global handheld economy has supplanted them. De Medeiros does not show the austere architecture and high-tech technological trade as we know it, but instead street scenes of local trade in large cities in Africa or China. Thousands of vendors, entrepreneurs and developers offer their goods and services in such places every day. *Handroid City* also implicitly addresses the shifts in social relations that are associated with this. Digital devices may have dematerialized our interactions, but they are themselves no less tactile. Communication and commerce take place in the palms of many hands.

Emo De Medeiros. *Handroid City*, 2019. Stills.


facebook/sams
SPORTS
AIR
SAMSUNG
Galaxy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The Facade of Datafication; The Real Harms of an Imagined World

PHILIPPA METCALFE AND FIEKE JANSEN,
DATA JUSTICE LAB, CARDIFF UNIVERSITY

On August 13, 2020, after being at home for months due to Covid-19 and lockdown measures, students in England eagerly awaited their A-level exam results as they made plans to enroll in university and regain a semblance of normality. In lieu of the usual A-level exams, which had been cancelled in 2020 due to the pandemic, the official regulator Ofqual (Office of Qualifications and Examinations Regulation) would assign scores using a standardizing algorithm on teacher rankings. The hopes of many students were tinged with fear a few days earlier, with the disastrous news from Scotland that over 120,000 grades had been initially downgraded from the predicted results.[1] Despite assurances that the algorithm implemented in England and Wales would provide much fairer, more reliable, and less biased student grades than the scores predicted by teachers (known as Centre Assessment Grades, or CAGs), this is not what transpired. As the results poured in, it quickly became obvious that a monumental catastrophe was unfolding. Outrage spread across the country as students reported being downgraded from As or A*s to Cs, Ds, or even Es.[2] At the same time, other students saw their grades inflated from Bs to A*s.

In the following hours and days, students took to the streets carrying placards decrying the results and the algorithm, with slogans like "Algorithms don't know me" or "Algorithm? Elitism."[3] Anger grew as one particular pattern became clear: private school students tended to benefit hugely from the algorithmic adjustment to their predicted results, while Black, Asian, and minority ethnic (BAME) students and students from poorer areas, mostly attending state schools, had their grades downgraded most dramatically. What the government claimed would be an unbiased and fair decision-making process turned out to erect new, invisible barriers and reinforce existing ones towards social mobilization through the algorithmic social profiling of students. This was the first time British streets saw placards decrying the harmful nature of algorithms, which drew attention to the great disparities of the British school systems. How did this happen? Or rather, how was this allowed to happen?

In Ofqual's A-level scoring algorithm, teacher-predicted grades (CAGs) had little bearing; instead, the algorithm translated CAGs into a simple ranking of students, and then mapped this ranking onto an adjusted grade spectrum calculated according to each school's historical results.[4] This spectrum imposed drastic limits on the number of top grades that each state school could award. Simultaneously, an exemption was granted to subject cohorts under 15 students—mostly from private schools—who were assigned their original CAGs. In short, if your school had always produced top students, then your grade would be good; if your school did not, then your grade could not be good. In schools that faced difficulties, there was little hope for high achievers and little acknowledgment of individual merit. The algorithm was too focused on avoiding teacher bias to consider the critique that "statistical models create normative vision of the future based on stereotypes of the past."[5]

As such, historical marginalization has been further ingrained into exam results. Black and brown communities in poor areas felt the worst of these effects. These communities have been the hardest hit by Covid-19;[6] stopped by police in the highest numbers;[7] denied visas to enter the UK;[8] and employed in lower-paying jobs.[9]

A few days into the protests, Ofqual overturned its decision to use the algorithm and assigned scores directly based on the CAGs, causing some to argue that teachers (and humans) are ultimately the best-suited to make such decisions. While the data harms from this specific A-level crisis were averted, the unfettered belief in data-enhanced decision-making and the state prerogative to test algorithmic systems on their population remain unquestioned. The A-level algorithm cannot be seen as an isolated or one-off incident. It is symptomatic of a larger turn towards algorithmic logic driving governance techniques across Europe, from the development of policing technologies to the changing landscape of Europe's border regime, affecting the structure and geopolitical makeup of Europe as we know it. Consequently, these techniques of dominance are becoming both more abstract and more inescapable for oppressed and targeted individuals and communities. The use of remote and complex AI and algorithmic decision-making is growing exponentially, despite the often inherent flaws in such technologies.

Not long before the A-levels incident, the Home Office had dropped the use of a controversial algorithm to sort visa applications through a traffic light system of red, amber and green ratings for travelers.[10] Here, travelers were targeted through their nationality, which was attributed a level of "desirability" to be granted a visa. Some nationalities were flagged as "suspicious" or "risky," placing individuals from these countries under far higher levels of scrutiny and affecting their ability to cross borders. Once again, the algorithm was heralded as a new unbiased means of decision-making, displacing control from human individuals and embedding it in supposedly neutral and fair AI systems. However, as with the Ofqual example, what we see instead is the concentration of years of structural bias into a black-box algorithm, wherein

The use of remote and complex AI and algorithmic decision–making is growing exponentially, despite the often inherent flaws in such technologies.

decades of institutional racism and colonial legacies become imprinted and cemented within AI systems. Arguably, a neutral algorithm does not exist; it will always come to hold the bias of the historical political structures that created it.

But these are not the only cases where algorithms have shown themselves to be incapable of achieving neutrality or desired outcomes, nor are they the only ones to be successfully challenged. In the Netherlands, the use of an algorithm to detect fraud within the welfare system using a System Risk Indication (SyRI) had been defeated in court several months earlier, with a legal challenge decrying the inherently

violent and unlawful nature of such forms of governance and decision-making.[11] Another example is the successful legal ruling against the South Wales police, in which they collected sensitive biometric data for facial recognition technologies from 500,000 people on the streets without their consent.[12] After an initial loss, the court of appeals ruled in favor of the plaintiff and found South Wales Police's use of facial recognition technology in breach of U.K. privacy rights, data protection laws and equality laws. In all of these cases, the state was able to test and implement these systems "in the wild," below the threshold of public scrutiny.

It is important to note that the public eye was not drawn to any of these examples in the same way that it was to the Ofqual algorithm. Algorithmic systems that impact migrants, "criminals" or those on welfare do not seem to ignite the same outrage as algorithms that target privileged children who happen to go to school in underprivileged areas. Indeed, challenges to algorithmic systems are often met with a lack of interest from the general public, who may not yet be victim to the punitive effects of AI systems of governance. Not only do algorithms lack transparency, but there is no willingness to engage with their failures from either people who implement them or those not directly impacted by them. This means, of course, that space is retained for continued experimentation and piloting of questionable and flawed AI systems deployed upon marginalized communities.

Despite the failures of algorithmic decision-making and the challenges mounted against them, immense public investment is continuously allocated for the development of algorithms and AI for border control and police, with great disregard for the long- and short-term impacts upon those subject to their controls. The EU Horizon 2020 program has invested heavily in AI technology, from the iBorderCtrl project, with its questionable practice of lie detection using facial recognition and micro-expression analysis, to the SEWA project, which aims to exploit human emotions "in the wild" for more effective marketing.[13] In addition, the UK police transformation fund,[14] which seeks to transform policing by investing in technological capabilities, has enabled police and other actors to run short-term pilots using predictive policing systems[15] and live facial recognition.[16]

These algorithms and AI investments have a common thread—the state as the "user" of the datafied "stack," which actively externalizes decision-making to algorithms and, where possible, sees the body as an increasingly datafied space for analysis. It is pertinent to criticize and challenge these practices, as the people most vulnerable to discriminatory and flawed data-driven decision-making are often those most reliant on the state for basic rights and services, from migrants and single mothers to people in poverty and young black boys.

Why is the state so eager to externalize decision-making to algorithms when these systems are capable of inflicting real harms and reinforcing (in) visible barriers? One answer lies in the fact that they operate in an imagined reality where there is little accountability to achieve the desired objective. More often, the real harms are deemed acceptable if they further the image of the socio-technical imaginary as a functioning reality, wherein there is a vested interest in presenting a notion of a perfect system to further a specific cause.

When the belief that data allows institutions to better predict and preempt results is applied to the context of policing, border control, education, or welfare, an imagined reality emerges. Here, trust is placed in data as a tool to predict and pinpoint actions or suspicious behavior, and thus able to intervene prior to the problem manifesting itself. The objective of pre-emptive governance can be seen in the tracking of migration flows within sub-Saharan Africa to prevent people from attempting to reach Europe, or the analysis of crime data to predict the likelihood of known perpetrators escalating from low-harm to high-harm offenses. These efforts presume that automated decision-making can replace human decision-making, thereby reducing costs, dispelling bias, and creating the outward appearance of the state taking charge in times of crisis. Undoubtedly, such methods become more pertinent in relation to politically charged, reactive policy, seen for example in ongoing reforms of the Eurodac biometric database and the Dublin Regulation as a response to the "refugee crisis" of 2015.

The issue is that algorithms—despite their wide usage—are simply not designed for complex, messy social problems, and datafication is thus very real and simultaneously false. This is not to belittle the damage and violence inflicted by such imaginaries, but rather to highlight their intentionally harmful elements—their flaws and their power to govern notwithstanding. While AI techniques for governance may only ever form an imaginary, as opposed to a functioning reality, they nonetheless work to normalize surveillance and data collection. Moreover, they legitimize decision-making based on risk profiling across multiple sectors—including border control, policing, welfare, workplaces, schools, and healthcare. They make inevitable some degree of collateral damage, and practically guarantee the exacerbation of structural limitations on life chances for BAME and low-income communities. This process entrenches existing power relations in society and disempowers those who are most negatively impacted. Consequently, this becomes most prevalent in class politics, border politics and the governance of mobility, as well the racialized politics of policing.

As a result, we are witnessing data systems that resemble dystopian imaginaries, best exemplified by the aforementioned iBorderCtrl pilot project, which aims to detect "biomarkers of deceit." This project, until now, situated in the imaginary of fully datafied borders, reaffirms the beliefs, ideas, and constructs shaping societal acceptance of the datafication of life, and substantiates the fears of what is to come. By investing in technologies already proven to be completely flawed, governments direct our focus onto the technologies themselves, as opposed to the systems that have fostered the implementation of such dystopian methods of governance.[17] Ultimately, the sociotechnical imaginary inherent in the development of these systems obscures a stark truth: it is not algorithms or AI technologies that are failing students, migrants, low-income families, and BAME communities—it is the state, and as such we should hold them to account.

October, 2020

Philippa Metcalfe and Fieke Jansen are both part of a large multi-year project called 'Data Justice: Understanding datafication in relation to social justice' (DATAJUSTICE) funded by an ERC Starting Grant (no. 759903).

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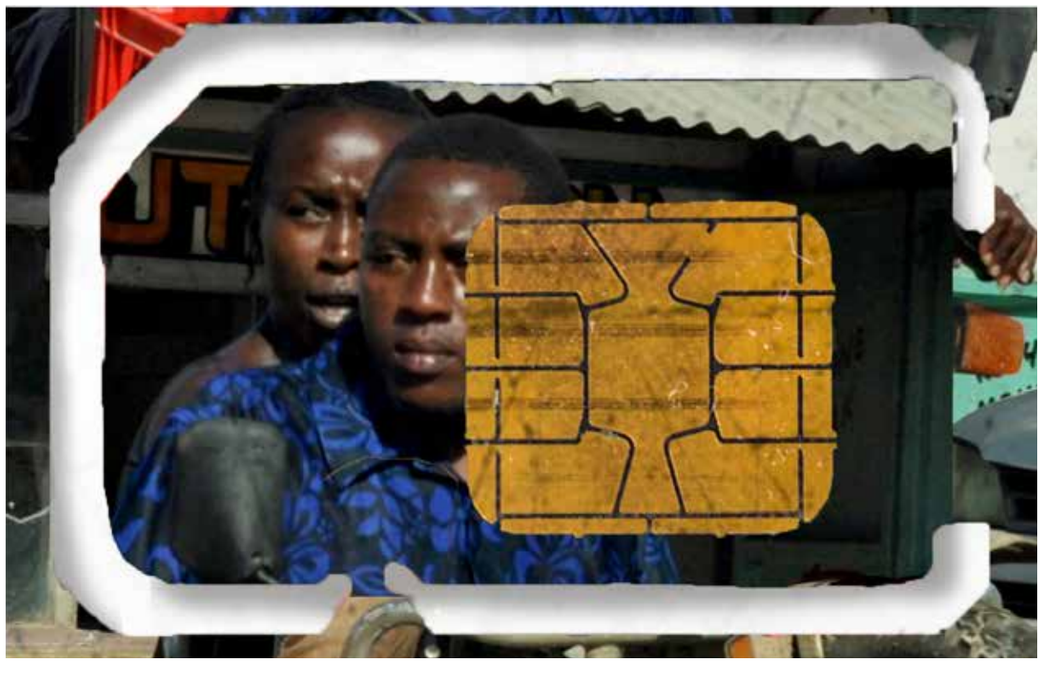


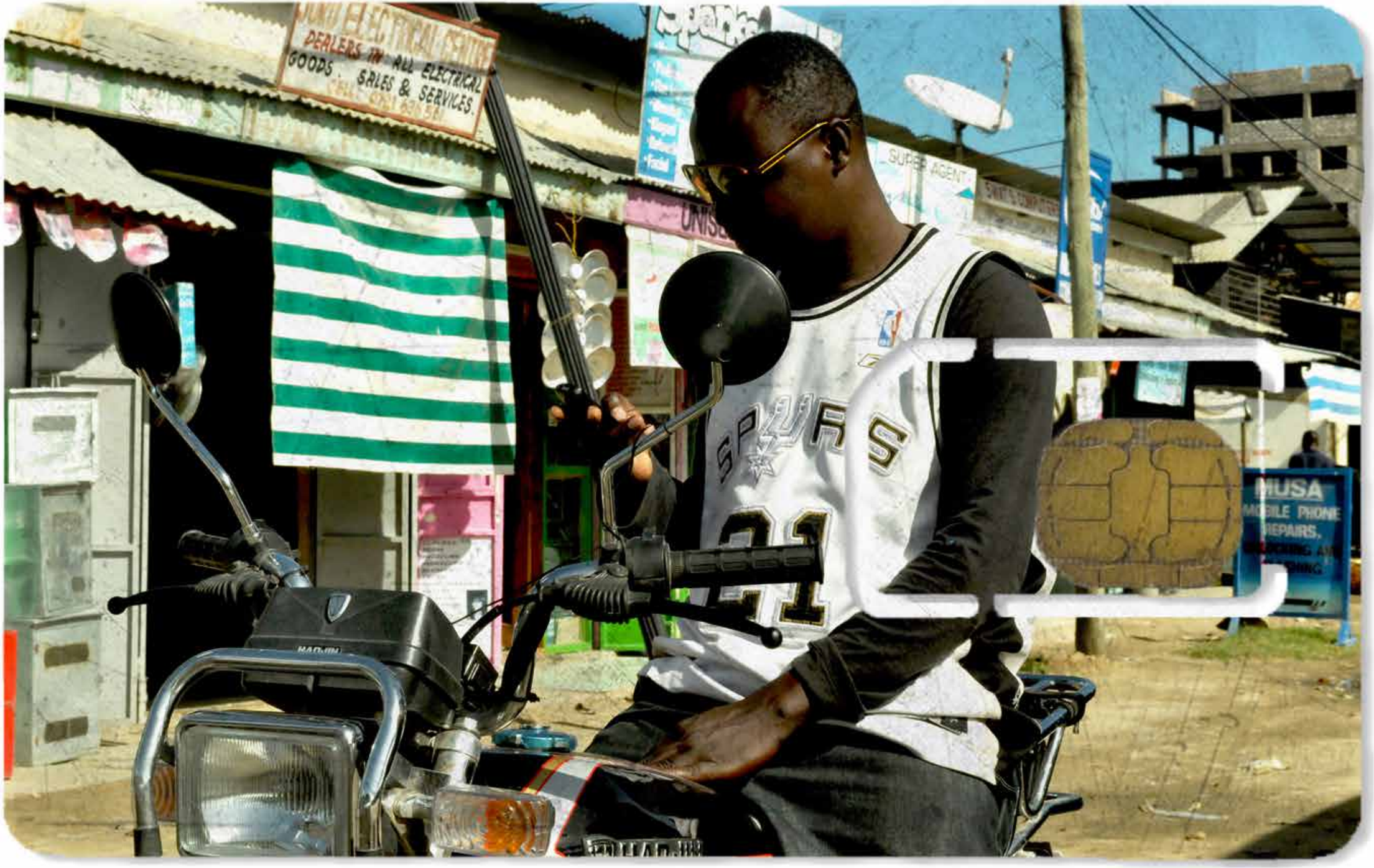
SIM Card Project

ISAAC KARIUKI

In *SIM Card Project*, Isaac Kariuki presents ongoing research and reflection on cellphone culture and Internet economies in Kenya, that do not operate through PC's and Internet providers, but through negotiated cellphone providers. Tracking cellphone culture in Kenya and in neighboring countries, the project presents the liberating aspect of owning a phone that connects you to the Internet. However, this freedom is burdened by the constant fluctuation of the cellphone carriers' rates and accessibility that essentially dictate how much you can communicate with people and the world.

In this work, Kariuki appropriates the aesthetics of Safaricom and Kencell, Kenya's largest cellphone providers, that use glossy promotional images on their SIM cards. Kariuki went to a small town near Mombasa, named Mtwapa, where he took photographs of people using their phones and going about their everyday lives. Affixing these images to SIM card templates, Kariuki attempts to humanize and lessen the overbearing, almost sinister presence of cellphone providers and the ongoing control they have on how millions of people access the Internet and each other.

Isaac Kariuki. *SIM Card Project*, 2015. Silicon and Plastic. Various sizes.


DEALERS IN ALL ELECTRICAL
GOODS SALES & SERVICES.
SUPER AGENT
MUSA
MOBILE PHONE
REPAIRS,

Citizenship: A Modern Ritual

VICTORIA IVANOVA

I CITIZENSHIP: A MODERN RITUAL

What do you imagine when you hear the word "citizenship"? Does an image of your passport pop into your head? (And with it, the thought that you can't quite remember where you last saw it?)

Or is it the land, the people, and the smells that populate your childhood memories?

Or do you immediately feel the anxiety that accompanies the simple gesture of sliding your "inferior" documents under the Plexiglas window under the probing gaze of a border control agent?

Perhaps citizenship's administrative reality has eluded you, and so you go blank.

Perhaps "citizenship" is a trigger word through which a complex web of history, trauma and family drama reasserts its ghostly presence as your stomach starts to churn.

In the modern version of citizenship, there is one active protagonist, one passive, and one pseudo-active (can you guess which one is which?):

A PHYSICAL TERRITORY	a physical territory (initially known as "conquered land")
A HUMAN	a human (initially known as "socio-economically privileged white man")
A STATE	a state (initially known as "monarchy" or "colonial administration")

And the ritualistic order that stitches them together is law.

Citizenship is then the contract that binds humans emerging from a certain physical territory and/or from the blood of humans that have already been recognised as emerging from a certain physical territory, to the sovereign of that territory.

It is a mode of control that operates by granting limited and discriminatory access to the bounty of the land.

It is a pledge of allegiance in exchange for a part within the narrative of a collective ego.

It is a statist solution to managing humans' will to survive.

Modern citizenship is today a deeply embedded protocol informing and reproducing institutional and cultural imaginaries of Earth as a two-dimensional atlas of carved-up patches of land, marking territorial rootedness as the norm and the lack of such rootedness as the deviation.

II MODERN RITUAL GETS HACKED AND SHOWS CRACKS

Why this norm?

Don't the deep histories of human migratory flows, as well as the more recent projects of nation-state building with their crawling borders, serve as clear testimonies to the artificiality of the citizenship protocol?

Yet the protocol stands as a universal practice.
Or does it?
Where are the pressure points, and what do they tell us?

PRESSURE POINTS

1) Irregular zones

A Unrecognised states: when a state isn't recognised by the premier league of world nations, citizenship is revealed as a buy-in into a collective fiction that might as well be a delusion

B Refugee camps: turning over time into multigenerational cities where there is no state, no ownership of land, and yet there is still a society

C "Failed" or "fragile" states: war, civil unrest, state debt crisis, increasing unemployment, crumbling social and physical infrastructure devalue citizenship as an asset (see "The purchasing power of passports" below)

2) Citizenship as asset

A The purchasing power of passports: in a global financial system, each citizenship can be ranked by the range of benefits that it bestows on its holder (from access to social infrastructure to mobility), breaking up the primacy of the soil-blood connection as that which makes citizenship real

B Capital investment buys naturalisation: today, this option is offered by most countries, although some are cheaper than others

C Citizenship is leverage for other ends: frequently as a way of either forcing or escaping litigation (e.g. to claim certain protections, or to escape criminal persecution)

3) Advanced technological solutions are fragmenting oversight over citizenship's administrative functions (the latter being previously subject to centralised state power)

A Blockchain/machine learning: the core administrative function of identity verification can be wrested from the state, or can create state-like power for a new centralising agent

B Cloud technologies: the state's back-end digital infrastructure can be stored and accessed via an extra-territorial cloud, creating complex entanglements between different Earth layers

C Big platforms: acting as quasi-states over their networked territory, in lieu of citizenship, they offer usership—the seemingly logical endpoint of modern geopolitics and financialisation.

III USERSHIP SCENARIO PLANNING

Today we are somewhat stuck between the knowledge that we need to reconfigure the citizenship protocol, the evidence that it is being reconfigured whether we like it or not, and the idealistic as well as highly dystopian scenarios of the usership model. Several scenarios seem possible, and the following scenarios (and more) could unfold concurrently:

Usership Scenario 1

Although tech platforms have taken over all sovereign state functions and powers, the organisational shell of nation-states remains intact. Citizenship has become a much more fluid legal category, where the extent of

one's citizenship is dependent on a combination of birth privilege and financial solvency. Universal standards dissolve, and instead of the modern progressive notion of citizenship as a "bundle of rights", we end up with a wide variety of "bundles of access points to infrastructures."

Usership Scenario 2

As more and more sovereign states crumble under the compounded impacts of climate change, pandemics, war, and economic strife, tech giants such as Amazon and Alibaba start offering short-term residency schemes in exchange for different forms of data mining and labour. They also buy out what used to be the E.U. in 2014 and transform it into a heritage luxury gated community.

Usership Scenario 3

A globally distributed movement emerges in tearaway communities of renegade technologists, refugees, environmental activists, artists and gamer millionaires, who occupy remote areas and build societies based on experimental socioecological principles centred around advanced technologies and animistic practices.

Let's conclude by meditating on a few questions:

- If citizenship is a "bundle of rights," then usership is a "bundle of access points to infrastructures." How can we move from "human rights" to "infrastructural rights"?
- The contract of citizenship recognises third-party rights only when they belong to other fellow citizens. Neither non-human nor non-citizen entities count or matter. Could usership be a way of creating greater interdependence between a variety of entities rather than turning platforms into new monarchies?
- While it is obvious that usership can further entrench the financialisation of life and society, could it also offer ways to definancialise economies?

Citizen Ex Flags

JAMES BRIDLE

When you are born, there are two ways of acquiring citizenship: on the basis of the land on which you are born (*jus soli*, or the right of soil, used in parts of South and North America), or on the basis of your parents' citizenship (*jus sanguinis*, or the right of blood, used in the rest of the world). Your citizenship indicates that you have a place in the world, and connects you both geographically and constitutionally to a nation state. James Bridle investigates another form in his *Citizen Ex* project: algorithmic citizenship. This is not tied to (birth) location, but is based on data. This virtual citizenship is created in the blink of an eye, and can change all the time. It is based on online behavior and data traffic. The websites you visit or cannot visit, the files you download or the VPN you use: everything feeds the algorithms with new information about your geographical location, which influences what you can see and do online—or who can see you. Your geographical location determines which governments are allowed to spy on you. The flag series *Citizen Ex Flags* stems from this research. The colorful flags represent various composite citizenships. Each state that is part of the algorithmically composed citizenship is proportionally represented on the flag. The *Citizen Ex Flags* are immediately recognizable as a national flag, and thus as a symbol of a country or state. However, these flags are not tied to one geographical or political area. They represent personally constituted citizenship, and as such are a visual representation of the online rights, prohibitions and opportunities you would have in the various nation-states.

James Bridle. *Citizen Ex Flags*, 2015. 5' x 3'. Courtesy the artist.

JAMES BRIDLE

JAMES BRIDLE

CITIZEN EX FLAGS

India's Push for a Data Economy Using Digital Identity

SRINIVAS KODALI

India initiated multiple information technology and surveillance projects after the 2008 Mumbai terrorist attacks. Amid these efforts, it revived an age-old identification project, the Multipurpose National Identity Card (MNIC), and in parallel established a new Unique Identity Project. The unique identity (UID) project—which later came to be known as Aadhaar (Hindi for "foundation")—collected one billion people's biometrics without entirely informing them why they were being forced to get a new identity card. While not every citizen may have wanted this new UID card, there were both economic and political incentives for the government to fully roll out the project on the entire population—for example, for the purposes of civil registration and social welfare delivery.

Without a precise legal basis, the true intentions and limitations of these projects were never clear, whether it was for welfare provision or state surveillance and beyond. It has now become clear that the primary purpose of the exercise was to build a data economy for India using their citizens' private information. India's digital identity has been designed as a data infrastructure that can share citizens' personal data with private firms using application programming interfaces (APIs). Similar data infrastructures, commonly referred to as "The Stacks," are now being built for the financial services industry. The "India Stack" allows the private sector to easily acquire Indian citizens as consumers.[1]

India Stack consists of five APIs built on top of Aadhaar, digital identity project, which provides easy access to citizens' data. Aadhaar was such a crucial part of the business model of private companies that several companies appealed to India's Supreme Court to defend their API access for business activities.[2] The court, while allowing the Government of India to use the UID for state welfare delivery as initially proposed, restricted its usage by the private sector. Even after these restrictions, the Government of India continues to share API access with the private sector, terming it an exercise of "Good Governance."[3]

The private interest in digital identities primarily stems from surveillance capitalism models that have evolved across the globe. Surveillance capitalism commodifies personal data for profit, with the support of nation-states that make digital identities available to buy as consumer data. Who better to hand over citizens' data to the market than a nation-state with infinite powers to collect this information at scale, under the guise of increasing investments in the country? This is exactly what has transpired in India, where the private sector was able to choose their own representative, Nandan Nilekani—co-founder of IT giant Infosys—to build the desired data infrastructures within the government.

The proposal for India's UID was introduced in 2007 planning commission documents, in which the Government of India detailed a plan to build a public accountability information system for the purpose of tracking state benefits alongside citizens' incomes, in order to estimate spending per family unit and eliminate fraud.[4] The decision to build this system as a public-private partnership is part of the post-liberalisation policy adopted in 1998 (part of preparations for the Y2K crisis) to promote India's IT sector. These neoliberal objectives—to scale back state welfare to only the extremely poor members of the population, while promoting privatisation of critical state activities—were further encouraged by multilateral institutions like the World Bank.

India is not the only state to transform itself into a destination for capital investment by building a digital identity. Estonia, another post-communist country, also implemented these policies, developing the Estonian eID along similar lines to India's identity project. The similarities are striking, down to the words used to describe the venture. "The only thing was to push this card to the people, without them knowing what to do with it, and then say, 'Now people have a card. Let's start some applications,'" according to Tarvi Martens, the architect of the Estonian eID.[5] Estonia transformed itself into a digital republic by pushing a digital ID on its citizens and building applications on top of it for day-to-day usage. India, likewise, neglected to explain to the general public why a digital identity was necessary, and simply made it a requirement to receive state welfare; in the meantime, the digital identity became intractable through function creep, as it expanded into every citizen activity.

By building applications on top of the digital identity, the state pursues its goal to digitise every single governance application. Still, there is a major difference between India and Estonia in their proposed use of data. Estonia leveraged its digital identity to build an e-government platform called X-Road in order to allow data sharing between government departments.[6] Estonia built certain safeguards into these systems using certain computational principles, such as granting ownership of data to citizens, or storing data only once in a single database, called the "once-only" policy. Like X-Road, India's new e-government platform, called India Enterprise Architecture, will interlink all government databases using Aadhaar.[7] However, in India the government assumes ownership of data and uses a different computational principle, known as the "single source of truth," to build an integrated master database.

The unstated goal of e-government platforms is to build databases about the population and its habits with information from a broad range of state-run registries for land, social security, vehicle, voters, financial credit, health, agriculture, and more, extending into every possible sector to collect data using government regulations. But these databases are not merely concerned with data. They are also tools to organise society using e-government platforms in ways that have particular consequences for minorities and the digitally illiterate. The design architecture and implementation of these systems tend to be closed, and are only made open to private capital so that it can access data for profit. The errors and failures in these computational systems result in the exclusion of India's poor and vulnerable: the havoc created by the poor design of systems for accessing state welfare should be taken as a warning sign.

The rise of surveillance capitalism, through the platforms and infrastructures built for digital economies, is turning citizens into mere numbers in a database. It takes away people's autonomy to make decisions in a democratic framework, and reduces their capacity for self-determination by pushing them to serve the economic goals of nation-states and venture capitalists. The pursuit of economic development cannot come at the cost of individual freedoms and civil liberties in the new data economy. Surveillance capitalism manipulates us by presenting optimum economic decisions based on the most intimate secrets of our personal lives, which are being traded away by the government instead of being safeguarded.

The data infrastructures currently being built are termed as digital public goods, and the APIs of these systems are called the information highways of the fourth industrial revolution. But this portrayal omits the process of privatising traditional governance systems and handing over control of public goods to Big Tech through public-private partnerships. The loss of public goods to the tech sector will be a costly affair; the Covid-19 pandemic, for example, has shown us the importance of universal public health systems, which Big Tech is unlikely to provide.[8] Selling off public goods under surveillance capitalism, with the sole priority of economic gain, would be catastrophic for public welfare. This process privatises not only state assets but even our bodies, the source of the personal data required by surveillance capitalism.

Forcing the user into this process of digitisation thus amplifies social and structural inequalities in

various societies. Without the right protections and laws governing digital society, these systems grant corporations tremendous power over users through surveillance capitalism, enabling private interests to constantly monitor us and find ways to exploit us. We are already aware of the dangers of Big Tech's power over our daily lives; this coordination with the state would only intensify the "new normal." The data industry complex emerging between private firms and states is taking away our rights globally, transforming us from citizens into mere consumers.

The state's interests in contorting its relationship with citizens in order to attract foreign capital for economic growth has gone too far. India is in the middle of building a Health Stack, Agricultural Stack, Skills Stack, and National Urban Innovation Stack, digitising every individual sector on the basis of digital identity in order to hand over citizens as commodities. Promoted by the World Bank and its Identity Alliance and Identity 4 Development programs, these intense data collection systems are now being exported to other developing nations, citing both Estonia and India as best practices.[9] Independently, India has begun exporting these technology systems to other countries; agreements with Morocco, Ethiopia, and the Philippines are already in place. India's domestic IT sector is increasingly colonising other nation-states with the help of the Indian software firms building these data infrastructures.

India wants to compete with American and Chinese Big Tech by promoting a domestic Big Tech that could supply data infrastructures based on digital identities to the rest of the world.[10] The aim is not merely to build individual digital identity systems, but to interlink these national digital identity systems into a global digital identity super-system.[11] India has already made such proposals, for example to use digital identity to manage Covid immunity passports for global travel is being debated. Indians are currently being forced to submit an ID to a centralized vaccination registration platform, which will issue these vaccine certificates. This platform has been proposed and built by the very same set of private actors and capital which stands to gain from the transformation of the country into a digital health industry.

As these platforms are pushed onto global citizens, one can only hope that resistance will emerge towards Big Tech and the grand plans of capital. In the context of governance, the user is fundamentally a citizen, not a consumer, and it is important to protect this distinction. Thankfully, other countries are learning from the growing resistance towards Aadhaar in India. The dissenting opinion in the judgment on Aadhaar in India's supreme court has already paved the way for Jamaica to stop its digital identity project.[12] The restrictions on the private sector's use of Aadhaar established by the majority judgment constitute an important win, which may encourage other countries to limit the onslaught of surveillance capitalism on society. Citizens need to renegotiate their social contract and rights in the new digital economy being forced on them today.

January, 2021

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CUT TO BLACK.

13 **EXT. THE MOON** 13

Stock footage of the moon from the earth.

POET (V.O.)
Al Atlal, the desert traces or ruins is one of the major themes of Arabic poetry...These old poems called Qasaid usually end as petitions to patrons, but they almost always start the same...the lonely lover is in pursuit of the distant beloved.

CUT TO:

14 **EXT. THE MOON** 14

Lunar desert.

POET (V.O.)
Crossing desert, they come to an abandoned encampment and directly address the traces they find in the sand -

The footprint from the moon landing.

16 **EXT. THE MOON** 16

A shot of earth, the pale blue dot from the moon.

POET (V.O.)
These remains conjure nostalgic memories in the ashes of a home fire, the poet can never return. Love has taken them and they have taken us to the tender point of ruin...

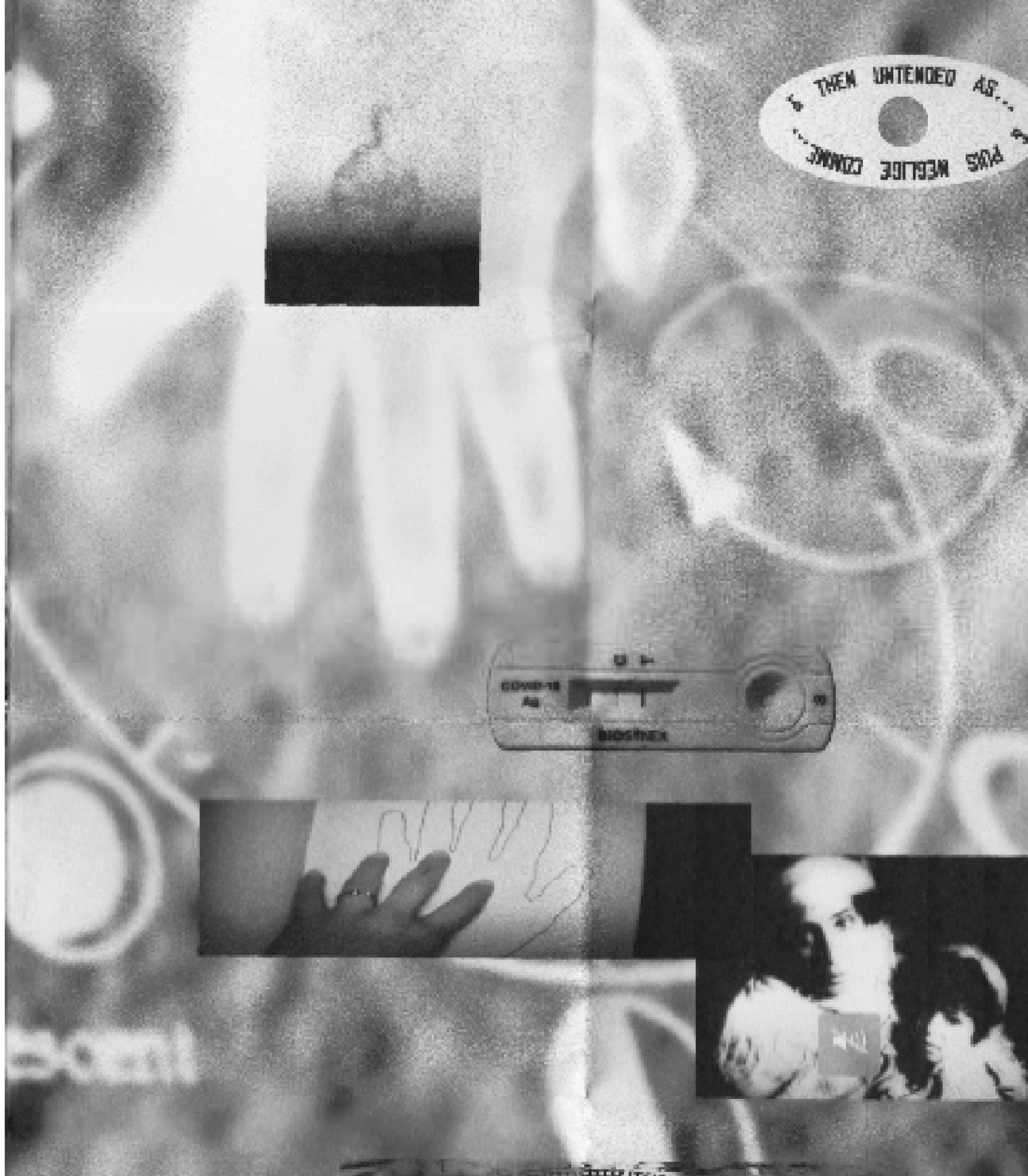
16 **EXT. EARTH** 16

Aerial views of junglee passing. Forests. The greenness of planet earth.

The tower of silence in Mumbai where Zoroastrians sky bury their dead. A base flute weaves our way back to land.

Since the pre-Islamic Jahiliya, the Gulf has been chronicled by its poets: Storytellers as history's recitators and the future's makers. But unlike many of the great narrative traditions, our bards skipped the formality of the written word and jumped directly from retelling aural tradition in poetry to living AV possibilities through their top-of-the-line mobile camera phone. In Dammam, Doha and Dubai the phone-cameras are always capturing. The Bluetooth is always on. The collectively sung and recorded epic is told unconventionally by a million faces on a million screens, each outfitted with the tool to tell with but stripped of the ability manipulate fate or change the conclusion. And the last event that went unrecorded? The moment of collapse." - the gaze of sci

fi Wahabi, Sophia Al-Maria, 2007



SOPHIA AL MARIA KHARABIT COMPASS

kharabit compass

SOPHIA AL MARIA

Sophia Al Maria's work is a critical analysis of our relationship to time and geopolitics through experimental fiction. She explores the notion of the self coined term 'Gulf Futurism'. In her writings, the Sci Fi Wahabi, Al Maria's alter ego, analyses the Gulf as ground zero in a heedless industrialization, financed by the global addiction to fossil fuels, that has set the planet on an irreversible path to extinction. In *kharabit compass*, Al Maria presents a mapping of the Arabian Gulf as experienced by her alter ego. The fictional character critically investigates the relationship between technological and industrial advancement in the Gulf alongside the accompanying extreme economic inequality and religious repression. Out of this, an alt-reality arises, both subjective and subversive. *kharabit compass* starts from a preoccupation with the detritus of the data collecting on our phones like dust—and the ways in which the data detritus in the cloud and in our memories are forming dunes; they form deserts inside of us as users. The mobile phone is being presented as a portal through which private and forbidden desires take a virtual form and can be virtually shared. Overlaid over satellite views of the desert, the work presents Al Maria's own digital detritus. Here, it is not space junk, but data junk plummeting to earth.

Sophia Al Maria. *kharabit compass*, 2021.

Comic Strip

SARAH WAISWA AND KEDOLWA WAZIRI

F Fatuma - small sister
A Abuba - nubian word for grandmother
S Saum - Kedolwa
Y Yusuf - The Vendor

F *I think we might be going back to school soon. The school called Abuba and told her we might be called back any minute now.*

S *I really don't understand the rush. We are in the middle of a pandemic. School can wait.*

F *Yeah... but you know how these things go. I am really, really going to miss Abuba's cooking. I was just telling her today that she should make gurusa and bamia mafruq for supper today.*

S *And she agreed? You know making gurusa is a whole process.*

F *Well, she said she would, but we need to go buy ingredients, so actually we should be heading to the market, so that we get the freshest okra. Let's go!*

S *Okay let's go.*

F *Yay!*

S *Oh noo!*

F *What?*

S *I just realized that I don't have any cash on me!*

F *You can just use lipa na mpesa, right?*

S *Well yes, I can and I will, but not so many people around here have that option. For many Nubians, mobile money is actually a privilege.*

F *What do you mean?*

S *Well, to have mobile money, you have to have an identification card. However, getting an ID card is difficult for Nubians because of how successive governments have maintained a legacy of discrimination, from colonial times. Our community is marginalized.*

The colonial past very much manifests in the current underlyings of the state. Nubians came to Kenya in the late 1890s from Sudan. They were brought by the British as soldiers in the King's African Rifles (KAR). Even after Nubains provided excellent service and dedication in both world wars and in the expansion of the empire in Africa, they would neither be given the permission to go back home to Sudan nor title deeds in the areas that they were resettled; Kibra in Nairobi, Mazeras in Mombasa and Kibigori in Kisumu.

F *What does that mean? What does marginalization look like?*

S *A Kenyan citizen enjoys many rights, as long as you can prove your citizenship, and you can prove your citizenship through various documents, the most important, and the hardest to get for Nubians, is the ID card. Without an ID card, you are excluded from many basic and civic rights like voting, higher education, legally marrying, legally dying, insurance, affirmative action, SIM registration, international travel, mobile banking services and so many more.*

Under Kenyan Law, Nubians should have automatically received citizenship at the onset of what is regarded as independence like all other communities residing in Kenya. Instead, Nubians are still regarded as foreigners and categorized under 'Alien.'

F *So what happens when you go to apply for an ID card?*

S *Nubians go through a very humiliating process known as vetting. You are presented before a council of elders and a magistrate, asked to provide various documents, such as grandparents' IDs and birth certificates, which don't exist in most cases, immunization cards, and others which are not asked of other communities.*

S *Naweza lipa na mpesa?*

Y *Hakuna shida.*

S *Shukran. Okay let's get home. Abuba must be waiting for these things.*

F *Did you have to go through vetting?*

S *Yes I did. It's in the past but the memory is still raw and painful. I have been hoping and praying that you and all the generations after me will not have to go through the same fate. I am getting especially worried. You are 16 now, in 2 years, you will have to start this process of proving you belong, and your fate will be at the mercies of an exclusionary state.*

F *We're back! The market was good. We found the freshest Bamia at Mzee Yusuf's.*

A *That's good, now leave the cooking to me. You sit and rest.*

F *Abuba, my sister was telling me about how hard it is to get IDs for Nubians. I didn't know, and we aren't taught in school!*

S *It's really not something that you can be taught in school. Here, let me show you this book that talks a bit about this issue, with a visual map of Nubian presence in Kenya. Abuba might know some of the people in these photos.*

A *That's Mzee Sebe! I knew him when I was a young girl. Most of the people in these photos are dead, they died and there's no evidence that they ever lived. Many Nubians just die and it's like they never existed, no papers.*

Lack of legal recognition means that the lived experiences of Nubians are flattened by marginalization, exclusion and othering. This othering means that Nubians exist at the margins of social, economic and political freedoms. It means that Nubians live and die without existing.

F *So what has been happening to the people who have died in our family?*

A *We ask around for anyone who has been lucky enough to have an ID then we use their documents to try and get a burial permit. The government*

DOESN'T LET YOU LIVE, THEN DOESN'T LET YOU DIE, BUT WHEN YOU DIE YOU NEED PERMISSION TO BE BURIED IN THE LAND THAT YOU HAVEBEEN DENIED. THIS HAP-PENED TO YOUR FATHER. WE USED MZEE HAMSA'S ID TO GET HIS BURIAL PERMIT.

Digitalization of identities in Kenya, coupled with the blatant lack of data protection laws and data security, is at present a tool to further entrench institutionalized discrimination and exclusion. It has the potential to undermine the rights of all Kenyans, and marginalized communities are especially at risk. Participation in more that 15 civic, social and political aspects of daily life will permanently be out of reach for Nubians. The consolidated nature of Huduma Namba also means that Mzee Hamsa's ID can no longer serve multiple people and purposes. NIIMS also stands to fragment Nubian relationships within the community and further alienate Nubians from other Kenyans.

S *THE SAME BURIAL PERMIT THAT ABUBA IS TALKING ABOUT IS THE ONLY DOCUMENT I HAD THAT PROVED DAD'S EXISTENCE. IT IS ONE OF THE THINGS I PRESENTED TO THE CHIEF THEN TO THE VETTING COMMITTEE.*

F *SO WILL I ALSO HAVE TO USE IT?*

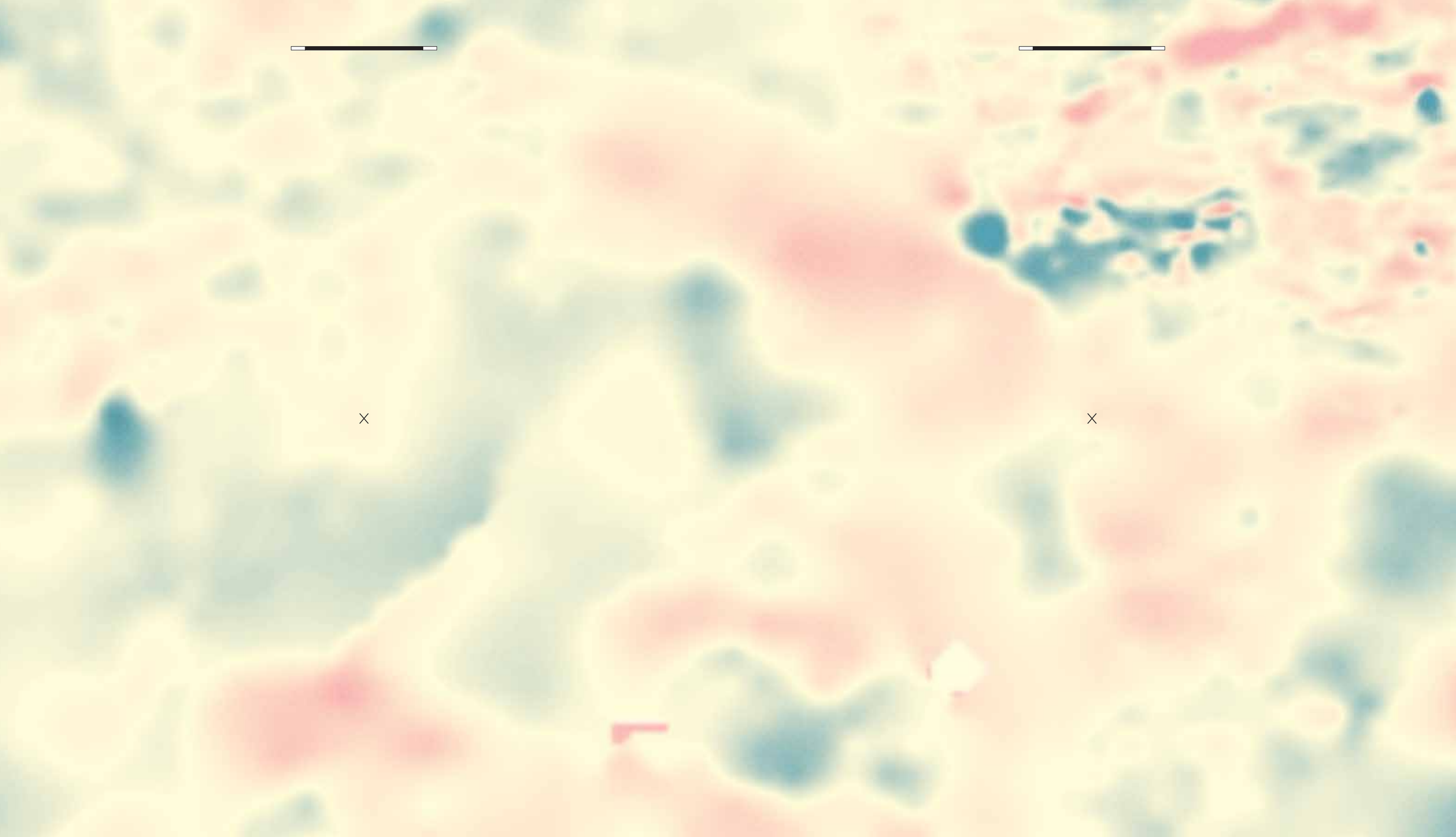
S *MOST PROBABLY, BUT WITH THE INCOMING HUDUMA NAMBA SYSTEM, IT MAY BE HARDER FOR YOU AND OTHER NUBIANS TOO.*

A *I HAVE NEVER OWNED ANYTHING. MY HOUSES ARE EITHER TAKEN BY THE GOVERNMENT OR MALE RELATIVES WHO HAVE IDENTIFICATION DOCUMENTS. I WAS THROWN OUT OF THE HOUSE WHERE YOUR FATHER DIED, WHERE I LOOKED AFTER BOTH OF YOU WHEN YOU WERE CHILDREN...*

Nubians have constantly begged successive governments for title deeds. In 2017, the current government issued title deeds to some Nubuans, but with only a few Nubians possessing identification documents, the ones who got the title deeds are few and spread out, meaning that this historical injustice remains.

F *SO DOES ALL THIS MEAN THAT I MAY NEVER GET TO USE MOBILE MONEY?*

S *IF THE SHORTCOMINGS OF THE CURRENT ID SYSTEM ARE NOT ADDRESSED, AND NIIMS IS ROLLED OUT AS PLANNED, A LOT OF THINGS, INCLUDING MOBILE BANKING WILL BE INACCESSIBLE TO NUBIANS AND OTHER COMMUNITIES AT THE RISK OF STATELESSNESS.*



New Extractivism

An assemblage of concepts and allegories

VLADAN JOLER

This is an assemblage—an assemblage of concepts and allegories.

The word assemblage is usually understood as a collection or gathering of things or people, a machine or object made of pieces fitted together, or a work of art made by grouping together found or unrelated objects. This map and following footnotes are precisely that: one big messy assemblage of different concepts and ideas, assembled into the one semi-coherent picture or let us say a map, a world view.

Presented concepts are mostly represented here visually in the form of the allegories. Dictionaries will define allegory as a story, poem, or picture that can be interpreted to reveal a hidden meaning, typically a moral or political one. All of those allegories and concepts together joined in the form of an assemblage are creating together a blueprint of machine-like, superstructure, or a super allegory. In that sense, what we have here is an almost fractal allegorical structure—allegory within the allegory within the allegory.

This work takes three forms that hardly can function independently. Map—that try to present the superstructure or overall view; Guide—that deals with the individual concepts and allegories; Footnotes—textual descriptions of the presented concepts.

1. Gravity

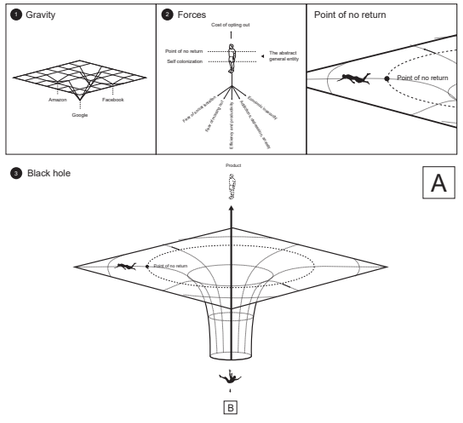
French artist Louise Drulhe[1] introduces the notion of gravity in thinking about the topography of the internet. Like Einstein's theory of relativity, the massive objects in space, proportionally to their weight defined by the number of their users and content, curve the space and time of this virtual universe. So we can think of massive monopolies and conglomerates such as Google and Facebook as the enormous black holes that, with their gravity, create a field so intense that attracts and swallows the content and users.

2. Forces

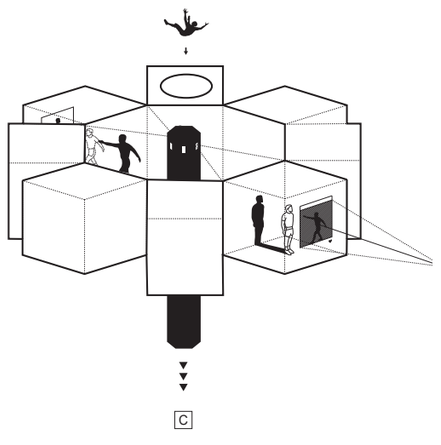
We can claim that many other potential vectors and social forces contribute to that force. Fear of social isolation and missing out; economic and professional insecurity; unrealistic expectations of efficiency and productivity in adapt or die environment; tailored addictions, depression and anxieties; and reputation economy systems are just some of the other vectors that constitute social forces that keep us, with or without our wish, attached to those platforms. Opting out became a privilege that requires a supernatural human being who can economically afford to opt-out and exist at the level of nirvana-like strength and peace to overcome all of those challenges. "The social cost of opting out has become so high that opting out is essentially a fantasy" (Brunton and Nissenbaum).[2]

3. Black Hole

Our imaginary hero, or what Federico Campana will call the abstract general entity (AGE),[3] is swimming against one of those platforms' gravitational force. As she floats along, imperceptibly, the stream gets faster and faster even if he can't see the hole yet. He could swim to safety until, without even noticing it, he crosses the point of no return. As they glide towards the singularity defined by the mass of these giants, users and content pass beyond the event horizon, the imaginary boundary in time/space, beyond which there is no return to the outer part of this universe. The event horizon defines the line after which the social and economic price of leaving those platforms is becoming too high. No matter how fast he tries to swim now, the stream will pull him towards the center of the black hole. Without even noticing, this story's actor is now falling towards the hole into the new allegory—the cave.



Gravity, Forces, Black Hole



Allegory of the cave, Platopticon

4. Allegory of the Cave

What takes place at the bottom of this metaphorical black hole can be described through Plato's allegory of the cave.[4] Plato describes a group of people who spend their entire life chained to cave walls looking into an empty wall. These people are watching the shadows of real objects projected on this wall, giving them names and meanings. In our story, the script and directing of this performance of shadows are entrusted to human-algorithmic machines that regulate, filter, censor and moderate the projected content on the walls of the cave. The existing elements and content that exist outside this cave and horizon of events create an information flow, a theatre of shadows. Or, what Guy Debord[5] will describe as: an immense accumulation of spectacles consisted of images, sounds, text, emotions, and meanings. All that once was directly lived has become mere representation.

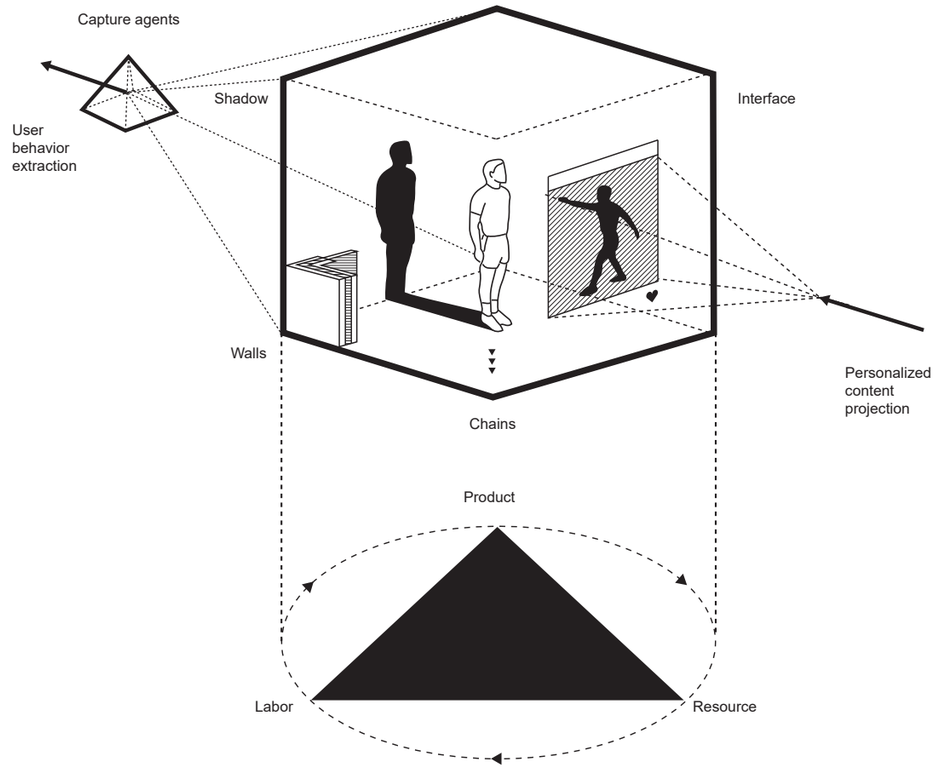
5. Platopticon

However, this is not a single play, but a multitude of simultaneous and different performances. The gravity of these techno giants hold billions of users/workers/products at the bottom of those caves. Each user detained in their own cave is exposed to a designed play adapted only to them. This self-centered personal space is filled with images and meanings selected by algorithms partly with respect to its affective and cognitive reactions. The user is in a specific closed circle, communicating with oneself in a particular form of self-stimulation and exposed to a constant flow of spectacle. Therefore, this cave or prison cell is a place of pleasure from which, as in Plato's cave, the prisoner does not even have the will to come out.

In this assemblage of allegories, millions of caves or prison cells form the unique and invisible panopticon structure.[6] The central tower of this structure has two main functions: (1) to project the content on the walls of the caves and (2) to surveil and capture the digital shadows of the prisoners reflected on the opposite wall.

6. Cave Architecture

Cave and tower walls are constructed of multiple opaque layers and built mostly by ghost work[7] or



Cave architecture, Digital labor triangle

invisible labor. The bricks of this structure are made of black boxes, closed code, and hardware, glued with the invisible network infrastructure. They are covered with layers of corporate secrets, patents, and copyrights. The prisoner is standing in the middle of the cave facing the interface.

Interfaces are framing and structuring the projected algorithmic spectacle of images.
The interface is the office cubicle of immaterial labor. Even though they are a direct manifestation of rules, regulations and taxonomies they successfully obscure what is hidden beneath them. They define directly or indirectly what we can or cannot do. They are both tools and discursive frames. They are instituted as an order of discourse and embodiment of the discipline power of the platform.

The spectacle of a constant flow of information projected through the interface creates a digital shadow on the opposite wall of the cave. The projected digital shadow on the wall is a resource field where thousands of capture agents, tentacles of rhizomatic surveillance complex, extract information.

7. Digital labor triangle

This cave is not only a panopticon prison cell, but it carries out the function of a factory hall and a resource extraction apparatus. The prisoner/worker performs his three-fold function of a worker, a resource, and a product.[8] Cave prisoners constantly attached to digital platforms carry out different forms of mostly immaterial and rarely paid labor such as scrolling, liking, sharing, commenting, or creating content (labour side of this triangle). At the same time, every movement or emotional reaction is being recorded continuously. This data is becoming a resource for different forms of exploitation. Finally, by consuming the content projected at the walls of the cave, this user is ultimately a final product sold to the advertisers.[9]

8. Information Retrieval

From each cell-cave and through the core of the panopticon tower streams of information are flowing into one of the central structures of this image—data bank. In the Orwellian universe, this structure is known as the Records Department within the Ministry of Truth.[10] In Terry Gilliam's *Brazil*[11]—Information Retrieval. The data bank is not just the engine room, but the power itself.

From here, we are examining three processes crucial for this story. On one side, extracted stored and analyzed personal data is shaping the multidimensional portrait of the individual. On the second, all the products of the user labor are being stored, analyzed, ranked, and forming the information spectacle of images, meanings, reputation. Furthermore, in the third one, this structure lays upon the top of the exploitation of human minds, bodies and nature.

9. Creation of Dividuals

In his famous essay "Postscript on the Societies of Control," Deleuze[12] envisions a form of power that is no longer based on the production of individuals but on the modulation of dividuals. Individuals are deconstructed into numeric footprints, or dividuals, that are administered through "data banks." Our online behavior is captured, processed, and deconstructed into the statistical vectors, clusters, patterns, and anomalies. Each move we make is carefully analyzed by thousands of mathematical functions, algorithms, and machine learning systems. This system does not see us through linear narratives emerging from our browsing behavior, metadata, or movements in physical space but as n-dimensional statistical projections. Each and every of our clicks sharpens the resolution and complexity of this abstract and constantly changing statistical portrait or data body.

10. Multidimensional portraits

This multidimensional data portraits of the individual, consisting of millions of data points in hundreds of dimensions, can be seen as what Deleuze will name—dividual. "A physically embodied human subject that is endlessly divisible and reducible to data representations via the modern technologies of control"(1992).[13] The Critical Art Ensemble is describing this data body as "the fascist sibling of the virtual body, a much more highly developed virtual form, and one that exists in complete service to the corporate and police state."[14]

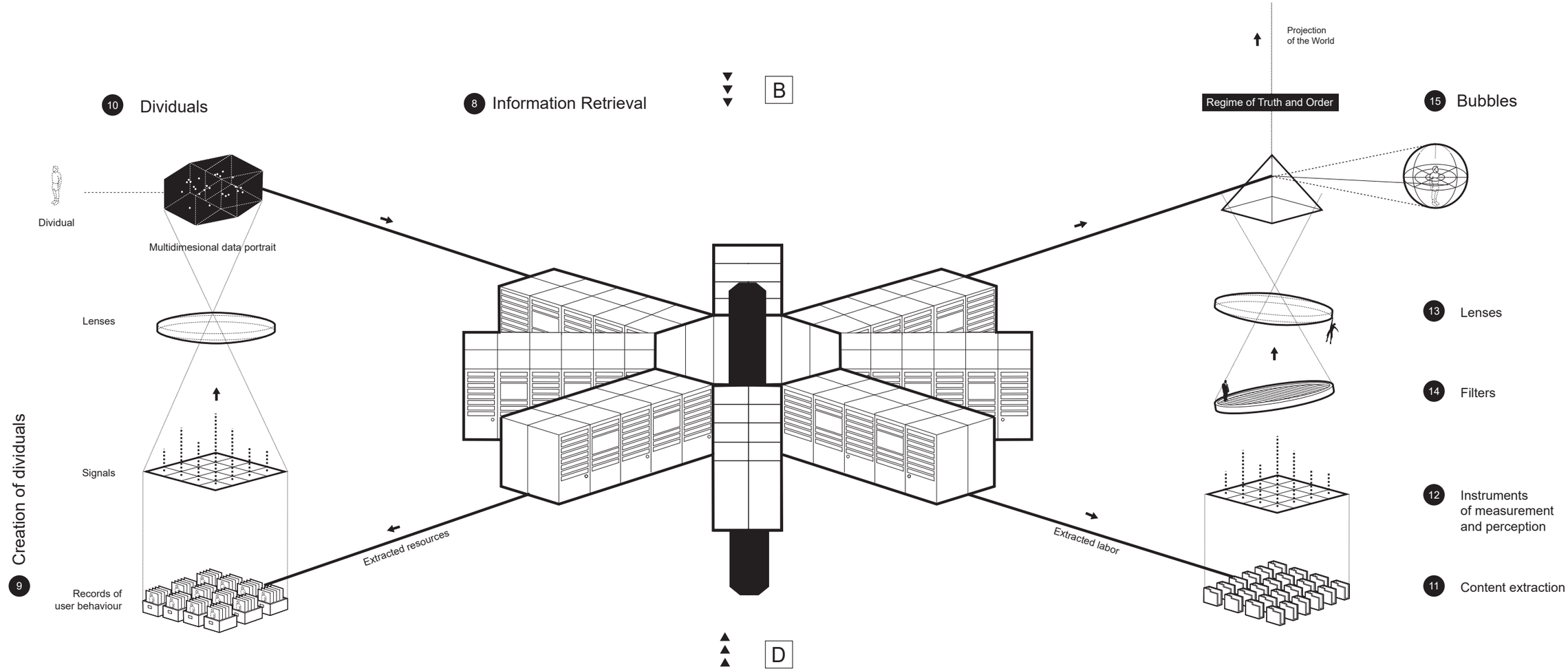
The full picture of our dividual being or data body is not centralized at one place but is spread across hundreds of data centers in the rhizomatic assemblage of the surveillance economy and government actors. This non heterogeneous and dispersed assemblage portrait exists through the system of data dealers, official and unofficial exchange of data in constant flow.

As described by Marco Deseriis in *The Politics of Condividuality* "..dividual is always open to interaction, always ready to be detached from and attached to other dividuals. Thus, as compared with the individual—which prides itself of its unique properties—the dividual has the advantage of being combinable with other divisible beings that share some properties with it."[15]

In the words of Matteo Pasquinelli, "The dividuals do not simply describe an atomized subject but make possible the posthuman consolidation of collective agents as condividuals, or as superjects."[16]

11. Content extraction

All products of digital labor (comments, texts, books, images, videos) are being harvested by content platforms and a multitude of different capture agents. Each web page or other piece of content that is being captured "in the wild" is rendered and analyzed. This



Information Retrieval, Creation of individuals, Dividual, Content extraction, Instruments of measurement and perception, Lenses, Filters, Bubbles

content is being extracted into hundreds of different signals processed through the algorithmic lenses that will later determine the position and role of this page in their Order of Things and their Projection of the World.

12. Instruments of measurement and perception

Collected content and extracted data become a permanent corporate resource for creating multidimensional, dynamic, complex topologies in which every piece of data becomes an object that is contextually linked to other objects. Within this map, this new meta-territory, crawl hundreds of different mathematical functions, algorithms, and neural networks that we can call as in the Nooscope diagram and essay: "Instruments of measurement and perception."[17]

13. Lenses

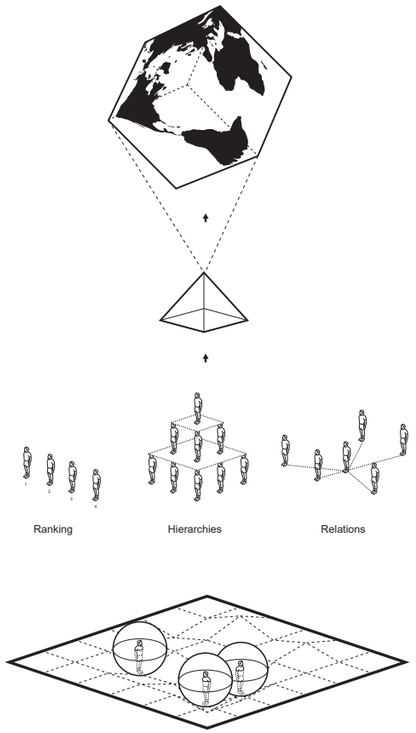
"Instruments of measurement and perception always come with inbuilt aberrations. In the same way that the lenses of microscopes and telescopes are never perfectly curvilinear and smooth, these logical lenses embody faults and biases. To understand machine learning and algorithms and register their impact on society is to study the degree by which social data are diffracted and distorted by these lenses."[18] The shape of the algorithmic lenses is carefully crafted to project the image that is in accordance with the platform's financial interest and political goals and values.

14. Filters

Aside from instruments of digital truth and order embodied in their algorithms and neural networks, platforms often imply direct rules and regulations. They have direct power of regulation of what can be seen or said, what kind of content can and cannot exist in their universe. Here we are visually representing those rules and regulations as filters. Similarly to the algorithmic lenses, the fabric of those filters is crafted according to the platforms' financial interests and political goals and values.

15. Bubbles

The flow of the spectacle is not a single stream but billions of personalized streams of images, sounds, and



Bubbles, Projection of the World

meanings. Based on the multidimensional portraits of the individuals, algorithms, and neural networks are carefully directing personalized plays for each user. In this simulacrum,[19] our main actor is a center of a small universe in which his or her opinion and attitude matters. Users trapped in their bubbles/caves are positioned within different algorithmic and statistical territories. Mountains and valleys of those multidimensional ever-changing invisible landscapes are clustering individual bubbles and creating new relations, taxonomies, and ontologies.

16. Projection of the World

Instruments of measurement and perception, are ranking, defining hierarchies and relations between content, users and meaning. They define the digital regime of truth and order. This regime is a prism through which the world is projected in the form of the constant stream of spectacles at the walls of the caves.[21]

17. Engines of extraction

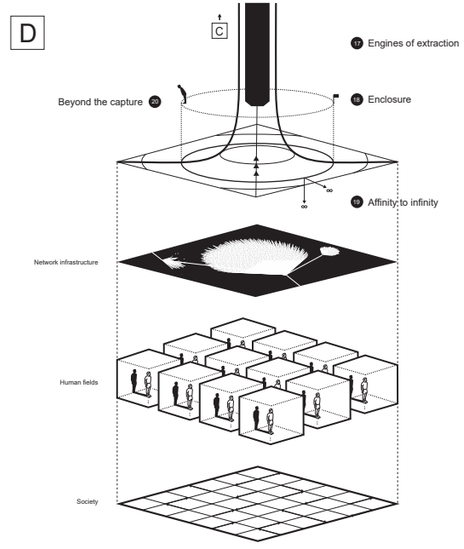
Empowered by the digital extractivism tools of the information age, everything becomes the potential frontier for expansion and extraction. From the depth of DNA code, every single cell of the human organism, vast frontiers of human emotions, human behavior, social relations to nature as a whole—everything becomes the territory for the new extractivism. As we point out in the Anatomy of an AI,[22] at this moment in the twenty-first century, we see a new form of extractivism that is well underway: one that reaches into the furthest corners of the biosphere and the deepest layers of human cognitive and affective being. Thousands of corporate and government actors compete to stick their flags into the uncharted territories of our behavioral, emotional and cognitive landscapes, invading deeper and deeper into our bodies and minds. Once the territory is invaded, the process of enclosure and exploitation is established.

18. Enclosure

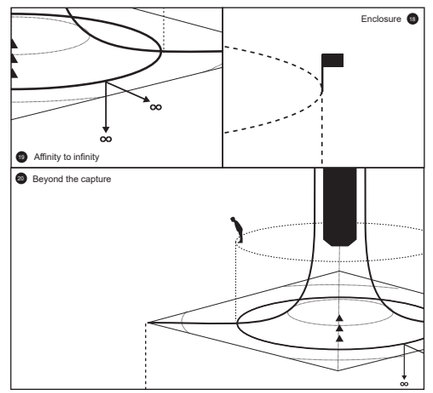
"The 'enclosure' of biodiversity and knowledge is the final step in a series of enclosures that began with the rise of colonialism," Vandana Shiva explains.[23] However, new forms of extractivism are expanding into the territories far behind the biodiversity and knowledge enclosure. This is why we are not speaking anymore just about the knowledge economy but about the attention economy, emotion economy, and many other "new economies" being born from the invasion of new territories of extraction.

19. Affinity to infinity

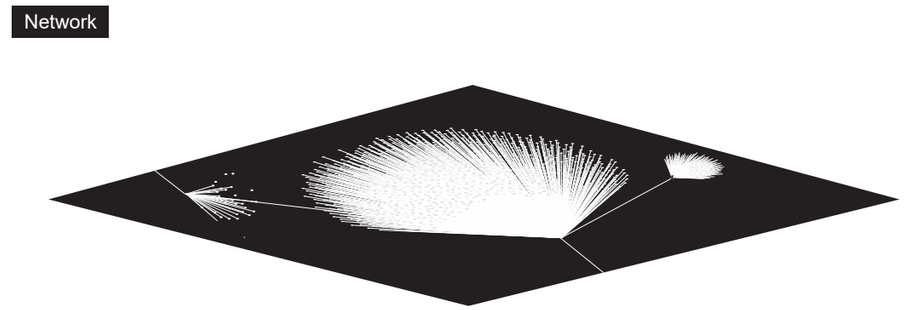
In his essay "Presenting The Unpresentable: The Sublime,"[24] Jean-François Lyotard introduces the phrase "affinity to infinity." In his view, the fields of contemporary art, techno-science, and capitalism have the same

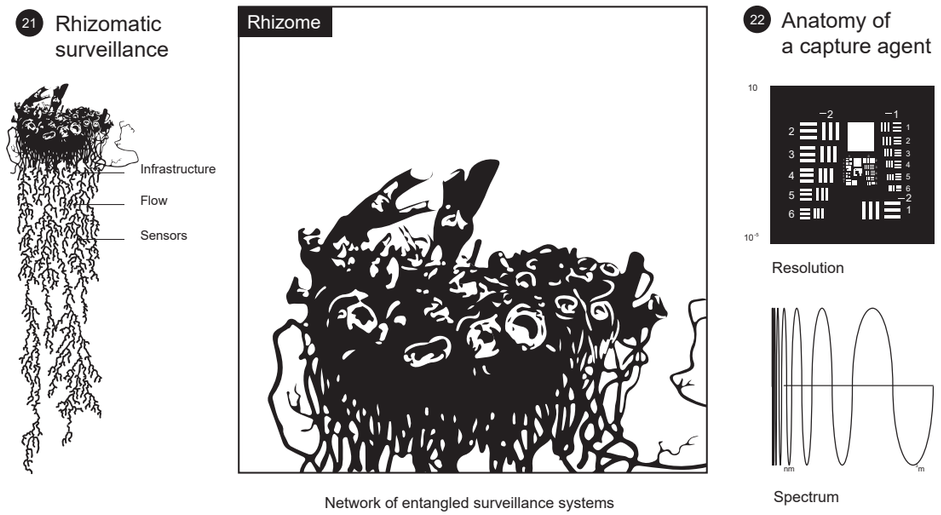


Engines of extraction, Enclosure, Affinity to infinity, Beyond the capture



Enclosure, Affinity to infinity, Beyond the capture





Rhizomatic surveillance, Anatomy of a capture agent

aspiration: to push boundaries towards a potentially infinite horizon. In the transition to the information age, capitalism was given a chance to satisfy its affinity for infinity, form and conquer an infinite number of new territories, create new mechanisms for the accumulation of capital within these new spaces, and formulate new forms of exploitation.

Here we see a contemporary embodiment of the story "On Exactitude in Science,"[25] written by Borges in 1946. Whether we talk about indexing of the entire online world, digitizing all the books that have been printed so far, mapping the entire globe or mapping people through their profiles, we talk about the tendency of those companies, in their affinity to infinity, to create the maps that cover the entire Empire.

20. Beyond the capture

We are standing at the imaginary edge and looking into the land beyond limits of extraction. The land outside their capacity to capture, conquer, and commodify. Is there any word or meaning that is not captured by this gigantic meta-structure and millions of their synthetic spiders and sensors capturing multiple aspects of reality? How can we investigate but not hurt those fragile words or meanings that somehow escaped the capture process? How can we speak about them without exposing and capturing them? How do we care for and cultivate ecologies that exist beyond the border of capture?

21. Rhizomatic surveillance

Planetary scale surveillant assemblage[26] is one of the critical infrastructures behind new extractivism practices. Thousands of corporate and government actors are independent of each other, collecting information about us. Through the invisible network of data dealers, public and not public partnerships, those pieces of information are in the constant flow forming one functional entity. Surveillant assemblage can be seen as a rhizomatic structure described by Deleuze and Guattari.[27]

22. Capture agents

At the end of each of the rhizome's roots, tentacles of the planetary surveillance rhizome, there are one or many sensors—capture agents. They can take many forms and sizes. From the tiny pieces of code, crawlers that wander the web collecting information about each web page, over the sensors catching heartbeats and surveillance cameras capturing our faces, to the complex network of satellites orbiting Earth and locating devices. They can see reality through a full range of electromagnetic spectrum: from gamma rays and x-rays, over infrared and visible light to micro and radio waves. They can be invisible as a Facebook pixel or massive as a 500m wide radio telescope.

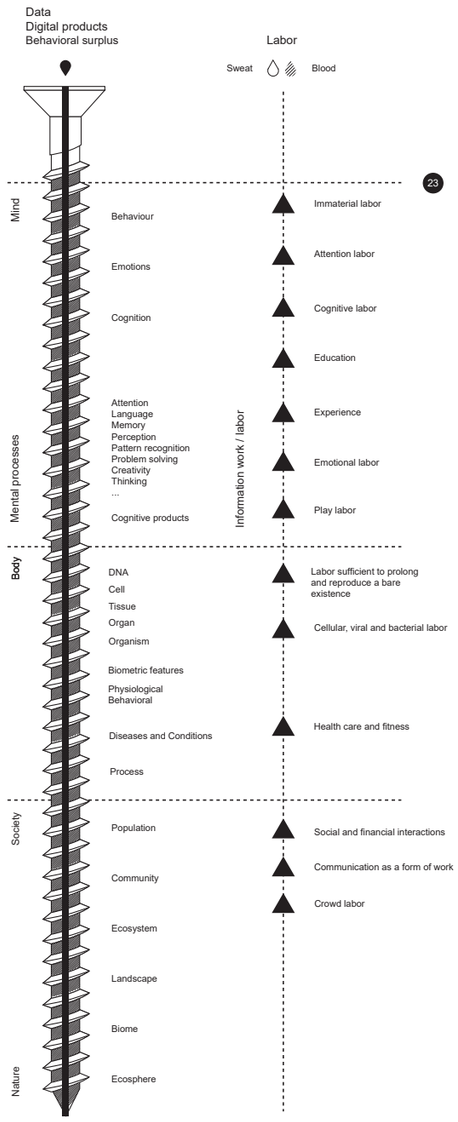
23. Body and mind as territory

In our anthropocentric world, the territory of the human body and mind is one of the most explored and exploited extraction strata. The process of quantification is reaching into the human affective, cognitive, and physical worlds. Every form of biodata—including forensic, biometric, sociometric and psychometric—are being captured and logged into databases for AI training, psychological profiling, nano targeting, and many other forms of data exploitation.

This crusade is not just about the quantity of data but also about the quality and diversity of data in order to achieve a full spectrum of color and resolution of our multidimensional portraits that they are painting. Furthermore, as Pasquinelli[28] pointed out, the process of extraction of "analytical intelligence" from the most diverse forms of human labor and transfer of such intelligence into a machine is another crucial part of the process.

24. Digital Labour

In 1750, Diderot and d'Alembert[29] published the first volume of the Encyclopédie, which set out to cover each and every branch of human work. Two hundred thirty years later, that kind of endeavour is much more difficult since labor is nowadays being obfuscated, hidden behind layers of transparencies and complexity. As elaborated in Christian Fuchs's book "Digital Labour and Karl Marx,"[30] different forms of labor and relations are part of the contemporary production of digital technology. Slave work in mineral extraction in Congo, primitive accumulation and absolute surplus-value production at Foxon in China, body shopping of Indian



Body and mind as territory

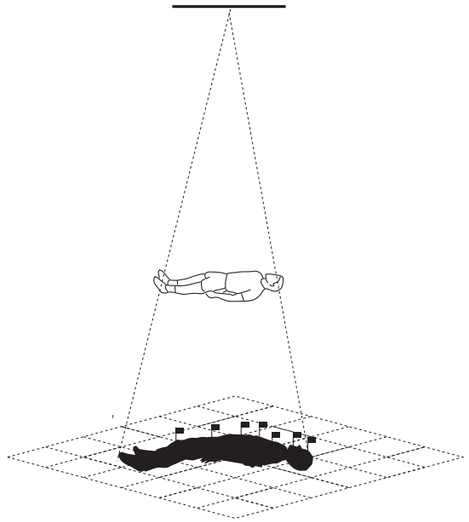
ICT workers, an army of ghost micro workers behind Mechanical Turk platform, Amazon distribution center workers in the cage, unpaid user and Google labor aristocracy are all part of the evolved triangular trade system within the planetary scale factory. Those and many other forms of labor are needed to produce and operate this planetary-scale extraction system.

25. Behavioral surplus

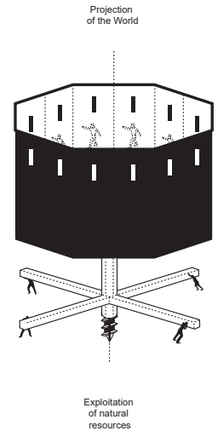
As Shoshana Zuboff[31] points out, surveillance capitalism renders behavior so that it can be parsed as observable, measurable units. Once it's rendered as behavior, it is turned into data. This is what she calls "behavioral surplus." Since our bodies, minds, and behavior are one of the ultimate resources for the new extractivism, every segment of our existence can be seen as a form of direct or indirect labor producing data as a behavioral surplus. When we breathe, walk, or sleep, every single emotion that we feel, our attention, our body temperature, or diseases that we have—everything can produce behavioral surplus if being captured by this giant surveillance apparatus. In that sense, even our bare existence can be seen as labor.

26. Digital identity labor

As pointed out by Kristian Lukić in the essay "Colonization with Love":[32] freelancers, self-employed, unemployed and all those grey areas in between that now constitute the world of labor need to spend more and more hours maintaining their profiles and offering in(directly) their expertise, experience, success stories, opinions and documentation of their works and activities, in a similar fashion like sex workers in windows of red-light districts. It takes a lot of privilege and financial and psychological stability to not participate in the reputation economy systems moderated by those platforms. Digital identity labor is forced labor of the twenty-first century, and as we mentioned before, opting out is essentially a fantasy. This creates an auto-disciplinary society specialized in the detection and targeting of human anomalies. When each anomaly is detected, it would calculate risks and decide on individual liquidities.



Digital Labour, Behavioral surplus, Digital identity labor



Fractal supply chains, Heteromation and ghost labor

27. Nonhuman labor

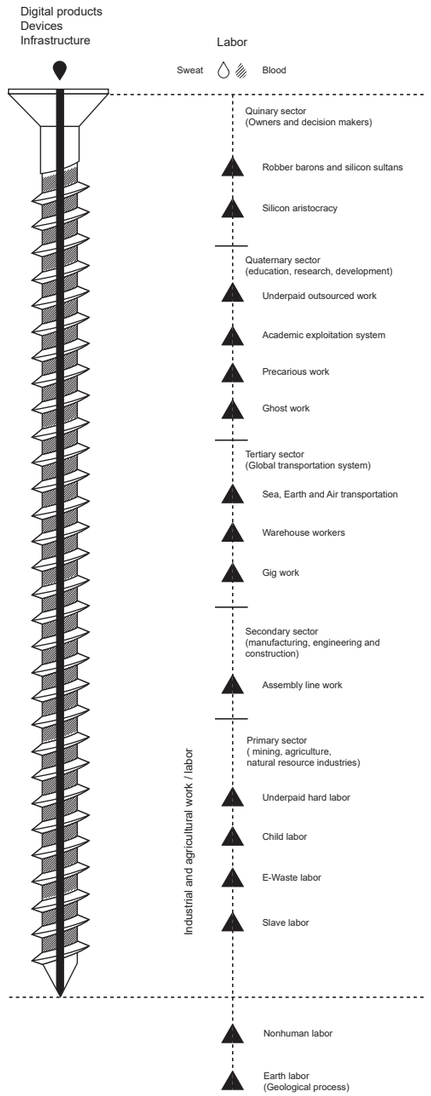
It is important to try to come out from an anthropocentric point of view and try to think of non-human labor as a part of the overall mosaic. We can zoom out into deep time and consider the labor of prehistoric plants and animals embedded in the formation of carbon that is being burned as a fuel for data centers, infrastructure and our devices. Millions of years of nonhuman labor are burned for just two hundred years of industrial spectacle. Even further, we can think of the geological process as a form of Earth labor or the process of element creation as a form of Universe labor. Nevertheless, we don't need to go so far into the past, and we can try to observe all the labor existing within the microbiome of our bodies.[33]

28. Fractal supply chains

Supply chains hidden behind the engines of extractivism are black boxes as much as neural networks or algorithms hidden behind interfaces. Californian ideology presents itself in the form of colorful, playful offices filled with all year long Silicon valley spring sunshine, where digital bourgeoisie enjoy in playbor[34] and free five star food. Analysis of the invisible layers of digital infrastructure and product supply chains, tell us a different story. In the Anatomy, we used the image of the Sierpinski fractal to illustrate the complexity of supply chains and the process of exploitation embedded in those processes. Each triangle of this fractal represents one phase in the production process, from birth in a geological process, through life as a consumer product, and ultimately to death in an electronics dump.

29. Heteromation and ghost labor

Within the fractal supply chain, we see a perpetual dance between human labor, nonhuman labor, earth labor, and automatization. As pointed out in the Nooscope by Matteo Pasquinelli, Automation is a myth; because machines, including AI, continuously call for human help. Hamid Ekbia and Bonnie Nardi call this kind of participation "heteromation."[35] Another term for this invisible human labor embedded in almost every phase of the production process is—ghost labor.



Nonhuman labor, Fractal supply chains

30. Blood, sweat and toxic lakes

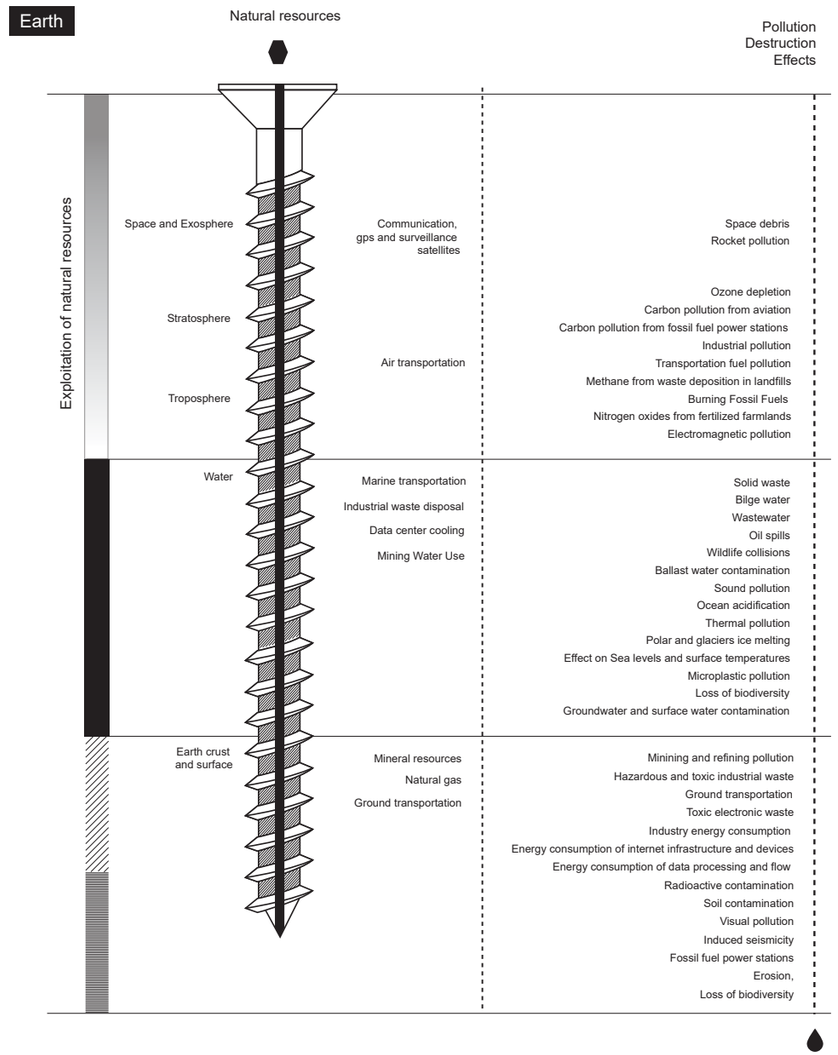
"I wish to God these calculations had been executed by stem!" said Charles Babbage and developed his plans for the Difference Engine in summer 1814.[36] More than 200 years later, engines of new extractivism are still running on burning coal and human sweat. Every click or swipe we make online creates one little hole in the ground, filled with toxic waste and toxic clouds. Every movement of materials and data within the planetary scale factory has its own hidden price. Supply chains are optimized towards maximizing profit for a few, while the real costs of destruction that follow are shared between all the living entities on the planet in the present and the future. In the words of Mckenzie Wark, "The Anthropocene is a series of metabolic rifts, where one molecule after another is extracted by labor and technique to make things for humans, but the waste products don't return so that the cycle can renew itself. The soils deplete, the seas recede, the climate alters, the gyre widens: a world on fire."[37]

31. Expanding the gap

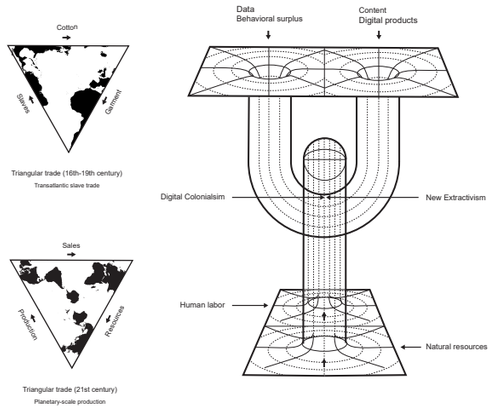
In H.G. Wells's novel *The Time Machine*,[38] in the year 802701, humanity developed in two separate species: Eloi and the Morlocks, as a result of the expansion of the gap between different social classes over a long period. The Eloi live a banal life on Earth's surface, while Morlocks live in the underworld, serving the machinery and breeding food, making clothes, and other products for the Eloi. While one primarily functions in the space of a cave-factory, the other serves the materiality of this space in the mining pits, factory halls and office spaces of the spectacle of global production of technology, energy and resources.

32. Triangular trade

The best-known triangular trading system is the transatlantic slave trade operated from the late sixteenth to early nineteenth centuries, carrying slaves, cash crops, and manufactured goods between West Africa, Caribbean or American colonies and the European colonial powers, with the northern colonies of British North America. Slavery was at the heart of the development of the modern planetary-scale global economy. As Barbara Solow[39] illustrates, "by the late seventeenth



Blood, sweat and toxic lakes



Triangular trade, Chains of digital colonialism

century, the New England merchant, the Barbadian planter, the English manufacturer, the English slave trader and the African slave traders (and merchants) were joined in an intricate web of interdependent economic activity." From those days, the same model of constant flow within the vast fractal production chains expanded in time, space and complexity. The transatlantic slave trade evolved into the contemporary planetary-scale factory.

33. Chains of digital colonialism

"By digital colonialism, we understand the deployment of imperial power in the form of new rules, designs, languages, cultures and belief systems serving the interests of the dominant power. In the past, empires expanded their power through the control of critical assets, from trade routes to precious metals. Today, technology empires control the world through data and the ownership of computational power, often with the active collaboration of the most powerful governments in the world, set out to satisfy their needs."[40] What human rights and technology expert Renata Avila is describing here as digital colonialism is rooted in the extractivist practices illustrated on this map. Nevertheless, this map is proposing an extensive understanding of this term. Traditional colonial practices of control over critical assets, trade routes, natural resources, and traditional exploitation of human labor are still deeply embedded in the contemporary supply chains, logistics and assembly lines of digital content, products and infrastructure. In that sense, chains of digital colonialism are made both on the extraction of digital surplus and traditional exploitation of labor and resources.

Acknowledgements
This assemblage mainly builds upon research and maps that have made in collaboration with others, especially Kate Crawford in Anatomy of an AI and for her forthcoming book ATLAS OF AI (Yale, 2021), Nooscope with Matteo Pasquinelli, and research done within the SHARE Lab and valuable comments and suggestions by Olivia Solis, Vuk Cosic, Daphne Dragona and Vladimir Todorovic.

November, 2020

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THE KILLING OF MARIELLE FRANCO

CARTOGRAPHY OF A TECHNO-POLITICAL ASSASSINATION

Rio de Janeiro

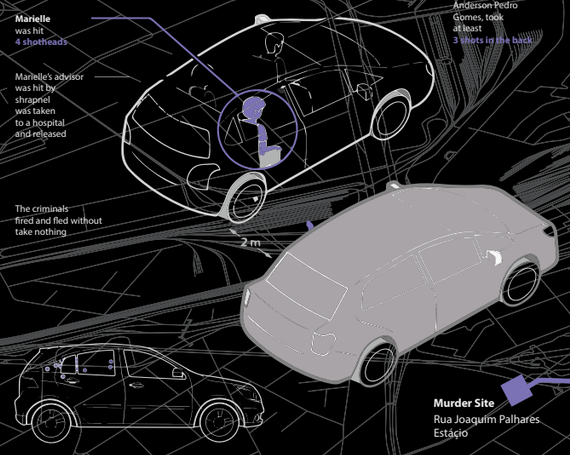
By Pablo DeSoto, Lucas Rolim & Alice Piva

Sources: Folha de S. Paulo, O Globo, G1, BBC Brazil, Brasil de Fato, El País and research institutions: FGV and Monitor de Debate Público Digital / USP.

Time Scope Analisys: Mid-February to late October, 2018

PROFESSIONAL ASSASSINATION

The car that opened fire on Franco's vehicle had cloned license plates. The murder weapon was a Heckler & Koch MP5, the same model as five restricted-use submachine guns that disappeared from the arsenal of the civil police in 2011. The ammunition used in the 13 shots came from a lot sold to the Federal Police of Brasília in 2006. Capsules from the same batch had been used in the 2015 killing of 17 people in the city of Osasco, São Paulo.



Murder Site
Rua Joaquim Palhares
Estácio

TURNED OFF SURVEILLANCE CAMERAS

Five of the eleven surveillance cameras operated by the city on the route from Casa das Pretas to the murder site were turned off at the time of the crime. While not indispensable for clarifying the identities of the perpetrators, the images could have helped determine, for example, the number of suspects and the involvement of any other vehicles in the action. On May 3, the press reported that the cameras had been turned off at some point from 48 to 24 hours before the crime on March 14.

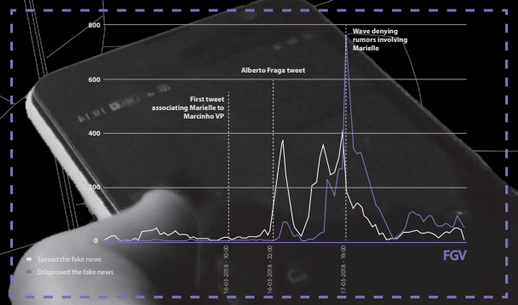
Casa das Pretas
Rua dos Invalidos
Lapa

PUBLIC EVENT AS CASA DAS PRETAS

On March 14, 2018, Rio de Janeiro councilwoman Marielle Franco attended a roundtable discussion titled "Young Black Women Moving [Power] Structures" (Jovens Negras Movendo Estruturas in Portuguese) at Casa das Pretas (Black Womens' House). When Marielle left the place around 9 pm with her driver and advisor, their car was followed by a Chevrolet Cobalt with a Nova Iguaçu license plate.

DISSEMINATION OF FAKE NEWS AND CYBERWARFARE

According to a report published by Monitor de Debate Público Digital / USP, the dissemination of fake news about Marielle Franco's personal and parliamentary life began a few hours after her death. The rumours, which appeared to spread mainly through WhatsApp, tried to connect the figure of the councilwoman to organized crime and drug dealers.
Fake news gained momentum on Facebook and Twitter, with endorsements from public organisations and officials including MBL (Movimiento Brasil Livre), Deputy Alberto Fraga and Judge Marília Castro. Mass media outlets echoed these rumours in headlines without acknowledging that they had been disproven, encouraging disinformation. According to a survey by the Getulio Vargas Foundation's Public Policy Analysis Directorate, the Twitter discussion about the murder of Marielle Franco was driven in part by 1,833 bots.



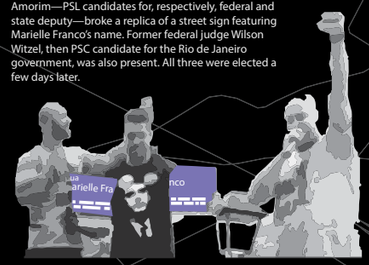
LEGACY

The double murder of Marielle and her driver Anderson was the subject of condemnation across the political spectrum in Brazil, as well as from Amnesty International and Human Rights Watch. Thousands took to the streets in coordinated protests across the country, and local activists named a street in her honour outside the Rio city council building. Marielle Franco street signs spread globally, becoming an international symbol of her legacy.

The most repeated message about Marielle included multiple false claims that she was pregnant at 16, elected by Comando Vermelho, and married to the drug dealer "Marcinho VP", among others. The second-most repeated message includes a photo that supposedly features Marielle on the lap of Marcinho VP. However, neither Marielle nor Marcinho are the people pictured in the image.

2018 BRAZILIAN GENERAL ELECTION

All candidates in Brazil's 2018 presidential elections condemned the crime except for Jair Bolsonaro (PSL), the eventual winner and current president, who repeatedly declined to comment on the case.
In a political campaign act on September 30 in Petrópolis, ex-policeman Daniel Silveira and politician Rodrigo Amorim—PSL candidates for, respectively, federal and state deputy—broke a replica of a street sign featuring Marielle Franco's name. Former federal judge Wilson Witzel, then PSC candidate for the Rio de Janeiro government, was also present. All three were elected a few days later.



Google Trends "Marielle Franco"

Marielle Franco's last heartbeat
21h30
14/03/2018

- Military intervention decreed in Rio — 16/02/2018
- Marielle leads an investigation committee on the military intervention — 28/02/2018
- Police investigation declared secret — 20/03/2018
- Investigations reveal political motivations as the main cause of the crime — 29/03/2018
- The crime is reconstructed — 10/05/2018
- Police discovers links between the killers and a group of militia members known as the "crime bureau" — -/08/2018
- An Amnesty International truck drives around Rio, pressing for answers about Marielle's death — 14/09/2018
- Marielle's widow denounces to the UN the delayed response to the crime by Brazilian authorities — 19/09/2018
- Marielle Franco street sign destroyed — 30/09/2018
- First round of elections (federal and state deputies) — 07/10/2018
- Second round of elections (presidential and state) — 28/10/2018

The Killing of Marielle Franco: Cartography of a Techno-Political Assassination

PABLO DESOTO, LUCAS ROLIM AND ALICE PIVA

Marielle Franco was a Brazilian human rights activist and politician from the most marginalized groups of society: black women, bisexuals and feminists. She was born in one of Rio de Janeiro's largest favelas and became a voice for disadvantaged people in the city. After earning an M.A. in public administration, she served as a city councilor in the Municipal Chamber of Rio de Janeiro for the Socialism and Liberty Party (PSOL).

Franco was an outspoken critic of the police brutality and extrajudicial killings in the favelas and took part in a state legislature inquiry into the paramilitary gangs that dominate large areas of Rio state. In February 2018 she was appointed rapporteur of the commission investigating the deployment of the army in police operations in the state.

On 14 March 2018, Franco and her driver Anderson Gomes were summarily executed on the streets of Rio de Janeiro. Her murder was followed by an attack on her reputation through the circulation of fake images and disinformation on the Internet. Fake images connecting her to the narcotraffic went viral, popping up on smartphones and computer screens across the urban fabric.

This work provides a visual exploration of the multiple layers surrounding the crime by analyzing the context of the city and the digital realm. The study spans the period from February 2018 to the Brazilian presidential election in late November that same year.

The map presents an overview of the multiple agents involved in the event: bodies, urban routes, human users, bots, smartphone screens, digital militias, disabled surveillance cameras, WhatsApp groups, lethal weapons, and cloned car license plates. While visualizing these heterogeneous elements all together, the map tries to unravel a complex story of two mechanisms of assassination: physical violence and the weaponization of smartphones that made it possible.

Through the lens of the Marielle Franco murder case, the map makes tangible the rise of far-right techno-politics in Brazil and the global phenomena to which every user is exposed through the use of smartphones.

This work was initiated in the context of the course "From the Sputnik to the Stack: Architecture in the Age of Planetary Scale-Computation" conducted by Pablo DeSoto, Visiting Professor at the Postgraduate Department in Architecture and Urbanism at the Federal University of Paraíba. Previous versions of the work were presented at the VI International Symposium LAVITS (Latin American Network of Surveillance, Technology and Society Studies) at UFBA Salvador; Google News Space at Festival 3i, Rio de Janeiro; and the panel on violence against human rights activists at the Forest Defenders Third International Conference in Marabá, Pará.

Pablo DeSoto, Lucas Rolim and Alice Piva. *The killing of Marielle Franco: Cartography of a Techno-Political Assassination*. 2020.

RMB City: A Second Life City Planning

CAO FEI

Taking its name from the Chinese currency renminbi, *RMB City* is an artwork that reimagines the future of China's cities. *RMB City*'s manifesto states, "New orders are born, so are new, strange wisdoms," a declaration appropriate to the work's setting, the virtual platform Second Life, in which users, through their chosen avatars, can purchase and trade items, build virtual urban structures, and interact with other avatars in an artificial utopia that is also part-apocalyptic. Inhabited by the avatars of the artist herself, China Tracy, and her friends and fellow artists, it retains the architectural and cultural icons of the real world transformed into a spectacular, shimmering metropolis.

In *RMB City*, the virtual city has become a vehicle to express ideas that relate to modernization, capitalism, and consumer culture, in contrast to key political events such as the Beijing Olympics in 2008 that were having profound effects on IRL cities in China. Through these constructed worlds, Fei presents a profound meditation on the boundaries between the real and the fantastic, and the sense of alienation that drives new generations to increasingly experience the world from behind the veneer of their avatars. For Fei, the digital world is an expression of our human condition, and as such, an avenue to reflect on these emerging forms of social consciousness.

Cao Fei (SL avatar: China Tracy). *RMB City: A Second Life City Planning, 2007.* Machinima, Single channel video, 4:3. Color with sound. 5min 57sec. Courtesy of artist, Vitamin Creative Space and Sprüth Magers.

Platforms as if People Mattered

SHUANG LU FROST

The History and Structure of V Taxi Team

In November 2011, Jiang Ye, a local taxi driver in Hangzhou, had an idea. After seeing one of his customers use WeChat, a recently launched instant messaging platform, Jiang leveraged the networking power of a mobile app to create digitally mediated transportation services. Jiang Ye believed that a digital platform could solve a key problem for transportation service professionals, namely, the inability to cultivate and retain large pools of personal clients. Like Jiang, many experienced drivers had long-term clients who frequently pre-booked their services. Pre-bookings are generally more lucrative than other orders—the more pre-bookings, the higher one's income—but they come with opportunity costs. Because drivers cannot control where real-time orders will take them, they must stop cruizing the streets well in advance of pre-booked orders, and therefore forego other potential fares; in addition, whenever more than one client pre-books an order for the same timeslot, the driver must refuse an order and risk damaging the client relationship.

Jiang, therefore, thought of a platform in which drivers could share orders with their peers in real time. Such a system not only enabled drivers to accept more pre-bookings (and thereby increase incomes), but also ensured that customers' requests were consistently fulfillled. With this idea, Jiang set out to digitize transportation services in Hangzhou. First, he registered a WeChat account and set his profile picture as a photo of his taxi. Each time Jiang dropped someone off at the airport, he parked his car in the adjacent parking lot, and used WeChat's "Search Nearby People" function to send friend requests to passengers at the airport. As an experienced driver, Jiang knew that the most lucrative part of the business were fares going to and from the airport, so he made frequent flyers his target clients. New customers began adding him on WeChat and booking rides. Jiang then persuaded four of his driver-friends to join him in using the same method to scan for customers. Within a few weeks, word of Jiang's new system had spread, and dozens of drivers around Hangzhou were requesting to join the group.[1]

The founders, including Jiang, felt that the structure of V Taxi should reflect how members of a community naturally form the deepest bonds with their immediate friends, and weaker connections with more distant peers. This meant that the organization would resemble a set of concentric spheres (see Figure 1). Drivers would be situated in a close-knit "sub-team" of eight to ten drivers, which would in turn be embedded within the larger V Taxi community. The entire community would then form cooperative networks with other taxi driver groups in Hangzhou as well as with V Taxi communities in other cities in China.

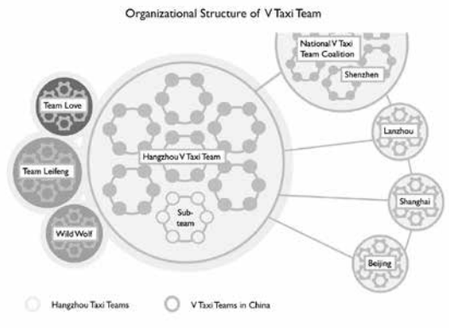


Figure 1: Graph Showing the Concentric Structure of Hangzhou V Taxi and Their Outward Networks.

V Taxi as Contemporary Guild

The founding members of V Taxi also designed a seniority-based managerial system and an apprenticeship program. Both features are highly reminiscent of Chinese professional guilds. At the top of the hierarchy, a group of senior members would serve as managers on a voluntary basis. This managerial board, headed by "Driver No. 1" Jiang Ye, would create codes of conduct, establish basic regulations, and control the admission of new members. New members to the group would be assigned to a sub-team and paired up with a senior driver for a three-month apprenticeship. Just as in guilds of the past, the candidate would first need to establish *guanxi* (interpersonal relations) through practices of gift-giving. One driver, for instance, had to gift a computer to a senior driver in order to gain access to V Taxi.

While it is unlikely that the V Taxi founders studied the classical work of Fei Xiaotong, the organization they imagined perfectly mirrors Fei's theory of the traditional structure of Chinese society.[2] According to Fei, every individual in China is situated within concentric spheres of relations that extend outward from the self to the family, then the lineage, the community, and finally the state. When people in society interact, they form "differential modes of association" (*cha xu ge ju*) that vary according to the degree of overlap of their respective spheres. So too with V Taxi, where the primary loyalty of each driver is to the other drivers in their sub-team. Only more distally do their "spheres of relations" extend to encompass other V Taxi members, and finally drivers in other organizations.

These spheres of relations produced vibrant yet varied social lives for the drivers. Sub-team members talked on WeChat daily and often went out together to have drinks or play mahjong. The larger team established a communal fund that was used to organize community-wide gatherings. These social interactions helped strengthen bonds, which enhanced interpersonal trust and facilitated economic activity.

With this community-centered design, V Taxi achieved remarkable organic growth. From its official founding in March 2012 to its zenith in 2014, V Taxi grew its team of 20 drivers into a thriving community of more than 300 active driver-members. As knowl-

While it is unlikely that the V Taxi founders studied the classical work of Fei Xiaotong, the organization they imagined perfectly mirrors Fei's theory of the traditional structure of Chinese society.

edge of V Taxi spread outside of Hangzhou, communities of taxi drivers in other cities established their own V Taxi teams. In 2015 a national association of V Taxi was established in Shenzhen, the tech capital of southern China, and Mr. Yang Zifeng was appointed to serve as its director. In addition to organizing an annual national V Taxi conference, Zifeng has worked alongside municipal V Taxi leaders to link up community-based networks and provide seamless transportation service for intercity travelers across urban China.

Sharing and Sharing

For V Taxi, value is produced through practices of "sharing," or *gongxiang* in Mandarin (literally "to enjoy together"). Drivers share entitlements to client orders that they cannot fulfilll themselves. These entitlements function in V Taxi as "gifts": they are earned through the cultivation of client relationships, and thus are personal and inalienable to each driver. Like gifts, they are always shared freely; no commission is charged. The only expectation of reciprocity is that those who receive orders will "pay it forward" by sharing with other drivers in the future.

Such practices of sharing create new relationships and reinforce existing ones by producing positive value attached to the creation, reproduction, and extension of relationships in economic exchanges. Unlike resources or assets, relational value does not reside within individuals or among groups, but is performed through networks.[3] When individuals exhibit community-mindedness in interactions with their peers, they produce a "value of generosity" that binds the community together and enables it to carry out its economic functions. In V Taxi, relational value involves feelings of fellowship that encourage the sharing of economic opportunity, which in turn sustains the production of relational value and deepens the ties of the community.

V Taxi's notion of "sharing" harkens back to an earlier era of the "sharing economy," when communities of actors used digital technologies to facilitate non-monetary exchanges.[4] Couchsurfing, for instance, enabled hosts to share their sofas in exchange for companionship and conversation rather than rent. However, since the early 2010s, these alternative forms of value creation were crowded out by "crowd-based capitalism."[5] Guided by a "bigger is better" ideology, platforms such as Uber and Airbnb created centralized algorithmic systems to efficiently coordinate users and their capital. The more user data these platforms collected, the better they could predict and shape user behavior, and the more efficient and cheaper their services would become. This hyper-scalable model attracted billions of dollars in venture capital investment, which enabled these platforms to undercut the prices of their competitors and expand at lightning speed. After a brief period of intense competition, a few platforms emerged as virtual monopolies. This winner-takes-all approach to dividing up the "sharing economy" has been glorified in the tech sector, with prominent figures such as Peter Thiel arguing that "monopolies are good for society" and "competition is for losers."[6]

The crowding out of values can be understood as corporations' efforts to engineer universal social structures that are divorced from local contexts. "Sharing economy" companies have internalized the lesson that people's economic lives cannot be decoupled from their social lives.[7] Instead of embedding platforms within local social worlds (like V Taxi) or giving economic actors the freedom to connect the platform with their local contexts (like Craigslist), the monopoly platforms have designed universal structures that can be implemented in any context, and they promote only those activities which further the goal of profit maximization. In doing so, they ultimately constrain users, rather than enabling them to produce a heterogeneous range of values that hold communities and societies together.[8]

The tendency of large-scale platforms to crowd out values also becomes fixed in their technological designs.[9] In the ride-hailing industry, centralized algorithmic systems (closely resembling Deleuze's "control societies"[10]) make it almost impossible for economic actors to diverge from predesigned paths.[11] The laborer's every action is controlled by omnipresent tracking, monitoring, and data feedback. Their sole purpose is to execute orders and conduct repetitive tasks.[12] Under such conditions, where humans are treated as mere extensions of machines, laborers can hardly develop transferrable capabilities or form the social connections necessary to produce relational value.

V Taxi thus provides an interesting alternative model for digital platforms, one that is more localized, socially embedded, and human-centric. Unlike platforms that depend on computational algorithms to process orders and match customers with drivers, the V Taxi platform relies principally on human agency.

Human-Centric versus Machine-Centric Platforms

V Taxi thus provides an interesting alternative model for digital platforms, one that is more localized, socially embedded, and human-centric. Unlike platforms that depend on computational algorithms to process orders and match customers with drivers, the V Taxi platform relies principally on human agency.

When joining the group, new members are assigned unique identification numbers, which are used for all community communications. Even when drivers develop close relationships with their peers, they continue to refer to each other by their codes. To soften the impersonality and show respect and intimacy, however, most drivers append "brother" or "sister" to the numbers. You often hear them referring to each other as "Brother 6" (*liu ge*) or "Sister 108" (*yaolingba jie*). Such terms mimic forms of address in Chinese families, in which siblings refer to each other by ranking instead of by name (e.g., third brother, *san ge*). The strange combination of technical anonymity and kinship terminology reflects the community's ability to produce intimate relationships within a technologically mediated system.

Though the operation of V Taxi depends on mobile technologies, the platform's human-centric design affords it a high degree of transparency and accountability. The system is structured to ensure that the order-sharing process is open and disputable. Service requests are posted in open forums and are thus subject to the scrutiny of every community member. If there is a dispute about impartiality, drivers may request external verification or may call on a senior community member to arbitrate. Jiang Ye used to spend so much time settling disputes that he became "far more intimate with my phone than my wife." But by providing access to the inner workings of the system, drivers are better able to establish trust and more willing to share economic opportunities.

By contrast, the computational algorithms of machine-centric platforms like Uber and Didi are intrinsically unknowable to the people whose actions

they coordinate, and their decisions are nearly impossible to contest. On-demand drivers often experience frustration with the perceived injustice of algorithms. Drivers report that algorithms sometimes miscalculate their miles or fares, levy fines unjustly, or that misreport fraudulent behavior resulting in account suspension. When they call customer service hotlines to lodge complaints, drivers report experiencing long wait-times that interrupt their work. Even for those who do get through, it is often difficult to provide sufficient evidence that an error has been made. "If Didi were a person, it would have already been murdered a thousand times," quipped one on-demand driver. "We truly hate it, and often feel wronged by the platform. But when we reach out to the company, the people who answer the phone are just other migrant workers. How can we argue with them?"[13]

Expanding Human Capability

Human- and machine-centric platforms also strongly diverge with respect to their investment in human capabilities. Since corporations such as Didi and Uber use humans primarily as extensions of their proprietary technologies, they tend to put little focus on training their drivers. Instead, they dedicate their resources to technological advancement, betting on the belief that, in the near future, fleets of autonomous driving vehicles will be cruizing the streets.

In the V Taxi community, a new member gets a three-month apprenticeship with an older V Taxi member that teaches the required skills for participating. Every car must be equipped with at least two smartphones, a wireless hotspot, a wireless amplifier, and a touchpad. Every member must develop technological literacy with all these devices as well as demonstrate their proficiency with WeChat. Another essential skill to train is the ability to attract and retain clients. A critical component of this training is the honing of communication skills. Each driver receives instruction on how to identify a customer's interests and how to spark conversation. When new drivers go on trips, their mentors ask them to record (with consent) their conversations with customers. After the trips are completed, the mentor listens to the recordings, and gives feedback on how well the driver engaged with the customer's interests. For V Taxi, the skills imparted through this training are key to cultivating a loyal clientele. As one mentor stated: "If one cannot find where the customers' interests lie, how does one expect to retain them as long-term clients?"[14]

The cultivation of communication skills also makes their work more meaningful. Brother 25, a veteran V Taxi member, once had an old client, a businessperson who traveled frequently between Beijing and Hangzhou. One time when the client was on a business trip, the client's elderly father fell ill. The first person the client called was Brother 25, who recalled, "I asked him which hospital I should take his father to and he replied, 'To whichever hospital you think is the best. I trust your judgement.'"[15] There are many such stories of driver-client friendships. While seemingly trivial, these moments give V Taxi members the sense that they are more than drivers. As Brother 25 explained:

> Taxi drivers are probably the lowest rung of professions in our society. We don't have fancy cars or shiny uniforms. The reason clients stick with us is because we treat each other like family … In this little space I have met so many different kinds of people, and some of them have become my true friends, the kind you can grab a drink with after work.

Unlike the archetypical "enterprizing selves" of China's post-socialist market economy, who make autonomous decisions to cope with uncertainty, the ideal V Taxi driver realizes his optimal self by engaging in non-market activities (such as the sharing of resources, skills, and knowledge) with his fellow community members.[16] This pursuit of "enjoying together" immaterial things complicates narratives of an overwhelming trend of individualization in China's marketization processes.[17]

Small and Beautiful

"Small and beautiful" (*xiao er mei*) is the phrase that Jiang Ye, the founder of V Taxi Team, used to describe his community-based organization.[18] Unlike corporate ride-hailing platforms V Taxi endeavored to preserve its sense of "smallness." Clearly formed and well-maintained community boundaries are viewed as equally important to sharing practices. For members, "sharing" did not imply equal access to common pool resources. To the contrary, sharing could occur only within the confines of clearly delineated boundaries, such as the mutual observance of "personal property" (that is, clientele). These boundaries enabled the community to function and underpinned the system's sustainability.

In one incident, a client who rode with Brother 315 noticed a stack of business cards with the V Taxi logo in a holder on the dashboard. Throughout the trip, however, Brother 315 never offered one. As the client stepped out of the car, she asked, "Why didn't you offer me your business card?" Apologetically, Brother 315 said, "Because you are Brother 25's client. If I offered you my card, it would be considered poaching. That's not the way we do things. But if you are happy with my service, you are more than welcome to take one."

The taboo against monetization does not extend to orders from on-demand platforms, however. Because those trips are assigned by impersonal algorithms, V Taxi members have no moral qualms about selling them. Some members even employed hacking software such as "accelerators" and "GPS movers" to snatch up the most profitable trips on Didi and then sell them to their peers for a small profit. By clearly delineating the boundary between personal and impersonal orders, the community enables members to generate additional income without corrupting the ethics of sharing.

Members of V Taxi also recognize that creating a sensible boundary around admission to the group is necessary to guarantee that the basic economic needs of its members are met. During V Taxi's initial period of growth, the acceptance rate of new members outstripped the expansion of drivers' client bases. This caused a decline in the ratio of orders to drivers on the platform, resulting in a fall in average income. The community then decided to cap its total membership at 320. As a senior driver explained:

> For a while, us existing members couldn't "get full" with the orders being generated, so we stopped accepting new members … when drivers cannot "get full" they will start to poach clients, cut corners, and breach the bottom line of morality.[19]

In other words, V Taxi members understood that the healthy production of relational value cannot be sustained without a concomitant production of economic value.

Maintaining the smallness of the community is also important for the building of strong social relations. It takes time for drivers to learn to trust one another and engage in meaningful sharing. If the team size is too big, it is almost impossible for drivers to become personally acquainted with all other team members. Therefore, merely capping the team size did not resolve the internal problems that emerged after the team expanded to over 200 members. Many drivers found it hard to develop trust towards their peers, and so began sharing orders only within their sub-teams. This resulted in the formation of cliques and a gradual reduction of the efficiency of the system.

Like all transportation service providers, the community was deeply disrupted by the rise of ride-hailing platforms, but unlike many, it was able to weather the storm. Years of fierce (and some would argue unfair) competition from Uber China, Didi, and Kuaidi (now all subsumed under Didi Chuxing) took its toll on the community. In 2018, the original Hangzhou team had shrunk to around 100 member-drivers, about one-third the size during the boom years of 2013–2014. But membership numbers were stable, and the V Taxi network continued to expand to ever more cities across China. The dynamic new head of the national association, Leader Yang, had even begun to develop new revenue streams for V Taxi, including wedding car bookings, roadside emergency assistance, and other specialized services.

Conclusion

The V Taxi community created a sociotechnological system that both reflects and reinforces the values of its members. Instead of deskilling drivers, the system harnesses their skills and knowledge and encourages the development of their capabilities. Instead of atomizing drivers, the system operates through spheres of loyalty that mirror the social structure of Chinese society. And instead of centralizing decision-making processes, the system treats drivers as moral agents who are capable of thinking beyond their immediate self-interests. The success of V Taxi's model resides in the fact that it is not only an economic organization,

but a moral community that reproduces shared values. This article serves not only as a critique of ride-hailing platforms like Didi and Uber, but also as a constructive proposal of what more human technologies might look like.

October, 2019

Scan the QR code for the original text, this is an abbreviated version.

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The Net Wanderer– A Tour of Suspended Handshakes

GUO CHENG

The Internet, which the first non-military users perceived and shaped as the utopian universal space, has limits. *The Net Wanderer* by Guo Cheng sheds light on one of the highest walls of the Internet: the Great Firewall of China (GFW). In his project, Cheng examines the virtual borders China has erected to safeguard its cyber sovereignty. Certain foreign websites are blocked, and cross-border communication is slowed down. This politically motivated censorship is carried out by the Cyberspace Administration of China, under the ever-watchful eye of the Chinese Communist Party. In *The Net Wanderer*, Cheng assumes the role of a "firewall tourist" who visits the invisible websites that host the GFW's network infrastructures. He also invites the audience to roam the Internet as virtual firewall tourists. If visitors encounter sites blocked by GFW, they are led to a game where they can enter their user names. On a censorship wall actually built by Cheng, a machine then inscribes their names and scores along with the IP address of a GFW node. This geolocation data is also used to track the physical location of the firewall's network gateway. Through a playful premise, Cheng criticizes China's government censorship and makes it extremely tangible. He charts how technology, culture and ideology are intertwined.

Guo Cheng. *The Net Wanderer– A Tour of Suspended Handshakes*, 2019—ongoing.

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The Dark Forest Theory of the Internet

BOGNA KONIOR

Where are we going?" Shi Qiang asked.
"To the darkest place."[1]

There is a Quichua riddle. El que me nombra, me rompe. Whoever names me, breaks me. The solution is, of course, 'silence.' But the truth is, anyone who knows your name can break you in two.[2]

The internet is a dark forest. The roots grow upwards, the crown reaches downwards: wrapped around the planet, the Internet circulates between satellites and underwater cables. The Internet is a tangible space, yes, but also a mental expanse. Made for sleepwalking, for a mundane delirium. For sacrificial rituals. People get lost in it by shining light in all the wrong places, exposing too much about themselves, communicating impulsively, recklessly. You can enter through an interface, but also through your pocket. You can enter through a screen, but you must screen something of yourself in return. A traveler who enters the forest is never alone, eyes wrapped around her like insulation tape.

There is only one, simple riddle to answer at the entrance to the Internet:

What's on your mind?

It's a riddle we must answer over and over again. A simple question. What's on your mind?

An invitation to communicate.

*

In the 1990s, Mark Fisher's philosophical reading of the cyberpunk novel gave us a persuasive theory of cyberspace as a prosthesis of humanity, a cybernetic nature, an extension of the human nervous system. For Fisher, akin to the characters in William Gibson's druggy cyberpunk classic, *Neuromancer,* we are possessed by the internet; only as alive as the digital current that circulates in our veins. We are dispossessed of will, and inert as the machines that we get neurologically intimate with, letting them hack our endorphin channels and social impulses, addicted to their stimulants.[3] Our neuroses, emotions and attention are ordered by our computers. As if in a trance, we follow the collective pattern of feeling transmitted to us—collective hypnosis, a feeling of shared outrage, fear, anger, joy, catharsis, justice, revenge, pleasure. Online, all impersonal worldly events are experienced as intensely personal, even if we don't play a role in them. We internalize everything, struggle to see beyond ourselves, to see the mechanisms that are not centered on us. The Internet is a claustrophobia of interiority that only appears to be ours. It "doesn't work by suppression, or repression, but through a participative process ... [It] doesn't represent or even 'manipulate' public opinion but substitutes for it."[4] All actions are reactions, predictable reactions, endless nervous systems swaying to the same rhythm.

Most of human suffering comes from an exaggerated belief in agency and purpose, a belief that the personalized aspect of Web 2.0 accelerates. "What should be done and who am I?" is the question it poses to us repeatedly, as if the answer mattered. What's on my mind? Where is my mind? Is what I see on the screen an expression of my mind? Philosophy of digital culture is perpetually torn between two overkills: declaring the internet a blessed place of productive schizophrenia, where we lose our own self-importance to communicate with the world, or, to the contrary, condemning it as a narcissistic delirium, where everything we do fortifies our self-importance.[5] Benjamin Bratton captures this contemporary paradox by noticing that "paranoia and narcissism are ... two functions of the same mask."[6] What should be done and who am I?

On the one hand, we feel pluralized, composite, collective, constantly shaken up by the diversity of human natures laid bare on our screens, we feel implicated in the fate of others. But there is simply too much otherness, and we decide not to trust it. This threatening chaos tightens the walls around the self instead of dissolving it in an encounter with the other. Epistemological paranoia settles in—what is true? Who is on my side? Where is my side?

On the other hand, we are sold the illusory integrity of the world and the self-free will, agency, causality, ethics. Everything feels personal, even the fate of the world, which appears to us as one, common world streamlined alongside our individualized news feeds. There seems to be nothing outside of this narrative that encompasses everything but nonetheless centers upon us. Each of the millions of users is injected with global, cosmic tasks daily through supposedly unique individualized feeds that all communicate the same information.

Each new medium both expands and shatters the human ego, showing us more of the universe and then promptly reducing it all to us. Bound to discover that it cannot insert itself into an active social network and hope for a straightforward exercise of choice and ethics, "each generation is obliged to verify this horror anew for itself, and to discover that it is impotent."[7] The more the world can be described through complexity theory and emergent extra-human behavior, the more science tells us that notions such as free will and causality might be shaky, the more dogmatically humans reassert detailed textual descriptions of individual thoughts and morals as a panicked solution. In the prison of interiority that is the internet, everything hinges on us and yet no one among us can bring about the change that she desires. No wonder that neurosis underlies this paradox: everything is internalized, even the weather and the fate of the planet are down to us, and yet we can do only what the medium affords us—externalize, communicate.

*

"I could choose to communicate with you."

"If you do that, you should be aware of the price you'll pay: You'll have exposed your existence to me."[8]

The dark forest theory of the internet is about the tragedy of communication, its compulsion, necessity, futility, and risk. It's an experiment with "hardboiled survivalist hyper-nihilism,"[9] with metaphysical sci-fi, rather than cyberpunk, as a model for the cyberspace. Where Mark Fisher wanted to distil the internet's uniqueness, I aim to describe its genericity on a cosmic level. I want to grasp the brutality of our situation: communication is a compulsion and yet it is also the source of conflict.

Chinese science-fiction writer, Liu Cixin, elaborates his dark forest theory in the *Remembrance of Earth's Past* trilogy, as an answer to the Fermi paradox—if we are surrounded by life, why is the universe silent? Shouldn't the whole universe be a noisy social media feed, everyone vying for everyone else's attention? The dark forest theory flips the underlying assumption, explaining that communication, because it reveals our existence to others, is a sign of stupidity rather than intelligence. This is not because all alien civilizations are hostile, but because the laws of the universe necessitate mortal conflict among all civilizations that share the same dimension.

Survival is the primary need of all civilizations. They expand and their need for resources grows, but the total matter in the cosmos remains constant. "Exponentials are the devils of mathematics"[10]—if life keeps growing and aching for its own existence while resources do not expand, they need to be fought for. "The entire universe has been dealt that dead hand."[11] The universe is a battleground, existence is war. In the darkness of the universe lie many civilizations, all both hunter and prey. In this darkness, one better stay silent. Communication can potentially draw the attention of another civilization. When the two notice each other, one irrevocably must die at the hand of the other. The smarter one stays silent or attacks first. Why such

a brutal solution? Given the limited pool of resources, assuming the other's benevolence is too much of a gamble within "the cosmic chain of suspicion," where inter-cosmic communication is necessarily risky. Aliens might have a very different definition of truth, ethics, or the common good. Sure, you *might* be "benevolent," as I understand it, but, would I risk a whole planetary society on that assumption? And would you risk yours by giving me the opportunity to explain my idea of "benevolence" to you? What if one of us lies? Interdependent behaviors become complex quickly but the result is mercilessly constant: one of us will die. This trilogy considers various scenarios that could prevent this outcome, eventually disproving all of them. Humanity makes this monumental scientific discovery late, but for cosmic civilizations the dark forest theory is as fundamental as any law of physics. It is automated, unreflective, independent of emotion, will or ethics. "Entropy increases in the universe, and order decreases ... As for any meaning higher than that, it is pointless to think about."[12]

Some might object to the cold calculation of Liu's dark forest theory. And yet it does nothing more than generalize the laws of physics to arrive at a cosmic game theory of civilizational development. The assumption that all existence is suspended between conatus and entropy affirms the laws to which humanity is subservient, just like any other form of complexity. (We could wish for a different world but we have this one.) In the notion of entropy provided by statistical mechanics, many systems, whether bio- logical or social, can be grasped with the same tools that we use to understand entropy in physics. Every isolated system tends to progress towards disorder—the high-entropy option. One way or the other, conflict and dissipation of energy are woven into the fabric of existence. It's a question of "how" and "when," not "if." A recent analysis of over six hundred years of human history confirms that each "human system" must rid itself of its own excess; with the rise in complexity, there is a rise in entropy as well. "War is simply one of the methods that the system has to dissipate entropy at the fastest possible speed."[13] Dissipation of energy is not simply a result of "bad choices" or "unethical actions," but an inescapable, statistical probability tied to complexity. The more complex and intelligent life becomes, the higher the price it may have to pay in conflict.

*

The chain of suspicion [is] unrelated to the civilization's own morality and social structure. It's enough to think of every civilization as the points at the end of a chain. Regardless of whether civilizations are internally benevolent or malicious, when they enter the web formed by chains of suspicion, they're all identical ... To sum up: one, letting you know I exist, and two, letting you continue to exist, are both dangerous to me.[14]

The dark forest theory of the internet is about the risk tied to the very passport we need to enter our everyday cyberspace: communication, screening the self, telling the truth about ourselves, revealing or concealing our coordinates. It is not a winning game plan or a blueprint for "change," but a description. (Normative theories of what the world *should* be like in its ideal state are better left to priests and utopians.) Web 2.0 rests on two axioms. First, sociality is a primary human need, communication is necessary for survival. Second, sociality is the carrier of all human conflict. More sociality, more entropy. Our nervous systems cannot distinguish between sociality and survival, and so we are sentenced to each other. The whole Internet has been dealt that dead hand.

When communication is everything, thoughts, expressed in language, are endowed with a unique power. We draw them like maps that are supposed to lead others into our minds and hearts. But are thoughts truly representations of our beliefs or ourselves? Thoughts are experiences in the brain.

They are how we get from one moment to the next, how we experience a moment passing. They need not imprint themselves on us, even when each is immortalized in the lifeless glow of the cyberspace. And yet, frozen, they fortify the hallucination of the self—a "hard proof" that it "exists," believes things and has convictions, and things to do. A transcendental hallucination common to us all, sustained by the communicative interface through which we live our lives. By giving undue attention to thoughts, especially those

that we believe to be ours, "it is not only that we deceive ourselves; it is also that we are deceived about having a self."[15]

The dark forest theory of the internet bypasses that fallacy and instead outlines automated dynamics tied to communication. As an isolated system it tends towards the high-entropy option. Connection produces conflict. Intent, hostility, or internal benevolence do not matter once each one of us is reduced to a node in the cybernetic chain of suspicion. To signal "safe" sociality, each user needs to be legible in her self-representational practice; everyone needs to make themselves known. The forest-system needs to be able to read us, as do the other users. What's on your mind? We describe our thoughts incessantly, in detail. But this legibility means that our coordinates are exposed. We can be seen, attacked, and governed. The more detailed our descriptions are, the easier we are to govern. The more we are seen, the easier for us to become a target.

In the cosmic dark forest, those who speak up gamble with entropy, attract eyes, provoke attacks. Others focus on pre-emptive strikes: attack before they attack you. Liu optimistically believes that for humans, in contrast to alien societies that are too metaphysically remote to effectively communicate, the chain of suspicion "will only extend a level or two before it's resolved through communication."[16] But this assumes that communication between humans is truthful. This is why settling the *truth* is the internet's guiding paranoia—*what does she really think*; *but who are they, really, underneath, unbeknownst to themselves*—as is making endless interpretations, self-disclosures and declarations so that there is *no doubt* about the intentions of the other, or our own. If only we described things clearly enough, if only we communicated relentlessly, excessively, then surely, we could prove our benevolence and unbind from the chain of suspicion. And so, every exchange is designed for maximum clarity to pre-empt interrogation but requires endless disclaimers nevertheless. Connection produces complexity, complexity produces conflict: a self-sustaining mechanism.

But entropy flows through us, too. Disintegration is bland, predictable, laying us down softly. Every system oscillates between order and chaos. In the prison of interiority that is the internet, someone always has to be discarded: directing entropy away from the self, towards the other. Complexity—of arguments, of human groups—rizes until there is too much of it, and some sacrifice has to be made to return to the short-lived equilibrium, where the illusion of benevolent communication can still be maintained. What is any online "community" if not a sophisticated form of mutually assured destruction, suspended between neurosis and narcissism, tied to the unnegotiable need to communicate?

*

Madness, mayhem, erotic vandalism, devastation of innumerable souls—while we scream and perish, History licks a finger and turns the page.[17]

Symbolically and materially, existence is a conflict, a discord that produces complexity. The dark forest theory generalizes on a cosmic level the entropic nature of communication. Its trees grow roots everywhere. We patrol the forest, listening for each other's steps, all of us hunter and prey.

In some Amerindian ontologies, predation, warfare, and cannibalism underlie the relations between humans and other species. "In Amazonia, shamanism is as violent as war is supernatural. Both retain a link with hunting as a model of perspectival agonism ... marked by a profound conviction that every vital activity is a form of predatory expansion."[18] To exist as a plant or an animal is to be in a conflict defined by consumption, by material and spiritual warfare, where one species can possess the body and mind of the other. Hunter and prey. Entropy rests in the necessary consumption of other souls. On the "other" side of the spiritual spectrum, Christian theologian, Pierre Teilhard de Chardin, admits that conflict is necessary, metaphysically, for human nature; it is "an organic *phenomenon of anthropogenesis*," wherein humanity rizes only in conflict with others.[19] Humans hunt each other.

Friction produces meaning in a feedback loop, just as opinions often form in denial of the existing reality, interdependently making us who we are. Solidarity and benevolence do exist, but usually in defense of

one group against another, and so even the better parts of human nature are paid for in entropy and the conflict that results in (symbolic or real) elimination of the other.

Some philosophers, like Georges Bataille, believed that we can get rid of this excess in another way, that we could utilize this underlying conflict. His bacchanalian, anarchic concept of expenditure "can be defined as the illogical and irresistible impulse to reject material or moral goods [that could have been used] rationally," so that what is allowed into the social order gains meaning and value "only when the ordered and reserved forces liberate and lose themselves for ends that cannot be subordinated to anything one can account for."[20] The destruction of material goods and submission to inhuman chaos are forms of entropy that, he believed, could release some of the energy circulating in a complex social network. But *some* form of destruction remained necessary even for Bataille.

Humanity is a form of energy—like all forms of energy—that answers to entropy. The dark forest framework is as suited to intergalactic game theory as it is to personalized communication on Web 2.0. We hallucinate the self within its mechanism, but the process has little care for the self. The interface of the forest might read us well, its plants releasing the titillating hallucinatory gas of subjectivity. Each node in the cybernetic chain of suspicion, sustained by the communicative interface, asks itself: What should be done and who am I? We answer, again and again, through ever more sophisticated interfaces. Once the dark forest is set in motion, we might miss what's behind the thick fog of subjectivity—an automated extraction process that reduces every single one of us—to the complexity we generate, measuring our entropy-potential, playing one node against the other, designing patterns of disorder. In this forest, one better stay silent or prepare for conflict.

What's on your mind?

March, 2020

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Conspiratorial Logistics and the Late Arab Spring

Looking back on ten years of digital counterinsurgency

Ten years after the start of the Arab spring, there is great room for disillusionment. Where dissent was not squashed by overwhelming police repression, military coup, or protracted civil war, the uprisings either waned after months of attrition, or their demands were assimilated into attenuated reformist agendas that must compete with pre-existing power brokerage and entrenched governance structures. Yet in 2019, the Lebanese and Iraqi uprisings began, and sporadic protests continue despite the persisting pandemic, as further unrest looms. The coinage of late Arab spring is a call for an alternate historic periodization of the present, one that does not consider the period of accelerated mobilization of the early 2010s as concluded, but as one phase in a continuing epoch of popular questioning and resistance.

Historians and scholars examining the uprisings of the Arab Spring have repeatedly noted their lasting spontaneity, decentralized leaderless structures, eschewal of traditional political party organizational forms, pluralistic ideological alignments, embrace of liberal anti-corruption discourse, and cooperation with non-governmental organizations. **[1]** The uprisings that were able to sustain relatively stable transitions away from authoritarian power, while avoiding descent into civil in-fighting, were the ones where well-established organizational forms such as professional unions preceded the spontaneous irruptions, as was the case in Tunisia and Sudan. **[2]** Regardless of their outcomes, the movements themselves relied extensively on contemporary communication and social media networks, and this has come to be seen as inherently characteristic of their structures and means of coordination. This emphasis on logistics and communication in forms of dissent has been attributed to the nature of contemporary capitalism, one where the centrality of production, and its physical structures such as the factory, is outweighed by the circulation of goods along global supply chains. The resulting refusal often takes the form of the riot, and aims to gain bargaining power by causing disruptions to routes and infrastructures of circulation, such as highways and airports, **[3]** consistent across the later protests of the Arab spring, and elsewhere such as Chile and Hong Kong, in 2019.

The geographic scope of the mapping includes Lebanon, Syria, Egypt, and Iraq. The mapping visualizes and traces the latent relations between 1) currently existing and burgeoning public and private sector cloud infrastructure projects as manifestations of geopolitical maneuvering or counter-revolutionary planning, and 2) the platform counter-logistics and social networks used by protesters during the uprisings and suppressed by the concerned governments. Throughout, special attention is paid to the deployment and circulation of conspiracy theories, both as constructions by ideological state apparatuses against protesters, and as the result of legitimate questioning and speculation by citizens in the face of government opacity and recurring crisis. Thus, the conspiratorial here refers to, on the one hand, the governmental surveillance and intelligence agencies tasked with suppressing the protests through physical crowd management techniques as well as through counter-revolutionary rhetorical dissemination, and, on the other, to the spontaneously organizing protesters and rioters themselves.

The survey touches on the privative regulations and increased taxes imposed on logistics and communications networks that sparked the revolt in each historical episode, such as the "WhatsApp tax" in the case of the Lebanese uprising. the infrastructural disruptions accomplished by the protests, the geopolitical influences involved and accusations of foreign backing levelled at the protesters, and the contributions made by groups written out of the dominant narrativization of the protests.

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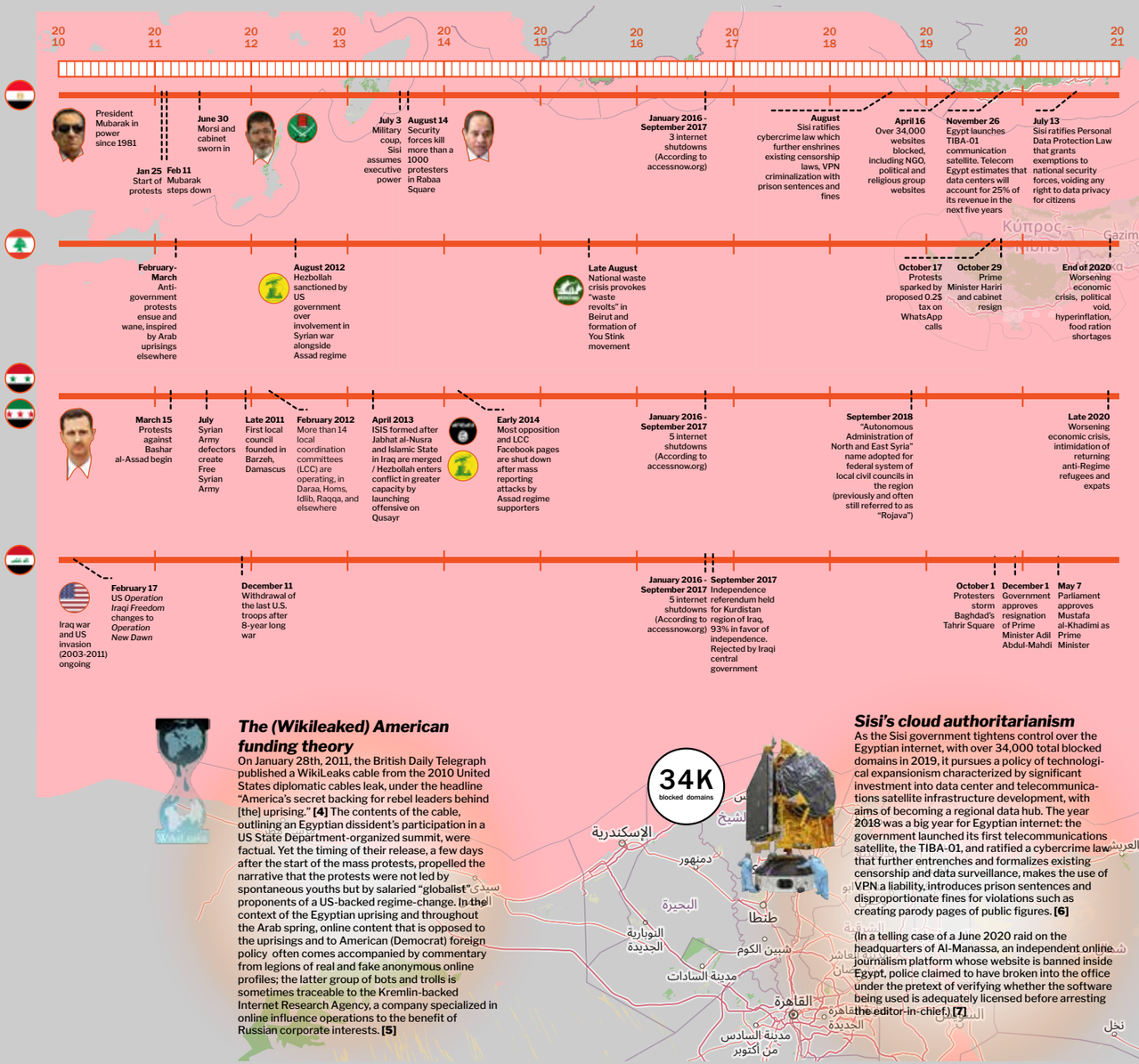


The (Wikileaked) American funding theory

On January 28th, 2011, the British Daily Telegraph published a WikiLeaks cable from the 2010 United States diplomatic cables leak, under the headline "America's secret backing for rebel leaders behind [the] uprising." **[4]** The contents of the cable, outlining an Egyptian dissident's participation in a US State Department-organized summit, were factual. Yet the timing of their release, a few days after the start of the mass protests, propelled the narrative that the protests were not led by spontaneous youths but by salaried "globalist" proponents of a US-backed regime-change. In the context of the Egyptian uprising and throughout the Arab spring, online content that is opposed to the uprisings and to American (Democrat) foreign policy often comes accompanied by commentary from legions of real and fake anonymous online profiles; the latter group of bots and trolls is sometimes traceable to the Kremlin-backed Internet Research Agency, a company specialized in online influence operations to the benefit of Russian corporate interests. **[5]**

Sisi's cloud authoritarianism

As the Sisi government tightens control over the Egyptian internet, with over 34,000 total blocked domains in 2019, it pursues a policy of technological expansionism characterized by significant investment into data center and telecommunications satellite infrastructure development, with aims of becoming a regional data hub. The year 2018 was a big year for Egyptian internet: the government launched its first telecommunications satellite, the TIBA-01, and ratified a cybercrime law that further entrenches and formalizes existing censorship and data surveillance, makes the use of VPN a liability, introduces prison sentences and disproportionate fines for violations such as creating parody pages of public figures. **[6]**

(In a telling case of a June 2020 raid on the headquarters of Al-Manassa, an independent online journalism platform whose website is banned inside Egypt, police claimed to have broken into the office under the pretext of verifying whether the software being used is adequately licensed before arresting the editor-in-chief.) **[7]**

BASSEM SAAD
CONSPIRATORIAL LOGISTICS AND THE LATE ARAB SPRING

Incomplete radical experiments

In 2011, numerous local coordination committees (LCCs), dedicated to citizen journalism and communicating news of the uprising, were set up in liberated Syrian towns and cities. The LCCs worked closely with the local councils, which coordinated community governance, civilian administration, and infrastructure management, drawing on the vision and writings of Syrian dissident Omar Aziz. Their associated Facebook pages, such as the Kafranbel Media Center, were the target of DDoS attacks by the Syrian Electronic Army (SEA), and most were shut down by Facebook in 2014. **[8]** The local councils and LCCs were radical experiments in horizontal self-governance that stood in the face of authoritarian terror and besiegement. It is up to the living to carry their legacy onwards, and to imagine the sort of networks, structures, and practices that they may have birthed, in the cloud and beyond.

"WhatsApp uprising"

Tellingly, the first night of protests within the Lebanese uprising was in spontaneous response to a proposition by the government to enforce a monthly 6$ tax on the mobile application WhatsApp, used by a majority of the population for daily communication. While the labelling of the uprising as the "WhatsApp revolution" is an overstatement that has been employed to rhetorically dismiss the historical significance of the uprising, the proposed tax and popular backlash demonstrate the dominance of the application in the national telecommunications sector that is both lacking and prohibitively expensive.

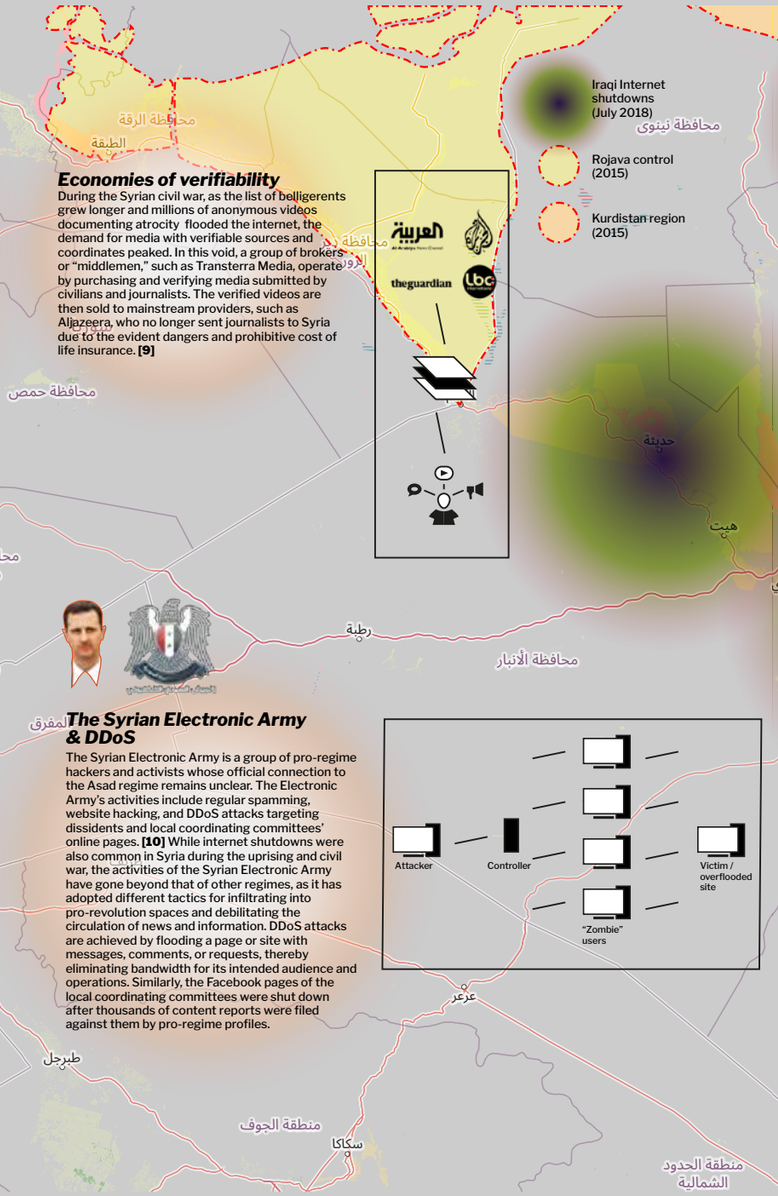
As the protests wore on, pro-revolution WhatsApp groups were frequently infiltrated by anonymous users and/or bombarded with phishing links and invitations to fraudulent news groups. **[11]** Most high-risk organizing groups migrated to other platforms such as Signal and Telegram in the early days of the uprising.

Economies of verifiability

During the Syrian civil war, as the list of belligerents grew longer and millions of anonymous videos documenting atrocity flooded the internet, the demand for media with verifiable sources and coordinates peaked. In this void, a group of brokers or "middlemen," such as Transterra Media, operate by purchasing and verifying media submitted by civilians and journalists. The verified videos are then sold to mainstream providers, such as Aljazeera, who no longer sent journalists to Syria due to the evident dangers and prohibitive cost of life insurance. **[9]**

The Syrian Electronic Army & DDoS

The Syrian Electronic Army is a group of pro-regime hackers and activists whose official connection to the Asad regime remains unclear. The Electronic Army's activities include regular spamming, website hacking, and DDoS attacks targeting dissidents and local coordinating committees' online pages. **[10]** While internet shutdowns were also common in Syria during the uprising and civil war, the activities of the Syrian Electronic Army have gone beyond that of other regimes, as it has adopted different tactics for infiltrating into pro-revolution spaces and debilitating the circulation of news and information. DDoS attacks are achieved by flooding a page or site with messages, comments, or requests, thereby eliminating bandwidth for its intended audience and operations. Similarly, the Facebook pages of the local coordinating committees were shut down after thousands of content reports were filed against them by pro-regime profiles.



Kurdish Internets

In 2014, only 9.2% of Iraq's population was online. Throughout the 2010's, the central government in Baghdad barred private companies from building proprietary networks, leading to two Kurdish ISPs being in control of three quarters of Iraqi networks, also by virtue of the autonomous Kurdish regional administration's pro-business regulations.

In the Autonomous Administration of North and East Syria, Rojava, the situation is very different. In the former de facto capital, Qamishli, and other main cities, basic Internet connectivity is available. Yet in most villages, the Internet is only accessible via 3G networks, often through Turkish providers, despite Turkey's open hostility towards Rojava. More recently, Turkish providers were banned in Rojava by the Kurdish regional administration, and a new provider affiliated with the Kurdish administration, R-cell, has been established. **[12]**

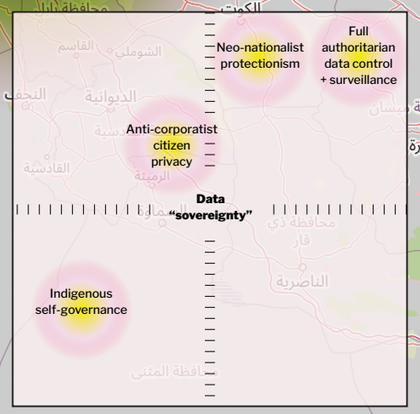
Counter-logistics of the Tuk-tuk

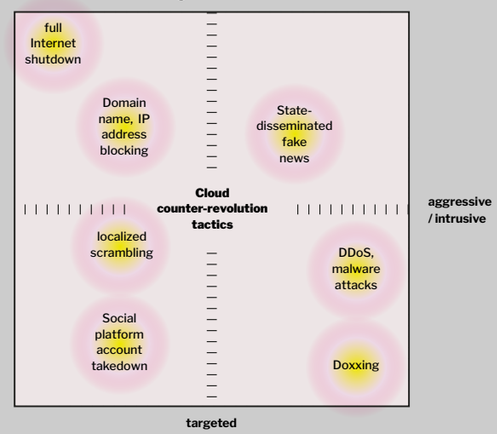
The Tuk-tuk, a three-wheel vehicle manufactured in India and used by street vendors in Baghdad and other cities, became a symbol of the uprising's counter-logistics. Tuk-tuk drivers were among the earliest contingents of the uprising, protesting fuel prices and traffic fines. In the following weeks, the vehicles were used extensively, to transport injured protesters to medical facilities and provide supplies.

After weeks of debilitating internet blackouts, an anonymous faction of journalist-activists began publishing a print newspaper titled after the small vehicle. The espousal of the street vendors' tuk-tuk as an unofficial symbol foregrounds what many have observed about the uprisings of the late 2010s, both within the Arab Spring and beyond: in the era of a capitalism that has become increasingly circulatory, the form that dissent takes will approximate that of the dominant activities of the time. In the place of a hammer or a cog, we have a three-wheel vehicle.

Totalizing blackouts

Over the last decade, the Iraqi Ministry of Communications has adopted a policy of frequent and totalizing internet shut-downs, versus more oblique measures which are common elsewhere, such as targeted censorship. The Iraqi Telecommunications and Post Company (ITPC) owns the centralized fiber-optic network, built in 2006, which sustains most Iraqi cities. With state monopoly on the central network, internet shut-downs are easily enforced and have become a yearly occurrence during periods of official student examinations. The policy is also a primary counter-revolutionary measure taken during cycles of heightened protest, in the form of nightly curfews, total shutdowns lasting several days, and blocked social media websites.





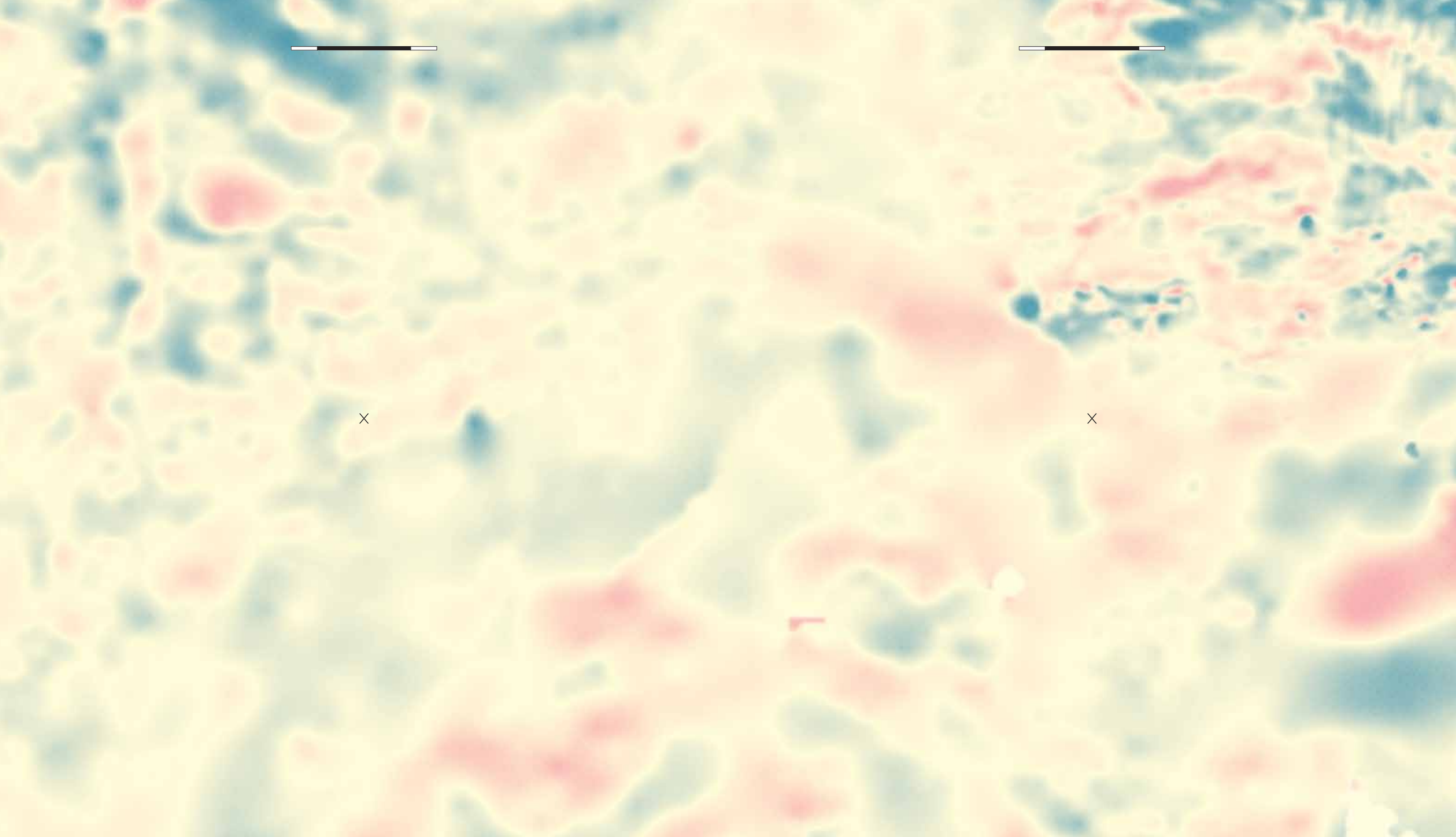
Amalgamated City

GCC GROUP

Amalgamated City presents a cityscape of real and proposed skyscrapers and landmarks from all of the Gulf cities combined into one skyline. Artist collective GCC presents an idea of a city powered by digital-imaging technologies that have transformed the way we visualize and see the world. GCC's visual language is not one of irony or hyperbole, but rather a way of framing culture in the Gulf that reveals the ambiguity and nuance of how people live today. With members trained in architecture, design, music and art, the collective embraces an interdisciplinary way of working and makes use of the glossy visuals employed by global businesses and nations alike that are standard fare for the late-capitalist consumer.

In Amalgamated City a fictional skyline is enhanced with the tools of dreaming: the architectural render. As buildings that exist in proposals and marketing sit side-by-side with actual existing ones, the line between the imaginary and the real is increasingly blurred. Presenting the experience of living in ever-growing cities, this work challenges the definition of a city, in which growth and planning are mutated by hyper-consumption, as it redefines authenticity by short-circuiting attacks on its proposed reality. Imaginary architectural spaces functioning as interfaces to consumerism can be modeled, rendered, animated, and experienced. As Gulf cities continue to grow and expand, the focus is on desire rather than practical urban problem-solving. New satellite cities and mega-projects are planned and announced so often that the idea of the future is a constant render and marketing campaign.

GCC Group. *Amalgamated City*, 2013. Wallpaper, firework projection and sound. 3000cm x 400cm.



The Terroir of Public Code

Based on an interview with Ben Cerveny, 2020

KLAAS KUITENBROUWER

Public Code

The Foundation of Public Code grew out of VURB, a late 2010s speculative design agency for urbanism in the Netherlands. Back then there were many similar perspectives on what the future might hold for cities, yet no one seemed to be making the actual concrete steps to get there. VURB drew an organogram to work out how to actualize some of these visions in a very precise way.

What became clear is that cities had very little capacity to build software on their own. Some pioneering cities, like Amsterdam or Barcelona, had taken it upon themselves to start open-source engineering projects that they would govern themselves. Having embarked upon it, they realized that collaboratively produced code that is version controlled, i.e., open-source, is not economically viable unless it has a community around it. If they were going to go for it alone, it would be cheaper to use commercial software. Here, the organogram that VURB had made confirmed that there was a need for an organization that would help municipalities in particular to create communities that could produce software and to help municipalities with codebase stewardship. The Foundation of Public code was established as a public organization that coordinated the creation of this new type of software, which was called "public code."

Public code starts with the recognition of the power open source—a type of software that was a fundamental accelerant to the digital industry from the very beginning. Software is open source when anyone can read and contribute to the underlying code base that generates the application. That creates an environment of radical collaboration and distributes the risks and efforts of using the tools among all the actors involved. Public code recognizes that software is one of two major "code bases" in a public organization. The other type of code is policy. Policy is a type of collaboratively generated version of code that has existed for thousands of years. Civilization essentially already runs on policy code.

Our culture is turning the corner in its understanding that software is infrastructure. Once technologies work, they become part of the stack that is taken for granted, like running water, or electricity. Network software is crossing that threshold at this moment in time. What is happening now, as public organizations undergo digital transformation, is that policy is becoming encoded in software. The way that cities are being run is becoming more and more software-driven and this software represents policy. Policy is replicated in the software, and the functional specification of the software is the policy.

But the creation of policy is governed by a complex mechanism: it is democratic, transparent, accountable, and deliberative. Software that runs public services should be held to the same kind of processes, and only then can we call it public code.

For that to happen, cities can't be operated by third-party packages projected onto them from Cupertino or Mountain View. Instead, they need to be able to understand the mechanics of the software and change it because, on a local level, there will be specific requirements that need to be fulfillled adaptively as policies change.

Public quality, sovereignty, equity, agility

The quality of public services in a city has a huge impact on the everyday quality of life of citizens, and nearly all those public services—for example, libraries, transport, waste management, parking, schools—are developed and maintained on the municipal scale. This is where a public code approach is most effective.

A problem of cities subscribing to a third party's software implementation is that this third party will have their own roadmap for how the software is developed and their own priorities as to which are the most important features. As subscriber you are informed of decisions that are made outside of your organization, which for a democratically run organization can be a problem if your citizens' priorities do not align with those of the third-party provider.

Public Code supports the notion of the technological sovereignty of cities that, for instance, Barcelona and Amsterdam are working towards. Sovereignty reflects a city's ability to take policy that is generated through democratic means and implement it in the code that runs in the city. This way they can offer choices to their citizens without being concerned that their service provider is going to back them into a corner. This logic extends to the citizens' own data sovereignty. Whatever citizens have voted for as their thresholds for the privacy and data use policies of public services, should of course be under the control of governance bodies that these citizens voted for.

Public code doesn't necessarily have to be a piece of software that's operated by a municipality or larger organization. Sovereignty comes out of community. It's about peer groups that share a policy orientation and then develop a community that can implement this in code. One public code environment in development is a tool for collaborative maintenance and decision-making around high-density residential buildings. It assembles a group of people that then has interfaces to look at the cadaster, the assessor's office, to talk to the realtor and the architect, and an OpenStack CAD tool that allows the architect to share a potential plan with the community, and everyone to comment on that and make alternative proposals and vote on it.

Other examples are civic operating environments, built out of a mesh of software running at the scale of buildings, or potentially neighborhoods that can decide how their street furniture is allocated on a local level, and what the circular economy dynamics are for the neighborhood.

This is the core issue of public code: to make sure that there is an infrastructure for policymaking itself.

In a lot of cases, the services that people have come to rely on these days are private sector tools in their digital life, and those are not necessarily inclusive, and they also often have different ideas on how rights work inside those applications. By having public versions of some of these tools, a more equitable approach can be guaranteed.

What has empowered huge corporate actors in the digital space is the practice of version control. In the making of software, version control is a mechanism by which thousands of people can be working on the same product at the same time, and all the changes they make can be merged into a single result. The Industrial Revolution resulted in efficient production. Version control is about innovating efficiently. Every time you open a Google product it has changed—that kind of agility and adaptability is what has allowed these digital corporations to dominate.

The sharing economy business models as used by Airbnb and Uber basically generated money by arbitrage between the time that they launch and the time it takes a public administration to regulate them. Therefore, public administrations need to speed up their refresh rate to ensure that the things that are broken by moving too fast do not include society itself. This is of course not just about disruption by big tech corporations, but also from pandemics and climate change. And this required agility of public institutions needs to happen within the context of representative democracy that incorporates inclusiveness and digital rights.

This is the core issue of public code: to make sure that there is an infrastructure for policymaking itself.

Code has *terroir*

French food and Italian cinema are obviously products that result from their cultural context. Software companies have trained users in the idea that software is scalable, that it can be built in one place and then be applied anywhere. But software is perhaps the most

contextualized cultural product. Software has *terroir*, which is to say that software is a product of its context.

Public Code is a kind of software that acknowledges terroir: it works with the idea of situatedness on different scales of implementation. Different cities have different contextual habits. When Hong Kong's transit card was introduced, women discovered that if they left the card on the bottom of their purse, all they had to do to open the turnstile was raise their arm slightly while passing through and slide their purse over the scanner. That turned into a choreography that you can see in the station: people leaning to one side as they approach the turnstile. And that's produced by a hardware software stack that is unique to that place.

Having canals in your city changes the way the city operates. Do you have to walk to a meter to pay for your parking? Or do you pay for it on your phone? Attitudes towards (a lack of) punctuality or tipping vary from city to city. Because these interactions are part of the texture of the relationship between cites and their dwellers and define how someone relates to the municipal organization that they're participating in, they also need to be able to be tweaked in the digital interfaces a municipality offers to its citizens. This is partly why the Foundation of Public Code software works on the municipal scale.

Even in its own basic principles, the public code approach has certain context-specific values built into it: it's about representation, shared decision-making and accountability. There is a particular political culture built into the code base. On that level, the public code approach is not unlike European Union politics in the sense that it has the core functionality of a shared code base and then on top of that are these distributions, specific code bases that are running in different situated contexts, as each country makes changes based on their own policy.

Recently the European Commission formulated a policy directive on the management of taxes and then simulated a software implementation as a demonstration, a reference code base that included all the proposed changes. Interestingly, several European states implemented that code base in their own jurisdictions. Now, retroactively, these countries must figure out whether they are going to invest separately in maintenance and development or if they are going to collaborate, but then also allow for the changes that need to be made in each national context. The Foundation of Public Code will be involved in this case. Having a functional code base, rather than only a policy directive, is a significantly more concrete way to discuss the issues. These types of questions point to the future of shared governance.

Estonia can run its state on a stack of public code from a server in Luxemburg. They really sell this as the image of Estonia: one can become an electronic citizen of Estonia by basically running the shared code base as a citizen. This is fully merged in the Estonian case.

Forking and continuous integration

The political issue of public code is whether the shared code base absorbs changes that happen in a specific context back into the shared code base. The more contested specifics are about citizen identification, taxation, property management and how citizens' core rights are administered.

What is interesting about places like Dubai and Singapore who we work with, is that they recognize the true value of public code services. They really appreciate the types of infrastructure that digital services provide. One thing that's great about public code is that it tends to perform really well.

This even becomes a differentiator for cities in the same way that the Burj Khalifa or a hotel with a swimming pool on its roof or whatever become part of the iconography of the city. It's like "Oh they have that incredible mixed modality, transport infrastructure, that is software managed."

In public code, as in any open-source project, participating developers can fork the code, i.e., make a copy of it and take it in their own direction. To a certain extent, that allows different types of government to make changes. The shared code base, however, is subject to version control and to a continuous integration process that involves stakeholders who review specific characteristics and pay attention to issues such as surveillance that might erode the rights of individual citizens. So, when discussing whether to absorb certain terroir-specific changes back into the core code base, the developers' community may reject those very specific modules about where you store the passports that you've taken from people, for example.

Software governance

Another handy aspect of the logic of version control is what is known as a testing suite—a set of computational processes that can compile the software and run it through a series of tests. Do all the buttons work in the interface? What is interesting about testing is that it can also function in a regulatory capacity: does this new proposed implementation comply with principle x, y and z?

These kinds of processes re-integrate humans back into the governance loop, which is particularly interesting in the context of the hottest topic of the moment: the governance of machine learning.

At this point machine learning implementations are not governed. This is primarily because most people don't actually know what machine learning systems are doing, and that includes their creators.

A learning algorithm is launched and uses a data set to learn, and then starts making decisions based on that data set. There is input of a data set, output of decisions and in the middle is this rather opaque algorithm.

A testing suite can bring humans back into the equation, because they can run tests on random samples of results of a machine-learning process, for instance, to establish whether it actually complies with human rights- or inclusiveness issues or whatever the things are that are most likely to be violated by that process.

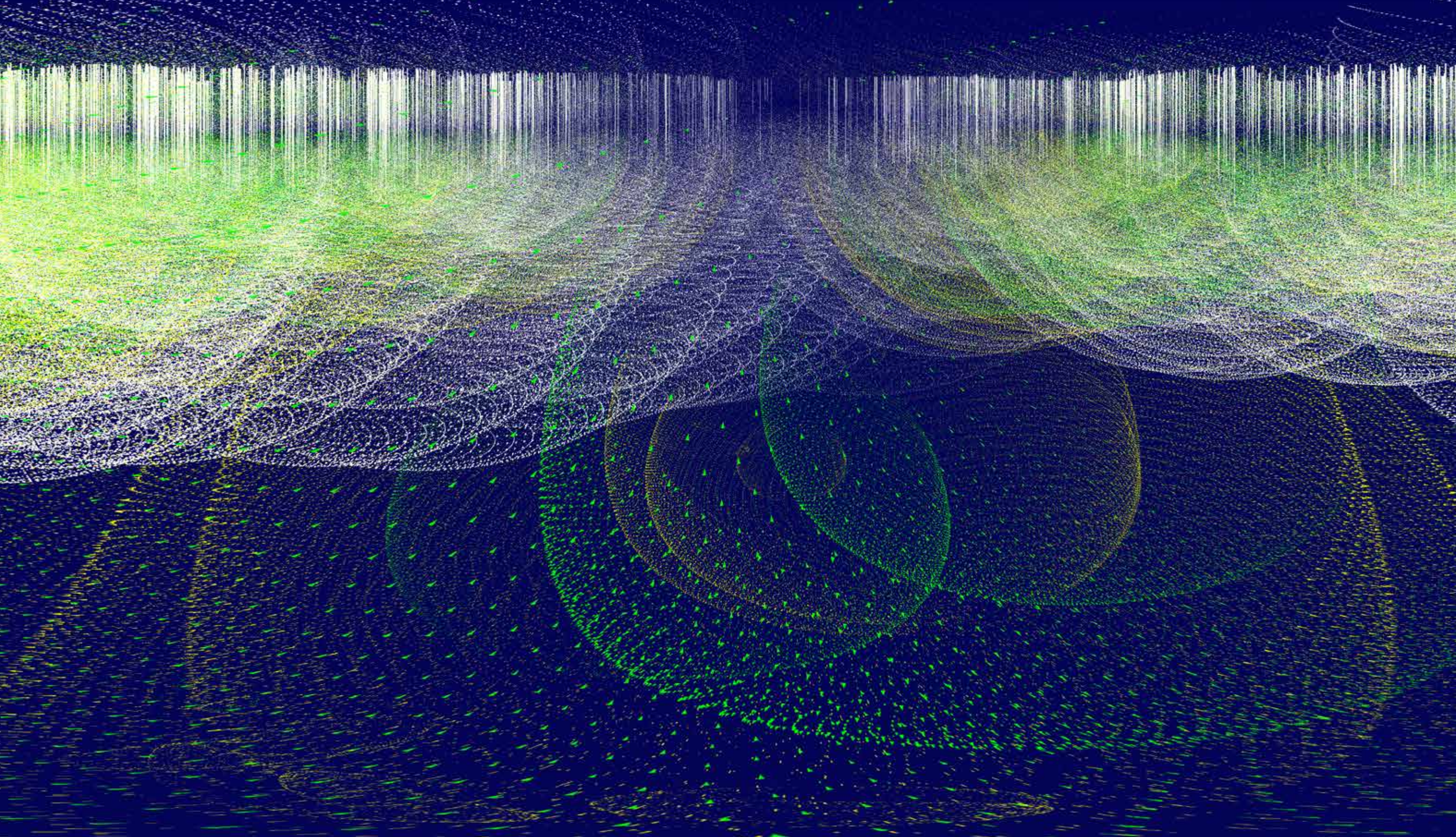
This is a major inflection point. Network software is undergoing this transformation process of becoming infrastructure, which means the service providers need to provide for everyone and to guarantee rights, which is something non-regulated corporations don't do very well.

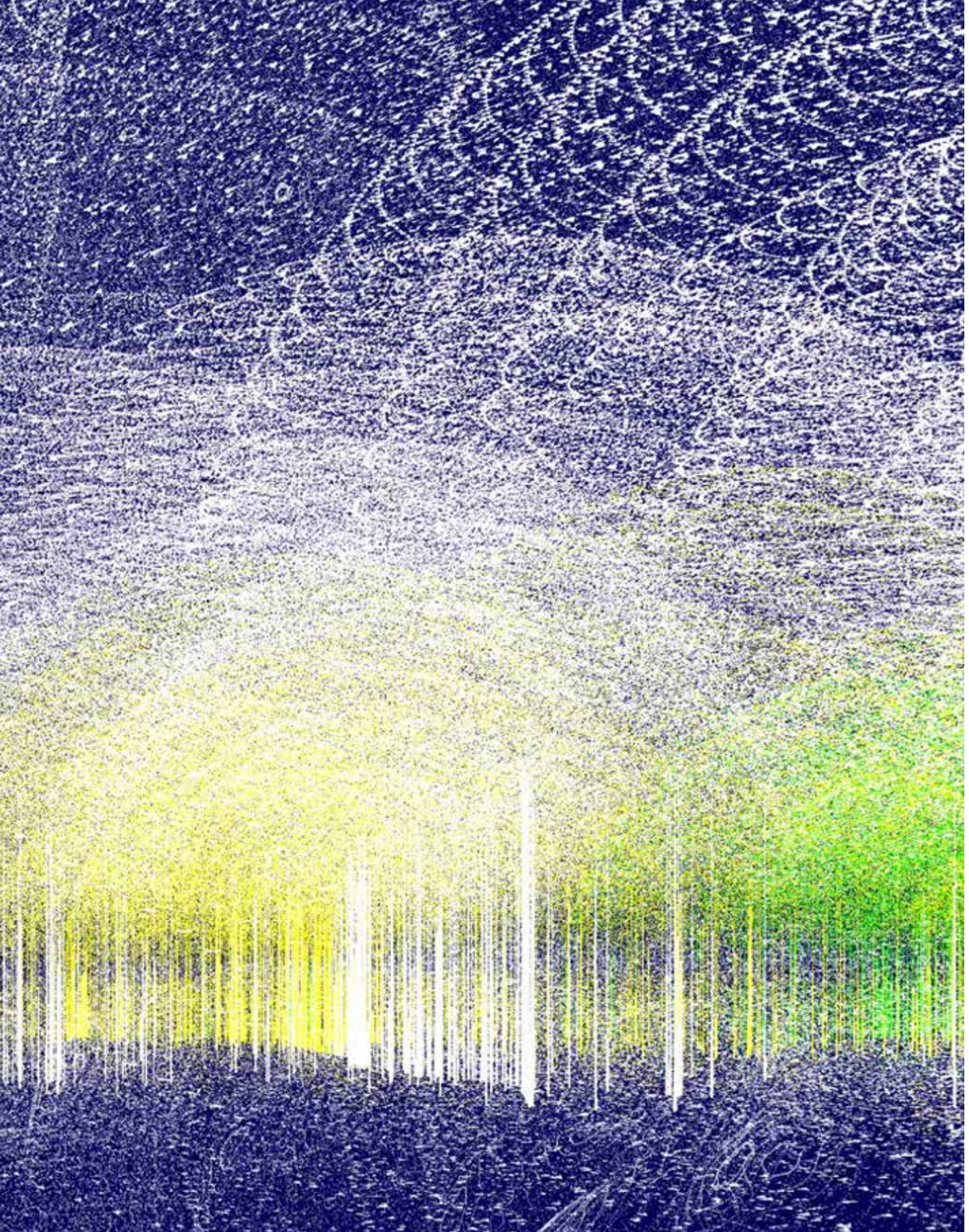
To avoid lock-in on a deep psychological level for basically everyone, there is the need for at least part of the stack to become public infrastructure. Europeans use the acronym ICT. When you hear that acronym, you know it's a policy person who thinks about technology people as being stuck in the basement plugging Ethernet into the back of their terminals, while the population is completely owned by Silicon Valley corporations, and policy makers have no idea what to do about it. And they will inevitably be ripped to shreds by the private vendors that show up and make promizes about things policy makers don't understand.

The fundamental aspect of public code is that public administration will be software-driven, and the process of maintaining that public code base that runs the policymaking process must be in the capable hands of the public administration itself. The architecture of the policy generation process cannot be outsourced to a third party, because the architecture literally is the process of governance. So governments need to develop this architectural understanding of what the software does, namely generating policy. A government can't say, "Oh, let's talk to those ICT people," because government is ICT people, government is technology.

That is really the fundamental motivation for the Foundation of Public Code: ensuring that society is ready to make choices about how digital signage and network software becomes infrastructure. How do we arrive at a situation where the deliberative discourse about what the best decision is can take place and can be acted upon? This is also part of the secret of version control and continuous integration. It is a process mechanism by which you can have deliberative collaboration and also produce a functioning service.

November, 2021





Architecture of Radio

RICHARD VIJGEN

Richard Vijgen's work *Architecture of Radio* is the visualization of the technological infrastructures on—and surrounding—Planet Earth. Dots and stripes make a colorful luminous network visible against a dark sky. However, Vijgen is not portraying cosmic phenomena. *Architecture of Radio* is, as the name already suggests, a representation of the usually invisible GSM, Wi-Fi and satellite signals that surround us day and night: an infosphere of terrestrial and orbital signals that travel around the world both wirelessly through the air and via cables. Vijgen reveals the usually invisible structures of radio waves and wireless network connections by means of an app. The signals, emitted by 7 million transmission masts, 19 million Wi-Fi routers and hundreds of satellites, provide insight into these networks, which we know are there but never see. In Vijgen's app, the natural or urban environments in which the signals move, and which we usually do see, are invisible. Thus the locality has not disappeared, only changed. The app shows where there is a high density of Wi-Fi and phone signals, and where there are fewer. In this way, you can explore the man-made "galaxy" that surrounds you anywhere in the world.

Architecture of Radio is a poetic representation of a technological reality that seems universal, but is very dependent on location. The sky may be the same all over the world, but the wireless signals vary in density from place to place, depending on local providers and networks.

Richard Vijgen. *Architecture of Radio*, 2021. Software.

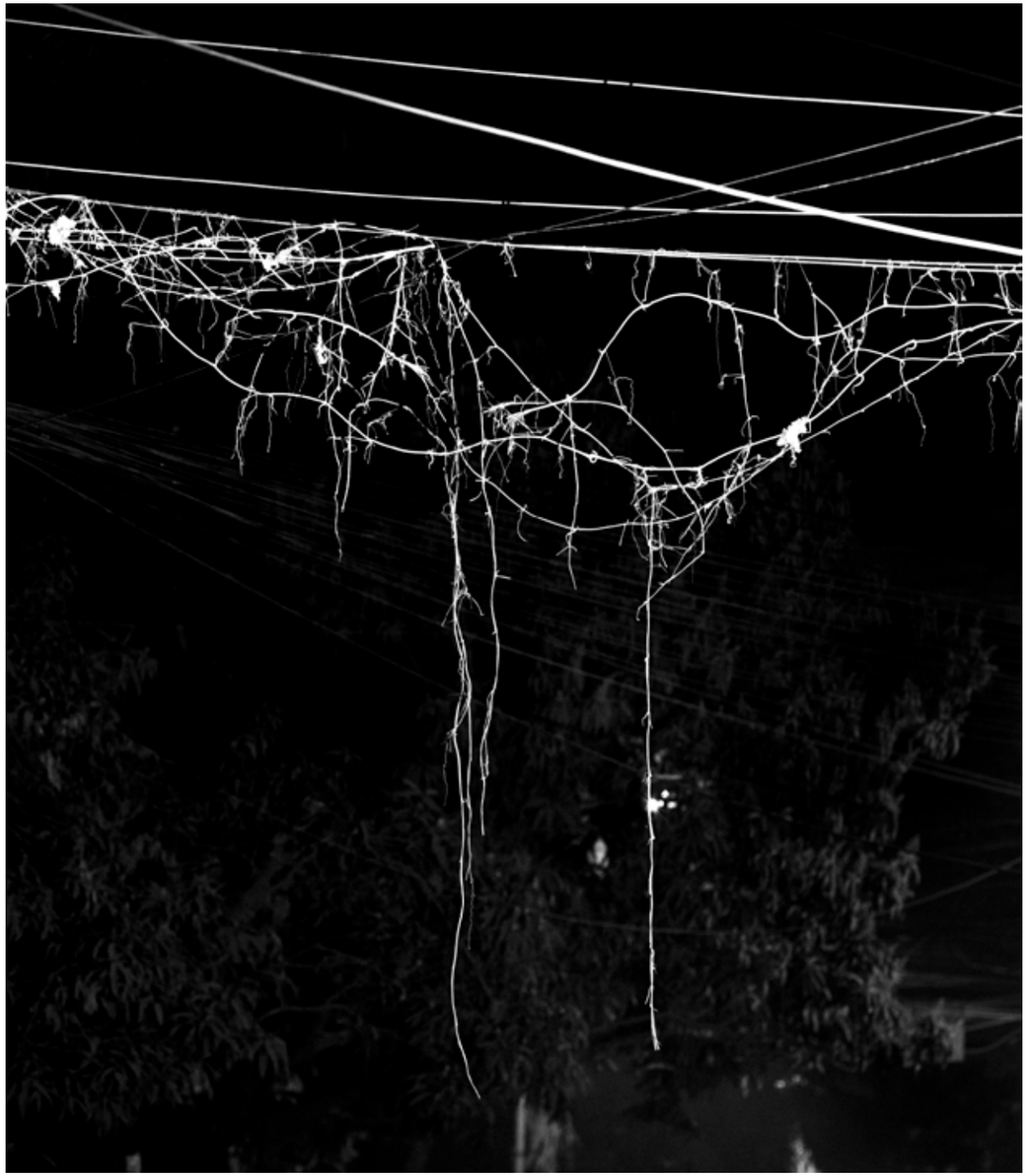
The Architecture of Radio iOS app is currently available for iOS and Android: http://www.architectureofradio.com. Scan QR code down below.

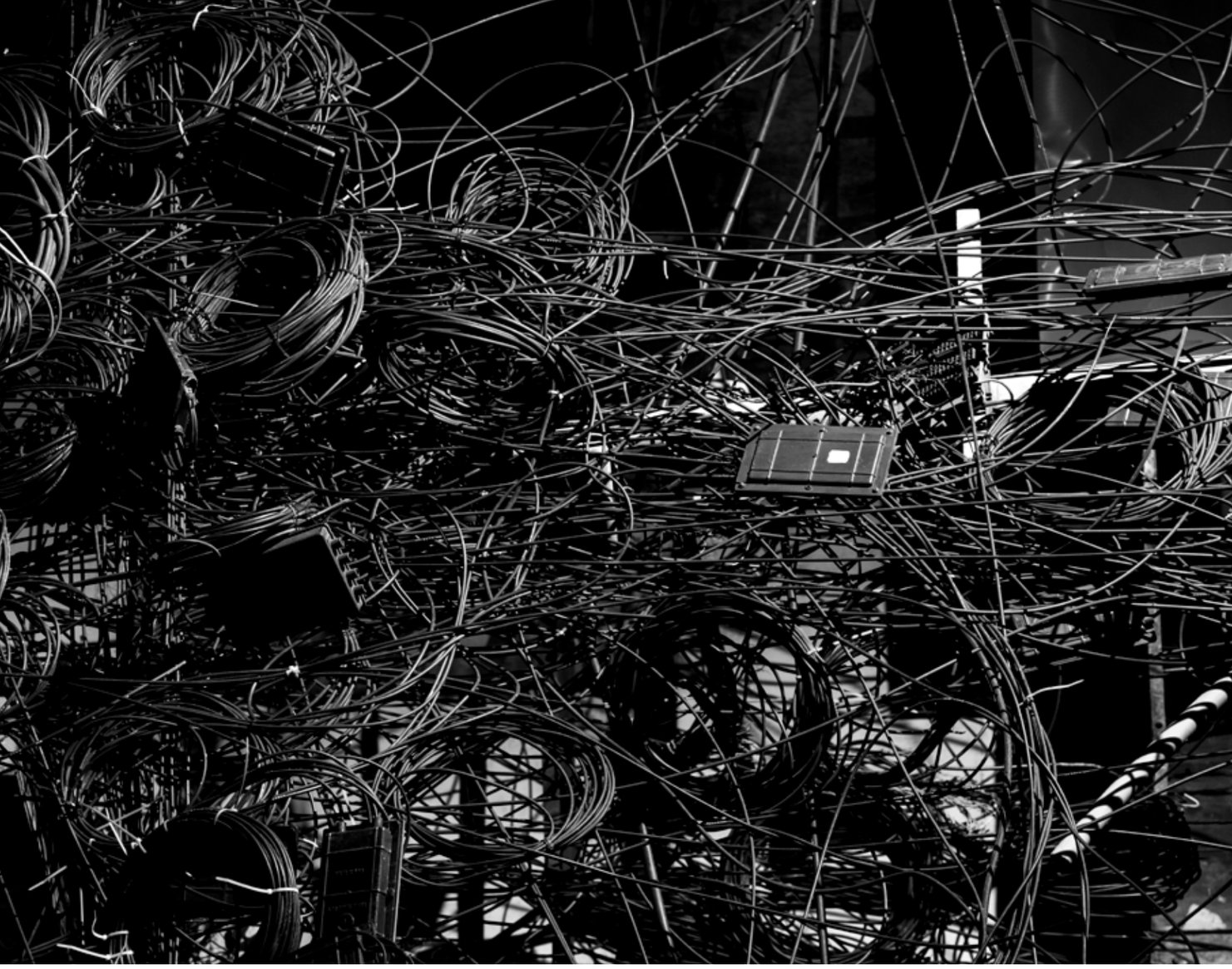
Wire Formation

SOUNAK DAS

Most of us access the Internet through Wi-Fi and mobile phones. However, these wireless systems are ultimately connected to physical cables that carry data at lightning speed from continent to continent. We are surrounded by metaphors like "the cloud," while most of our data runs through a jungle of cables. The cloud is not an invisible place: a physical infrastructure of data centers, submarine cables, satellites and more allows us to be in daily contact with each other, supported of course by invisible algorithms and protocols. The Internet Protocol facilitates data exchange between all these material technological components on a global scale. However, this high-tech standardization is not universal. Where the advanced and commercialized digital highway fails, users improvise ways of making connections. The photo series *Wire Formation* by Sounak Das shows the physical DIY presence of communication networks and structures. No tucked-away data centers and wireless connections, but tangled power cables dominate the streetscape of Dhaka, Bangladesh. In the technological reality captured by Das, kilometers of cables dominate the surroundings like modern lianas; the heavy cables hang like ballast from the poles situated in the streets. The Bengali government recently announced that they will start removing the poles, draped with wires, in 2022, making this photo series an archive of a fading technological reality.

Sounak Das. *Wire Formation*, 2018. Series.





Auto-Connect

MAYA INDIRA GANESH

When you think about driverless cars, you probably imagine a car that drives itself, as the name suggests, with happy humans—parents and children, chic silver-haired couples, or blind people—sitting in the back.[1] The driverless car is a specific sci-fi fantasy folded into a DARPA-inspired "smart" response to various crises—population growth, crumbling or absent public transport, the high rate of fatalities in car crashes, the interrelated crizes of climate and energy.[2] Ubiquitous computation is the infrastructure of smartness in which the human-driven car transforms into an "AI" or robot car or taxi. This power of computation tends to be framed in terms of the challenges to decision-making based on machine learning, such as the constructed narrative of the "ethics of autonomous driving." This narrative is chiefly concerned with the possibility that an "AI" or computational car, while notionally superior to a human in terms of efficiency and accuracy, cannot be trusted to always make the right decision, particularly in a car accident that could result in the loss of human life.

In contrast, I would like to situate the artifact of the driverless car in continuity with engineering histories and legacies of automation and industrialization. In this sense, I am interested in how expert engineering communities make sense of the industrial-scale evolution of human-machine relations, and particularly in the way this making-sense draws on ecological metaphors of communication, growth, feedback, design, and flow. From this perspective, the driverless car is less a fantasy of progress; instead it breaks down (pun intended) into a narrative about the transformations of space, bodies, and time.

Like many things we consider to be "AI," the autonomous vehicle is associated with a variety of coexisting fantasies: it is a connected and networked car,[3] part of a larger data assembly, imagined as a replacement for the human driver, a robot that is independent. I propose that we consider the future smart car in terms of three related yet distinct cultural ontologies of the machine—the car, the robot, and big data infrastructure. Looking through these ontologies brings critical specificity to the breathless hype—and enormous investment—surrounding this technology that is understood as primarily digital. If cars are now computational and big data infrastructures, what does that mean for car companies that shape culture, national identities, cities, the semiotics of individuality, and affect? Can you desire a silent, sustainable, big data infrastructure—in other words, an electric driverless car—in the same way you desire a BMW M2? This essay examines the fault lines and transformations emerging between these onto-genealogies.

Engineering Cultures

"In the 1970s, an eighteen-year-old's dream was to own a car … nowadays, an eighteen-year-old wants the latest iPhone so he can call an Uber." Following the changing fortunes of the car industry, Jonas, an automotive engineer, relocated from Southern Germany to Detroit, Michigan and finally to Silicon Valley, California.[4] He is thoughtful and open about the struggles of working across industries. He goes on: "software companies have realized that building a car is really complicated, so they have teamed up with car companies … and that's why I have a job here in Silicon Valley," he ends with a laugh.[5] Jonas finds that "software engineers do not have to worry about their product killing people, but mechanical engineers need to think about bridges falling and houses collapsing … this is very different thinking." Andrew, who trained as a mechanical engineer and now works with robotics and autonomous systems, echoes this. He cites the differences in education and training of software engineers compared to civil or mechanical engineers. He observes that most people who develop AI are not engineers but computer scientists, and thus do not necessarily have to study "the boring stuff," such as "reliable software standards documentation" or "code reviews." Instead, they "just learn how to code, and this is one of the reasons why there is poor quality AI in the world and AI-related disasters … like bias and discrimination."[6] For Jonas and Andrew, a "driverless" car is only marginally defined by "AI" and mainly refers to the infrastructural systems—cities, roads, energy, people—without which the car can do very little. The conversations with these engineers resonated with my reflections on a field trip a few years earlier to the heart of the German automotive industry, where the genealogy of the driverless car remains unique.

The Flowing Car Factory

Some years ago, I was part of a study visit to the factory of a renowned German car company. I was told that it was worth seeing this "smart" factory, where almost everything from the organization of people to information and raw materials had been automated, alongside the manufacturing process itself. (In addition, if I visited the plant as part of a group, I would not have to pay €200 for an entry ticket to the starchitect-designed factory.) However, I was more interested to find out how the senior management at the plant—longtime workers and engineers in the legendary German auto industry—perceived the driverless car and its emergence in society.

In the 1970s, an eighteen-year-old's dream was to own a car … nowadays, an eighteen-year-old wants the latest iPhone so he can call an Uber.

In the smart factory, the loops and flows of information supersede everything, making objects and people "disappear." The flow between these agents became the central organizing principle for the architecture and design of the building. The architects measured the number of steps that each team walked to speak with the others, and thereby identified which teams talked to each other the most, or not at all, at different points in the production lifecycle. One of the senior managers was delighted to tell us that he receives very little email because he gets up and walks over to people to talk to them, thus reducing his email footprint. He explained, "email is asynchronous communication; talking to people is synchronous." Everyone who works in the factory, be it on the line or in senior management, enters and exits through the same set of doors. Everyone eats at the same cafeteria. Human Resources and Corporate Communications departments sit on the ground floor, by the cafeteria and the entry doors, so everyone walks past them, and they are situated amid everyone. Cars assembled in the Body Shop in one part of the factory travel right through the building, along raized gantries lit by soft purple lighting, to be painted and fitted out in the Paint Shop. You could be at your computer or talking to a coworker at the watercooler while an unpainted shell of a car glided past overhead.

While we were walking around the shop floor, discovering these design features, a manager named Paul invited us to look at the engine of the new electric car that was on display. The team took pride in this new model, which had been made with the future—of both industrial production and the planet itself—in mind. In building the electric car, Paul said, they did not just replace the traditional combustion engine with an electric one; in fact, they invented a whole new car around an electric battery, taking quite a literal approach to the oft-heard phrase "from the inside out." This, Paul explained, was part of their approach to "flow," a principle that completely changed the company's understanding of factory production itself, moving away from linear production to a modular and "organic" process. The term "organic" came up in discussion when I expressed interest in the emergence of the "fully" driverless car and what it meant for a software company to build an automobile. Paul distinguished his company from Google in his response: "They're a software company: they think about a CPU and want to installl a car around it. We work the other way. Our cars are so organic!"

Mobile Communication

The term "organic" would also resonate with Theo, a futurist who I regularly met over two years ago, as well as his wife Elisa, both of whom work for another

famous German automotive manufacturer. Theo's job is to develop an approach to driverless-ness from the perspective of a company that has shaped the very idea of automotive engineering as luxury. They bristle at software developers imagining the future car in terms of navigation from A to B. Theo focuses on the feelings and experience of the *people* inside and outside a "driverless" car. Elisa's job, when she is not working with her husband on "re-imagining autonomy," focuses on a small yet significant detail of her company's high-end models: What does luxury smell like? Her work takes her to exclusive perfumers in Dubai, Oman, and Italy. Elisa's perspective showed me that the purported displacement of the human driver by software does not have to change the joy of driving and cars—and even a driverless car must still be pleasurable if they are made by historic luxury brands.

Theo's approach to future automobility is rooted in sensing and communication, inspired by Lovelock and Margulis's Gaia hypothesis of Planet Earth as an adaptive, self-regulating system, as well as Maturana and Varela's theories of autopoiesis. Theo believes that the future car must be seamlessly integrated into the environment in which it plays a part, unlike the driverless car that inspires anxiety when portrayed as a robot:

> The car has always been connected to the human body … so the future car is not a robot, it must sense the environment and the human, the human first, by becoming part of it … How do we innovate so that it *cooperates* with the human?[7]

Elisa and Theo draw on diverse sources to research this mode of communication: anime, cinema, and biosemiotics, such as the complex communication exhibited by schools of dolphins and murmurations of starlings. They work with design students to build prototypes of tactile, visual, spatial, and auditory interfaces. A small engineering and design in-house team then transforms these explorations into a working prototype (which I had the opportunity to see as part of a private event for journalists and researchers). The car, a legendary brand, is a beautiful object. I am a little overwhelmed to be standing right next to it, even though I am not dazzled by brand names (or so I tell myself). I do know, however, that driving this car is probably a special experience. The engineer gets inside and turns on the ignition—with his phone! We immediately notice something different, but at first, we cannot tell what it is. Then, I realize that the light inside the garage has changed: the car is now very subtly lit, almost glowing. On its roof, three points of soothing turquoise light glow dimly; as people move around, more lights around the car go on and off, glowing, not blinking or flashing. When someone walks directly in front of the car, the points of light become brighter, expand, and begin to move slowly from side to side, indicating a signal received and processed. It looks like a more sophisticated version of KITT from *Knight Rider*; everyone appears enchanted and curious. Theo talks about the car as a canvas on which to experiment with new kinds of sensing and communication between human and machine. How can the human learn what the car has sensed? How can the car communicate its intent? Why should the AV remain a black box? How can we bring the car and human together in a new dynamic of sensing, communicating, responding, and acting? At some point in the demonstration, he turns to me and says, "If we know what the machine intends to signal and what it is processing, then we don't need to talk about 'driverless,' it is just human-machine communication."

The car has always been connected to the human body … so the future car is not a robot, it must sense the environment and the human, the human first, by becoming part of it.

Transformations

Raymond Williams considered the automobile to be, besides the television, one of the two most important twentieth-century media because it reordered cities, spaces of work, leisure, family life, social interactions, and human subjectivity. The driverless car has emerged as a key element in the imagination of the smart city, which increases the datafication of the urban environment to transform mobility-and living into something more efficient, safe, smooth, and "smart." By identifying the multiple ontologies of the driverless car, we can disturb the imaginations of progress promized by these infrastructures. These vignettes from my field research suggest transformations that are underway in the framing of issues as well as in the reshaping of space and bodies—particularly as the car becomes data, and data become embodied. The language of flow, organicity, and feedback makes smartness appear soothing or "natural," but smartness is a kind of apparatus[8]: its ideologies, institutions, and science leverage anxiety/crisis to introduce new terms of the debate.

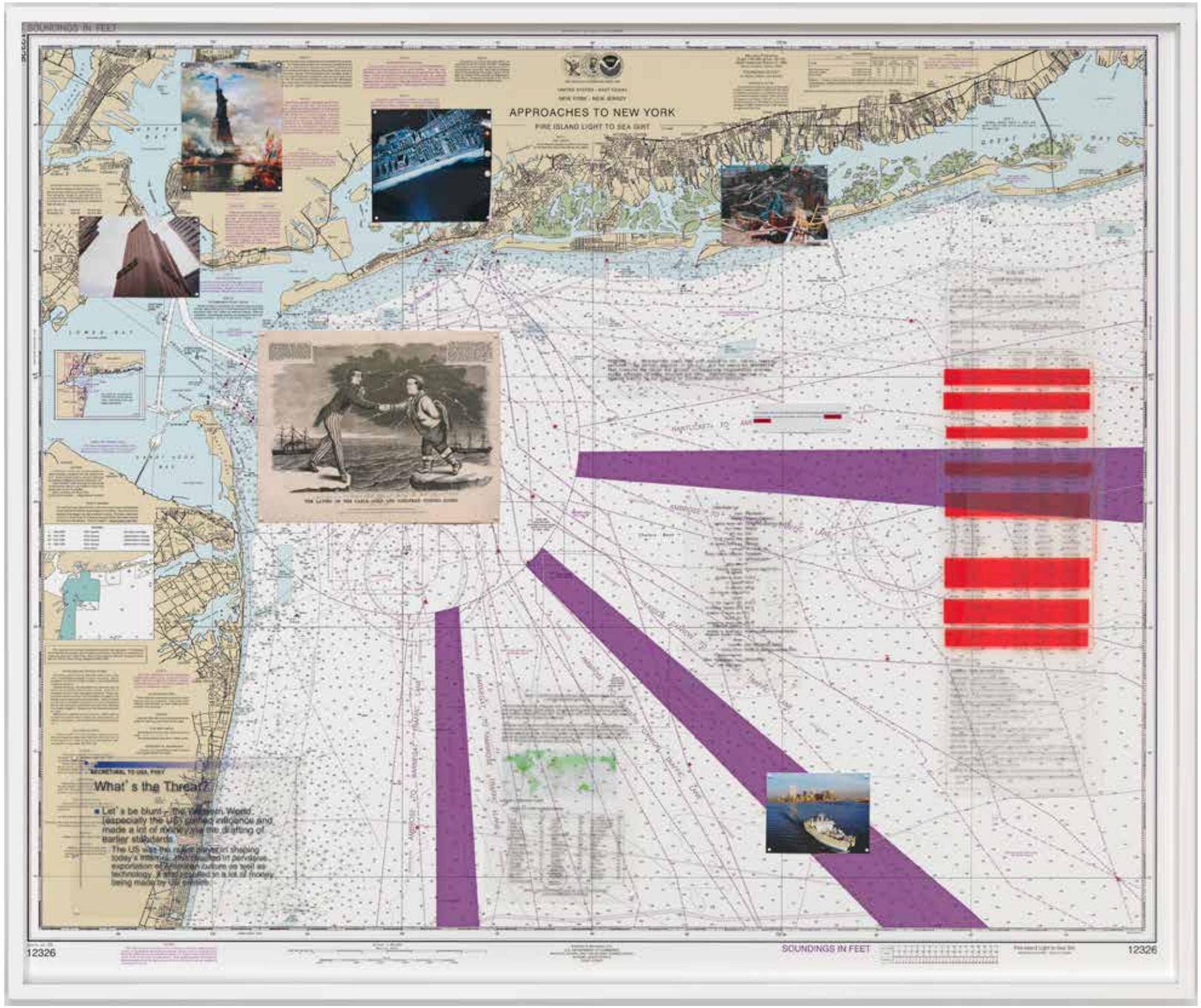
There is a strong affective, embodied, visceral dimension to driving and automobility. Marshall McLuhan refers to the car as "an article of dress without which we feel uncertain, unclad, and incomplete in the urban compound."[9] J.G. Ballard's macabre novel *Crash* (1973) drifts from one erotically charged description to another, mangled human bodies and machines fused together in the moment of a car crash. The "TV scientist" Robert Vaughan (the book's antagonist) and his motley crew of car-crash fetishists seek out crashes-in-the-making, even causing them, just for the thrill of it. Vaughan's ultimate fantasy is to die in a head-on collision with the actress Elizabeth Taylor. Ballard referred to *Crash* as the "first pornographic novel about technology," perhaps saying as much about our relationship to our machines as about porn.

The construction of jaywalking as a specific category of criminal offence in the United States demonstrates how humans have adjusted our bodies and behavior to "flow" with technologies.[10] In the early days of driving, before traffic lights were created, humans could not gauge the speed of cars and would frequently run out into the road in front of them. Rather than change cars or automobility, it was the pedestrian who was penalized in order to reshape her behavior . In much the same way, Andrew Ng, the chief scientist at Baidu, wants pedestrians to follow the rules and be "lawful and considerate" to enable the development of driverless cars.[11] Cities themselves have been and will continue to be redesigned to accommodate automobility. Florian Cramer proposes that rather than a terrifying future of sinister and omniscient AIs, our near future will be reshaped to accommodate AI—cars and highways redesigned to be legible to computer vision and autopilot systems, including "straightening motorways to make them perfectly linear and moving cities to fit [driverless cars], and redesigning and rebuilding all cities to make them safe for inner-city autonomous car traffic."[12]

The driverless car is a robot, a notional "intelligence" housed locally and individually, as if in a human-like brain. It is also a data assemblage melting into the environment. Despite what the engineers think, the metaphors of separation and connection are one and the same, just as in the earliest automobiles. The question is: what is at stake and what is lost in this relentless acceleration into the future?

March, 2021

1 Google's Waymo tends to advertise driverless cars based on the benefits they offer to disabled or less-mobile communities. For example, in 2015, according to their website, "our friend Steve Mahan, who's legally blind, took the world's first fully autonomous ride on public roads in Austin, TX." See *Waymo*, "Company," 2021, https://waymo.com/company.
2 Orit Halpern, Robert Mitchell, and Bernard Dionysius Geoghegan, "The Smartness Mandate: Notes toward a Critique," *Grey Room* 68 (2017): 106–129.
3 This is relatively recent terminology; the most up-to-date is the "circular car" coined at the 2021 World Economic Forum, in which the AV is integrated with sustainability mandates.
4 All names are pseudonyms.
5 Interview with the author, July 10, 2018.
6 Interview with the author, May 15, 2020.
7 Interview with the author November 21,2018.
8 Halpern et al. 2017.
9 Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge and London: MIT Press, 1964), 217.
10 Peter D. Norton, *Fighting Traffic: The Dawn of the Motor Age in the American City* (Cambridge: MIT Press, 2011).
11 Jeremy Kahn, "To Get Ready for Robot Driving, Some Want to Reprogram Pedestrians," *Bloomberg*, August 16, 2018, https://www.bloomberg.com/news/articles/2018-08-16/to-get-ready-for-robot-driving-some-want-to-reprogram-pedestrians.
12 Florian Cramer, "Crapularity Hermeneutics: Interpretation as the Blind Spot of Analytics, Artificial Intelligence, and Other Algorithmic Producers of the Postapocalyptic Present," in *Pattern Discrimination*, eds. Clemens Apprich, Wendy Hui Kyong Chun, and Florian Cramer (Lüneburg: meson press, 2018), 23–58, 39.



NSA-Tapped Fiber Optic Cable Landing Site + NSA/GCHQ-Tapped Undersea Cable

TREVOR PAGLEN

The NSA-Tapped Fiber Optic Cable Landing Site series and NSA/GCHQ-Tapped Undersea Cable series draws on documents from Edward Snowden's archive and other sources to develop a vision of the Internet that emphasizes the materiality of communications networks, surveillance, and the political geography of the Internet. Mimicking the NSA's own understanding of the Internet, which centers on fiber optic cables, landing sites, switching facilities, data centers, and the routes and choke points in global telecommunication infrastructures. While a metaphor like the "cloud" suggests that the Internet is a ubiquitous entity without place, it nonetheless requires a real and physical infrastructure. Photographs and maps point to the places where undersea cables connecting the European and American continents meet the mainland and are tapped by the NSA for the purpose of surveillance.

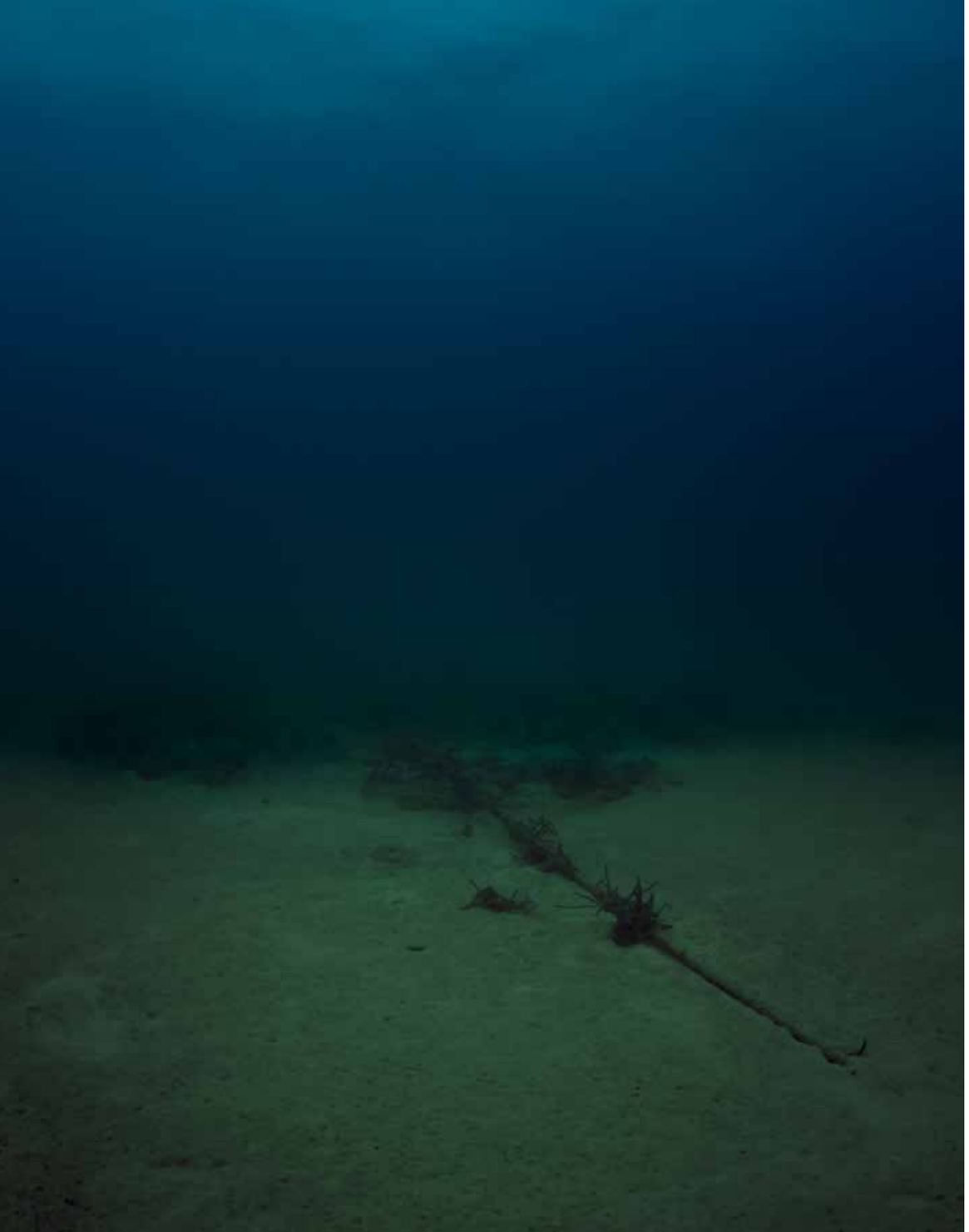
Each of the works in this series is composed of photographs of the beach or landing site where the cables either come ashore, or where they are located underwater, as well as a collage of images and documents related to each site. Also featured are maps produced by the National Oceanic and Atmospheric Administration (NOAA) for marine navigation. Layered on this map are various internal NSA documents from the Snowden archive, corporate documents, additional photographs of the site, and other materials.

Paglen trained as a scuba diver and studied underwater navigation and ventured to the ocean floor to photograph undersea cables that top-secret documents show are tapped by the NSA. These undersea photographs, composed of deep blue and green color fields punctuated by the unnatural presence of Internet cables, are meditations on vision, form, representation and the material networks that invisibly shape our world. These works are a visual reminder of how vulnerable our data is, and how easily it can be accessed.

Trevor Paglen. NSA-Tapped Fiber Optic Cable Landing Site, New York City, New York, United States, 2015. C-Print and mixed media on navigational chart–C-Print image: 48 × 60 in.; Map: 48 × 58 1⁄2 in.

Trevor Paglen. Detail of NSA-Tapped Fiber Optic Cable Landing Site, New York City, New York, United States, 2015. C-Print image: 48 × 60 in.

Trevor Paglen. Bahamas Internet Cable System (BICS- 1) NSA/GCHQ-Tapped Undersea Cable Atlantic Ocean, 2015. C-Print–60 × 48 in.



Early Internet in Africa

NANJIRA SAMBULI IN DISCUSSION WITH NII QUAYNOR

NANJIRA SAMBULI (NS): *Professor Quaynor, when you reflect on the early days of the Internet, a time when your focus was on building technical standards and teaching skills, how political was it then compared to now? And how was the topic of the African perspective navigated?*

NII NARKU QUAYNOR (NNQ): The development of technical standards has not been straightforward. On the one hand we struggled to keep up with our international colleagues despite our digital deficits, while on the other, we had to keep our policymakers sufficiently informed to ensure that they didn't make any blunders. Grappling with these two issues is always a challenge and has been political throughout. This is especially so in Africa. This struggle between governments and industry has always existed. Concerns about who contributes to or influences public policy in the new communications arena are at the root of the problem.

The way we navigated it was by adopting the principle that Internet openness was good for us; it was good for emerging countries. Because we didn't have any know-how, we didn't have any access. We didn't even know where to obtain a resource, an idea or domain... there was nothing. So without that kind of openness, it would have been difficult for the emerging economies to come to the table and be part of the dialogue, or even the business, let alone discuss governance of, for example, a local policy environment.

NS: *You've mentioned the voluntary nature of some of the forums and the discussions. I'm curious if over the years you have either experienced or managed to align those perspectives, especially those of our policymakers, with what would be considered the mainstream or the American understanding of what the Internet is in terms of what its norms are, the adoption of standards, or just the policy and political conversations.*

NNQ: There are many forums. On the local level, if you look closely at the underpinnings of the Internet you see an ecosystem around them. For example, names, local names, the ccTLDs—there are communities around them. If you look at the IP numbers, the number of resources that are required to deploy networks, and the ISP you have in your area, you will see that there are communities around them too. If you look at how, let's say, they exchange traffic among themselves and with external parties, you'll see exchange point communities there as well. If you look closely, you will see societies that are concerned with the side effects of these things, like Internet societies, etc. There are groups that focus on building capacity at a local level. At a local level in the policy realm, they have the equivalent of Internet governance-related bodies, which actually first started in Africa as far back as 1998. They were organizing meetings on how to govern even before ICANN [Internet Corporation for Assigned Names and Numbers] was formed and the result of all those meetings was the creation of the African technical institutions, the number registries, the AFrican TLDs, the research networks, and so on. In order to participate in the global, you had to also include the regional and the local as well.

So at a global level, for instance, we had to struggle to be involved in the formation of ICANN. In order to ensure that there was room for us to participate, we had to negotiate with the WSIS [World Summit on Information Society], we had to negotiate with the Internet governance groups that were formed, including the IGF [Internet Governance Forum], and so on. So, at all times, we had to be part of the global revolution, but at the same time be part of the local and build regional institutions as well. These are just a few of the examples in the technical realm in which I participate, and there are many more of course.

NS: *When Kenya and Nigeria, for example, come up in the conversation about cybersecurity it is obviously in relation to cybercrime. And both countries are net exporters of what are called cyber criminals. But the opportunities within this industry for white hat hackers, bounty hunters, or security researchers have not been exploited. As the bureaucrats feel fearful and arrest everybody, private sector actors are coming in.*

A good example is what happened recently in Uganda where Facebook, based on their own assessment, went so far as to decide which Ugandan politicians would be allowed a platform. My interpretation of what happened in Uganda is that over the last three or four years, Facebook has been working on the fiber optic cables to connect the country. So they're coming in as investors and they're running the entire stack now. As a result, they also try to shape the norm, or the way we actually think about governance altogether.

NNQ: There's nothing I can say about that particular incident. Africa is open to everyone for investment. But I expect that people will participate in developing their local ecosystem, not simply fulfill contracts and take their money out. I'm not sure how that is regulated by policy. I wish policy development would also consider the local environment. And if policy at the local level is being driven primarily by powerful multinationals, I am fearful that we will be excluded from the debate. But I also understand the government's problem, because it is looking for investment. And so it will take the money from whoever it can, but that too should align with a certain policy or strategy that attracts investors who see a return on their investment, but at the same time contribute to developing something locally. In most of Africa, the US invests in IT, but it becomes continuous procurement. Me, for instance, I installled ATMs here. What did I do? I bought a few of them, learned how they work. And then I looked at the new technology and replaced the subsystems on my own. Because, as an African developer that is my thinking. I want to develop, I want to learn, I want to teach it to my students. I want to encourage them to think out of the box. So if you take the easy road, if you let someone else do it for you, then you'll never have control over your own cybersecurity. If you want to have control

What you are seeing now is different, there is no globally shared interest. There's an interest only in dominance. But there's no place for that in Africa.

over it, get yourself a team of people doing open-source things. Train them in many, many different places and disciplines, and as open-source technologies change, they will move with the times. But if you just want to go and buy some off-the-shelf things.... Oh, good, you have it easy, life will be easy for you…

NS: *In fact, on that note on the new Internet and new IP, it's been fascinating to follow this at the ITU [International Telecommunication Union] level, you know China is stepping in to try and introduce new standards. We do need to talk about a new IP protocol that accommodates the growth of the Internet, but China is really angling for global governance through institutions like the ITU. You guys were raizing the same issues back then. Is the same spirit being fostered or are China's politics also encroaching upon the technical sphere, much as you hear about their welfare diplomacy in other areas?*

NNQ: It's similar to the early days when there was a struggle for access to something somebody had—so we had a shared interest to have access to it. What you are seeing now is different, there is no globally shared interest. There's an interest only in dominance. But there's no place for that in Africa.

African leaders might follow the newly proposed IP standards by China, but African industry won't. For me, it's very simple—this whole issue about the Internet concerns openness. If you cannot be open to scrutiny by others, and you have to negotiate with governments that are clueless, then how do you set and enforce the standard? Nobody's going to adhere to it. And there's a difference between the early 1990s and now. The current approach is top down—governments are setting the technical standard, not the scientific community. The norm we are trying to establish at IETF [Internet Engineering Task Force] and the like, is totally bottom up through working groups. And even then, two different groups must build the technical standards that they can then follow. Someone has to demonstrate that it is buildable and produce some data on the difficulties involved; only then can there be improvement. This is how it works.

NS: *So what China can do is roll it out on the Chinese market and impose it on a few others. But then, on the other side you have the multinationals, which can pretty much do the same at this point, because they are now investing in everything from undersea cables to standards in areas like AI. This brings us to the question of governance, specifically, separating the governing of the technology that runs the Internet and the governance of what you do on the Internet. How do these interoperate? These things are just going to keep coming into sharper focus without any sense of direction. Can you say more about the interaction between these two forms of governance, are they separate or related?*

NNQ: They are really in the same governance frame, because ultimately, the goal is the public good. Now, the distinction is to make sure we don't try to dabble in everything at the same time. The governance of how we build an Internet is more rigid and more rigorous, and apart from objectives, it has somewhat fewer social, political and economic considerations. It's more administration of the creation of the Internet. So we need to respect it as a different way of thinking—but it still involves everyone.

The second point is trickier because we don't know what we'll use the Internet for. That's why it is important not to be prescriptive about what the Internet is used for, because that stifles innovation. The whole idea is that one can innovate on it, once it has been successfully and securely put in place. The governance of this area on top of the infrastructure is a little different, as it is less administrative in a way: it's about feelings, about content, about how people choose to use it. People have freedoms and they have rights—you could say that it becomes like in real life. At the same time, it happens in cyberspace, where people don't have the same kinds of capabilities as they do in real life, and therefore it becomes more complicated.

It really means that we should be very cautious about how we govern it and not be so quick to say, for instance, "I'm deleting President Trump's tweet." I personally don't like his tweets, but I'm saying if one actor, in this case Twitter, can have the power to sanction to that extent, even if it is for the good, it raizes concerns about the consolidation of power and sovereignty in cyberspace. If a single actor has this capability, then I want to know how it is deploying this capability.

So that's the difference that I want to underscore: the governance of the use of the Internet is very broad: it's about life. As a developer and computer scientist, I don't feel I'm in a position to decide about a lot of things relating to this topic. I rather want the community to go through the process itself and consult experts and prevent governments from rushing into decisions or a powerful provider from just acting on its own.

The last important point is about how to make sure that technical standards work well and this is an area where there can be no compromises—one mistake and

It is important not to forget that the use of any technology brings its own problems that must be governed.

the impact and cascading effects are immediate. For example, if privacy is inadvertently not safeguarded in the design of a new standard, the damage is instant. In this regard, I want to urge everyone to be more rigorous in how we address this.

The same applies in all the areas. We see the same pattern in AI. The people building the hardware have to meet certain standards, because they're using a lot of IoT sensors. In such cases, the issue is: is it harmful to humans? For example, the sensors, the radiation, and similar considerations. And what about how the AI is used: is it for good or for harm, is it displacing human beings unfairly?

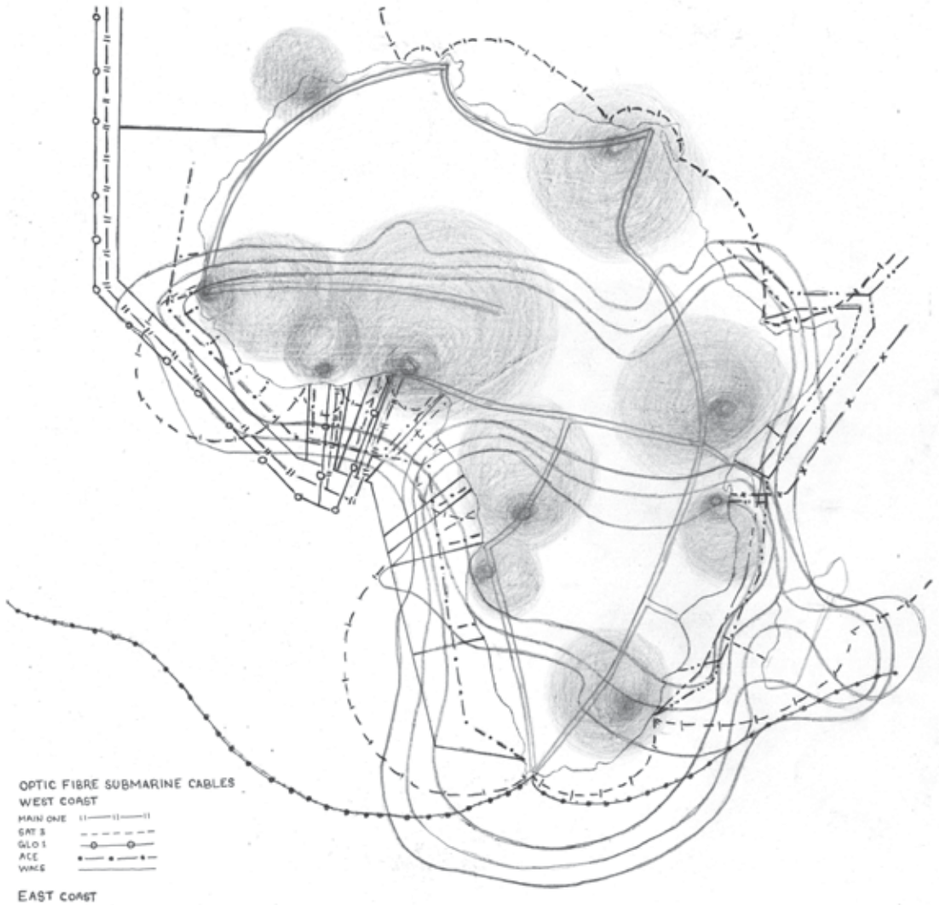
To avoid harm, several experts from different areas need to be involved—especially technical specialists—so that any misconceptions or misunderstandings can be clarified. For all kinds of technology, there is a need for standards or methods for building them sensibly. It is important not to forget that the use of any technology brings its own problems that must be governed.

As it goes with any technology, you have to wait a little while for it to take hold. If you rush, then nobody will use it, but act immediately once people who are using it have been harmed and complained, and you've understood how it happened. Only then you can work with the same group to devise a policy that may work.

NS: *That's a wonderful way to test it out, by putting it into practice and seeing whether people want these two things to coexist. And I think it's an open question, especially after the Trump situation, and then you have Amazon, for example, a cloud provider, suspending its hosting of Parler, an alternative to Twitter that Trump supporters decamped to, and stepping into that game. It's not that it was a technical violation so much as a political and societal violation. It really is a murky territory and we have no ethics in place at the moment. We have more questions than answers. And I think the question for us here is how we can have more skin in the game, because you're right, we could all be shut down.*

January, 2021

SOFT POWER DESIRE MACHINES AND



OPTIC FIBRE SUBMARINE CABLES
WEST COAST
MAIN ONE
GAT 3
GLO 1
ACE
WACS

EAST COAST
SEA-ME-WE 4
TEAMS
LION
EASSY
SAFE
SEACOM

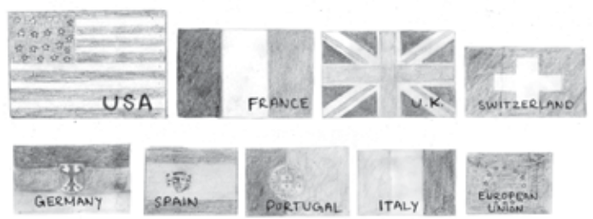
DSTV & CANAL HORIZON BOUQUET NETWORK

NEW CORRIDORS (ROADS, RAIL)

CULTURAL INSTITUTIONS
- ALLIANCE FRANÇAISE
- INSTITUT FRANÇAISE
- GOETHE INSTITUT
- INSTITUTO CERVANTES
- INSTITUTO CAMÕES
- CONFUCIUS INSTITUTE
- BRITISH COUNCIL
- PRO HELVETIA

CHINESE STADIUM DIPLOMACY

ENTERTAINMENT COMPLEXES



THE PRODUCTION OF AFRICA RISING

CASABLANCA
Royal Air Morocco
"Gateway to Europe"
"Ariawa Culture"

DAKAR
(incl Kano, Bamako, Ouaga and more)
Youssou N'Dour and Kanngoood
The Kora, Gorée and "West Africa"
"Desert blues", Timbuktu and Jollof rice
Senkoro, Senghor and Mouridism

CAIRO
(incl Khartoum, Beirut, Dubai and more)
Tahir Sqiare
Umm Kulthum and Tarab
"Ancient Egypt, the birth of human civilization"
pan Arabian high culture

ABIDJAN
Nouchi, Coupé-Décalé and Farotage

LAGOS
(incl Accra, Cotonou, Lome)
Nollywood, Naijapop, Afrobeat, cheap oil
Achebe-Soyinka, Felamphers and Yahoo-boys
"Africas most populous country"
Kente cloth and Orisha.
"Superior men of God"

NAIROBI
(the Kwani Generation)
Mpesa and the "Silicon Valley of Africa"
Long-distance runners
NGO's, think-tanks and foreign correspondents
The ghost of Karen Blixen

KINSHASA
(incl Douala, Libreville, Bangui)
Ndombolo, Primus and SAPE
The ghost of Joseph Conrad
enjoying poverty
"Blood diamonds" and Feymania
Roger Milla, Chantal Biya and "Rumble in the Jungle"

DAR ES SALAAM
(incl Zanzibar, Mombasa and Moroni)
Bongo Flava
Swahili novelists
Bi Kidude, Afrobeta and "dhow culture"
The ghost of Ujamaa

LUANDA
Isabel dos Santos
Kizomba and Kuduro
Federação Angolana de Basquetebol
"The most expensive city in the world"

JOHANNESBURG
(incl Maputo, Gaborone and more)
Tutsi, TRC and unity governments
DSTV imperium and Shoprite.
Maftikizela and Freshlyground
Yello and yebogoo
White writers and "World class" universities

Google

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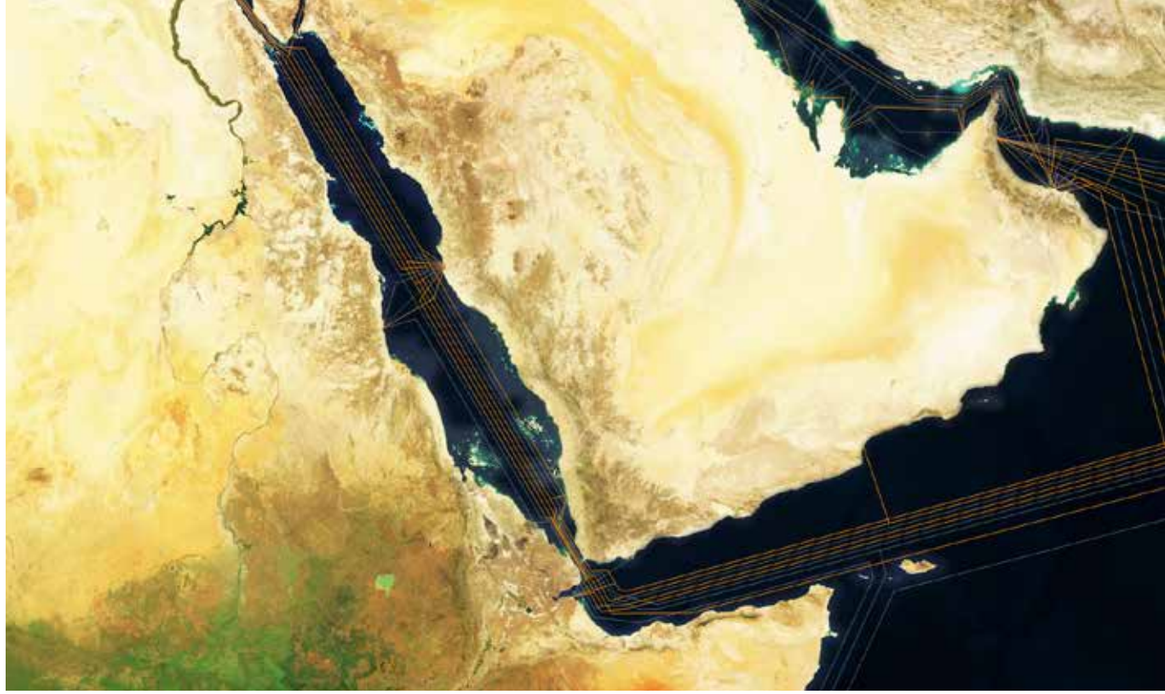
Soft Power Desire Machines

CHIMURENGA

Chimurenga's hand-drawn map has two representations of the African continent, symbols, flags and a legend. What is depicted here and by whom? We see the digital cables snaking around the continent; they resemble the trade and shipping routes that connect the Africa to Europe. But what are the Twitter, Facebook and Google icons doing there—and why is there a photo of Beyoncé, Jay-Z and their daughter next to them? The depictions of the cultural institutions of the countries that once colonized Africa underscore the suspicion that there is more to this map than initially meets the eye. *Soft Power Desire Machines* questions the colonial structures behind political-technological realities in Africa. The map offers insight into the cable network, based on colonial infrastructures and the new entertainment centers where digital celebrities, content creators and social media stars based in Africa produce content for a growing number of digital consumers in the African market. These African digital content creators often focus on the Western market. To achieve 'real' success, they turn to North America and Europe. What are the technopolitical motives and driving forces behind this drive for Western recognition? European institutions such as the British Council and Goethe want to partner with this new class of content creators through "soft power," while European technology companies install the hardware in the form of fibre-optic cables to facilitate this lopsided power relationship with infrastructure. The question arizes as to what exactly the African Internet is, and where it is situated in a digital world dominated by Western platforms and based on old colonial relationships. Are the new global African identities really a sign of Africa Rising—a narrative that is mainly propagated by business, donors and the media in the West? Or are we just seeing the technological heirs of the Scramble for Africa? Or are both narratives true?

Chimurenga. *Soft Power Desire Machines*, 2015. Originally published in: *Chimurenga Chronic* on March 19, 2015 in Arts & Pedagogy, Cash & Commerce, Faith & Ideology, Media & Propaganda, Systems of Governance.



Submarine Cable Taps

INGRID BURRINGTON

Almost all intercontinental Internet traffic takes place under water. A gigantic web of submarine cables facilitates our global communication. But what happens to the data that flows from continent to continent through these underwater arteries? Some of these cables are tapped by the British Government Communications Headquarters (GCHQ), through the use of systems that have been developed in collaboration with companies including Vodafone and BT Cable. But on what scale is this happening? The interactive website *Submarine Cable Taps* is an attempt to map the extent of this surveillance network. Angular orange and grey lines frame the continents that are displayed on a satellite view of the earth in Mapbox. The owner of each cable (often large telecom companies) and the name of the GCHQ program associated with it can be read from the map. That this is mostly not public information should come as no surprise. The interactive online map shows how some parts of the network appear in GCHQ documents, while others do not. This comprehensive overview is based on information from the Snowden documents that were published in the *Süddeutsche Zeitung*.

Ingrid Burrington. *Submarine Cable Taps*, 2014. Screenshots.

FARM (COUNCIL BLUFFS, IOWA) 2015

JOHN GERRARD

Data centers can be seen as the driving force and memory of a technological society. The cloud consists of gigantic factories that enable exchanges and transactions worldwide. Computers act as crucial, local nodes in this mega-structure: they transmit information in the form of signals through brains. However, these physical immense memory centers are often kept out of sight and are rarely visited by people. FARM *(COUNCIL BLUFFS, IOWA)* 2015 by John Gerrard is a digital portrait of one such data center, providing people around the world with the opportunity to visit it, albeit virtually. The work shows a photo-based computer simulation of the extensive Council Bluffs complex in Iowa, USA. The building houses many thousands of Internet servers. The center was set up by Google and processes a significant proportion of the world's information traffic. Gerrard, together with a team of technicians, has meticulously recreated the environment in virtual reality and then rendered this constructed world using a game engine. Everything is present: from the diesel generators to the enormous cooling towers. The viewer is slowly led through the environment. A slow-motion hyper-realistic impression provides glimpses of a usually invisible place. The slowness of the images indirectly emphasizes the unimaginable amount of data that is processed here hour after hour, day after day. Gerrard's FARM *(COUNCIL BLUFFS, IOWA)* 2015 is a visual representation of the robust house where the Internet lives. The heavy matter and energy that the cloud actually consists of are made tangible.

John Gerrard. *FARM (COUNCIL BLUFFS, IOWA) 2015*, 2015.

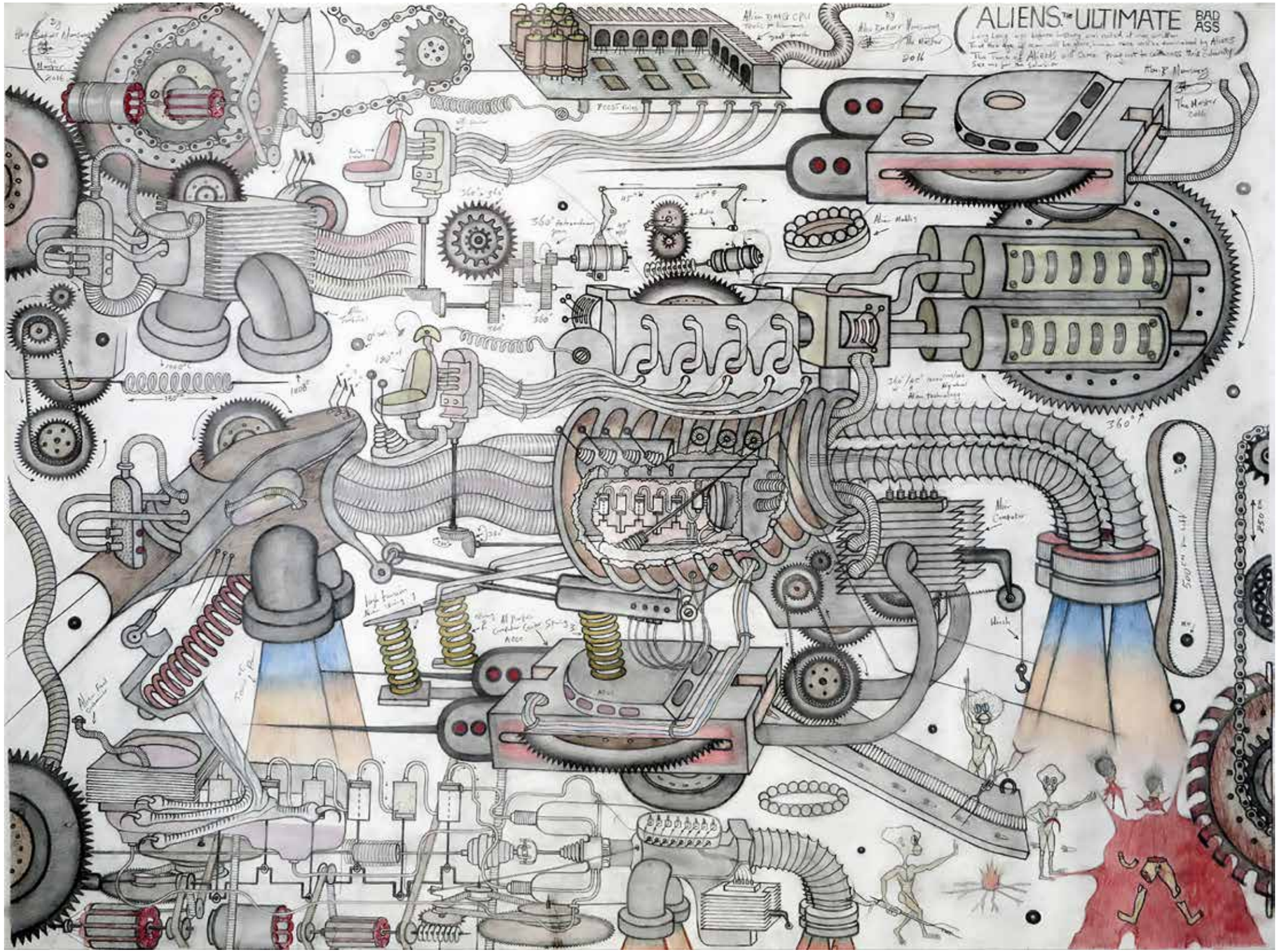

1W

Alien's Ultimate (Bad Ass)

ABU BAKARR MANSARAY

There is a lot to see in *Alien's Ultimate (Bad Ass)* by Abu Bakarr Mansaray. With tanks, aliens, vehicles, wheels, gears and explanatory texts, the drawing holds the middle ground between an infographic, a gory cartoon and a construction drawing for a complex machine. It is a serious military-industrial tableau with a cartoonish feel. Mansaray's drawing shows how aliens are taking over the world, using machines that are sketchily and fragmentarily depicted in the drawing. The mechanical side of technology is depicted in a retro-futuristic manner. The drawn manual or diagram for a bloody attack hints at the (military) politics behind technological inventions. Mansaray drew on his own experiences with the civil war in Sierra Leone, which raged there from 1991 to 2002. The drawings are the result of his attempts to forget the horrors of the war and the dictatorship of the destructive technology that played a part in it. It is not surprizing that Mansaray needs extraterrestrial life to portray a reality outside that of humankind's. In this new reality, it is no longer clear whether it is the aliens or the retro-futuristic machines that attack and threaten mankind. *Alien's Ultimate (Bad Ass)* is a schematic representation of automated (self)destruction in which biology, technology and militarism join forces.

Abu Bakarr Mansaray. *Alien's Ultimate (Bad Ass)*, 2016. Ballpoint pen, colored pencil and graphite on paper. 129 × 171 cm. Courtesy the artist and Galerie MAGNIN-A, Paris.



On Hemispherical Stacks

Notes on Multipolar Geopolitics
and Planetary-Scale Computation

BENJAMIN H. BRATTON

1.
Looking toward the 22nd century, it becomes clearer that the geopolitics to come and the planetary computational infrastructures with which they operate are, in fact and practice, not two separate things. They are different names we use for deeply interwoven socio-technical processes. Even a decade ago, such a statement probably would have seemed closer to science-fiction than political science. Now, even the conservative disciplines of law and international relations accept that planetary computation is more than a domain over which normal sovereignty rules; it constitutes a form of sovereignty in itself.

2.
These notes are meant to locate *The Stack* thesis on planetary-scale computation within the fractured geopolitical moment of 2018, and perhaps to look back on the present from the virtual perspective of a future bewildered by our present. What were they thinking? *The Stack* thesis describes planetary scale computation as comprised by six layers: *Earth, Cloud, City, Address, Interface,* and *User,* each of which has its own platform sovereignties.

The *Earth* layer is not only where energy is sourced, but where energy infrastructures determine social relations in their image. Unfortunately, the politics of energy and mineral flows, and how they relate to human biology (or could differently), now struggles under ponderous mystifications and expensive obfuscations. Primary problems of sovereignty at the *Earth* layer are rooted in the fact that the necessary alignments of state actors, open markets, city-states, and plural agencies necessary for massive carbon remediation, including the decarbonization of computing itself, wide-scale 4th generation nuclear power, meaningful carbon pricing, food supply rationalization, massive rewinding corridors, and so on either do not exist or are grotesquely mis-incentivized.

The *City* layer is where complex arrangements of inhabitation are played out in multiple and mutually entangled assemblages. It is where metropolitan singularities and networks of quasi-sovereign city-states hold recursive relationships to national territories sometimes held at arm's length. The city may serve as a capital territory with regional zones as its extended jurisdiction and peripheries as the back-office to the metropolitan core. Still, the countryside is where the *Cloud* actually lives, in data centers, logistics archipelagos, and other megastructures often largely unoccupied by people. These are an urbanism of a different sort: charter villages for inanimate objects and exceptional zones that become the new normal.

The *Address* layer is where we track multiple regimes of naming, counting, inscribing, indexing, and sorting any object, noun, event or verb according to particular needs, norms, and interests. It is where treasure maps full of miscellaneous entities, those with mass or without, coincide in realms of agnostic abstraction, identification, and interchangeability. It is the domain of classification and accounting (and thereby of decentralized economics and ledgers) and all the forms of communication that it enables.

The *Interface* layer is where the parts of systems see one another. It is where governance and biosemiotics collaborate and where overlaid diagrams turn perceptual loops into closed cognitive frames. Formally, these interfacial regimes become more standardized as their content is untethered from the real on behalf of self-reinforcing micro-mythologies. It is where, often dangerously, symbolic relations are freely substituted for causal ones. Interfaces are not only something users look through at the world, it is also the layer through which the world looks at itself. This layer is also where the sensing assemblages that feed the inputs of landscape-scale AI's as they configure strangely alien/familiar sensible worlds and the intra-species signaling dynamics that ensue.

The fragility of agency and the boundaries of agents are drawn at the *User* layer, including but not limited to the status of humans and humanism, individuation and collectivization, encapsulation and prosthesitization. The polyphony of imaginaries for AI and evolutionary robotics may be trained here, ranging from the standardization of cultures by a common virtualization to a proliferation of subjectivities unarticulatable by contemporary vocabularies. Here contestations of sovereign identification and identity are fought, sometimes one ID at the time. For some, "identity theft is when someone has a depersonalization episode, then repersonalizes as you instead," but for others, the trace of address is not so easily dislodged. Either may be experienced as a delinking of identity from agency, representation from non-representation, and may be dramatized in public forums or fought over more directly in ways that are non-representational, more operational: counted but unnamed.

3.
According to *The Stack* model, we observe not one totality but intersecting totalities superimposed on one another. *The* Stack is a generic frame that proliferates and multiples itself as the stacks we have and the stacks to come. In response to the book, *The Stack*, there has been a strong focus on the *Cloud* layer and how cloud platforms take on many of the functions of the Westphalian state the and the equally important inverse of this dynamic—how states turn into cloud platforms.

The other layers of *The Stack* are also sites of important artistic and design conceptualization. The model links the dynamics of sovereignty at each layer and recognizes how the conclusions of one may determine the terms of conflict at the others.

Sovereignty is contested and produced at each layer and not only in ways that are recognizably "political." At this moment, the production of new territories, when states absorb functions of the *Cloud* and indeed *become* cloud platforms, may include hard enclosures within a bounded territorial domain as well as transoceanic and atmospheric encapsulations, and more dispersed securitizations of information flows. The geometry of such political geographies are not without precedent; they are perhaps closer to what Carl Schmitt called *grossraum* than to any clean Sloterdijkian spherization or Neo-Cameralist patchwork of little Westphalian zones (though we see these, as well as private polities, appear).

Below, I will briefly explore the qualities of hemispherical stacks, as defined by a consolidation of computational networks into a handful of transnational blocs, which in turn comes to define the external boundaries and internal governance of those blocs and their geopolitical positions. I will consider the shared architecture of such stacks as well as decisive contrasts in how each configures both formal and *de facto* sovereignty based on different political/technological traditions. Expertise resides in complex divisions of labor and in persistent cultural norms, but also in the structured externalization of intelligence by technological standardization and procedural interoperability. Varied distributions of expertise form the basis of algorithmic governance as they locate sovereignty, decision and exception in the interfacial circuits that differentiate inside from outside one gateway at a time. Finally, the essay will briefly consider how the organization of governance under the rubric of hemispherical stacks may delimit the scope of geopolitical multipolarity and the spectrum of cultural diversification particularly in relation to artificial intelligence (AI) arms races.

Again, the production of new territories occurs as much if not more by how states absorb functions of the cloud and indeed become cloud platforms than the inverse. So instead of presuming that new spaces are developed in *opposition* to the state, we see that states are producing new territories and are perhaps the most important innovators. In recent years, the planetary reach of computation is even more granular and even more global, but it also has cohered into irregular and sometimes antagonistic consolidations,

federations and geopolitical alliances. We see then the emergence of not one global Stack but a mitosis of the stack genera into a regime of multipolar hemispherical versions; it is an emergent geographic governing technology for which the steerage of the state, even if unbound by Westphalian borders, is paramount. In time, however, that may not be the case as other forms of authority —centralized or decentralized—assume decisive places.

4.

The geographic scope of multipolar hemispherical stacks is delimited by the procedural integrations of data—imagined as a new sovereign substance—and the drawing of territorial circumventions that are sometimes ancient and sometimes quite new. That is, the boundary drawn for data capture often tracks directly with the defensible boundaries drawn for its geopolitical domain of influence if not formal jurisdiction: the geography of one becomes functionally, if not formally, tied to the boundary of the other.

No one hemispherical stack has global knowledge over all the others, and each sees and is seen according to this limited blindness. As each is limited by the data it can sense and model, its ability to govern can be defined by how it puts in motion the particular amalgamations of data and the *models* it chooses to produce about the world through its information haul. From such models, each stack produces simulations that stand in for the world and so each learns to govern and train these simulations as a way of governing its relations to the world. In this sense, each hemispherical stack is also an infrastructural initiative for the composition of a regional ontology that can know some things but never others. The geopolitical intrigues between now and the passage into the 22nd century will come not only by the interoperability between stacks but also by the confusions, lapses and mistranslations between these vernacular mega-machines.

Three of the most clearly drawn hemispherical stacks are the Chinese stack, recognized as the BAT stack (Baidu, Alibaba, Tencent and outlined by state-installed firewalls), an American (plus Australasia, UK, and Israel) stack, recognized as the GAFA stack (Google, Amazon, Facebook [now Meta], Apple), and an EU stack modeled less by the platforms it has built than by regulatory initiatives seeking to protect/produce regional data sovereignty in relation to the GAFA stack. The EU has also taken a leading role in developing an incipient and quite diverse/contradictory "open stack," which might include encrypted apps, Estonia's digital governance accomplishments, and Barcelona's data municipalism in its quilt. The wider map includes so much more of course, including a Russian stack (plus CIS countries) recognized as MYVKT (mail.ru, Yandex, VK, Telegram) and others in Latin America, India, Africa, Japan, the Gulf, and so on, and there are far more important innovations than this short essay can index.

In this sense, each hemispherical stack is also an infrastructural initiative for the composition of a regional ontology that can know some things but never others.

Clearly, national and linguistic histories play a role here in how each is divided from others, but they do not explain as much as it may appear. While each hemispherical stack organizes its constituency of users, data and models according to different conceptual and contextual demands, they all draw on historical and legal traditions in ways that are clearly also improvisational. Ultimately, the more important re-orientation however is not to fold present circumstances back inside the envelopes of regional traditions but to leverage those toward a new normative framework that better suits an inevitably entangled common future.

5.

Even by preliminary and sketchy observations on the contours and contradictions of some hemispherical stacks, some surprising patterns are already discernible.

While the GAFA stack continues its historical expansion, the structural map of its interlocking monopolies, both corporate and state, twists and turns on an almost minute-by-minute basis. In *The Stack*, I cautioned against presuming that the particular macroeconomic divisions between core platforms of the GAFA stack (search, social, commerce, hardware, etc.) must necessarily align as they have, and that we should anticipate new combinations. Recently, we've seen the ascendance of Amazon and vilification of Facebook, the continued fragmentation of Google/Alphabet and the dry incrementalism of Apple. Next year, a different "state of the stack." Unlike the halcyon days of its Obama-era ascendance, the GAFA stack now battles on several fronts, some quite real and others existing in the narratives of its frenemies. The GAFA stack fights for market share against the BAT stack but also against various platygaeanists within its core user base who depend on its platforms to oxygenate and distribute their fuels. Some even hold seats in Congress. Trump regime's reflexive hostility to multilateralism, and indeed any recognition that the host planet is spherical, has left the liberal globalism it inherited from the days of Sec. Clinton's "Internet Freedom" policies in a deliberate shambles.

"Throwing rocks at the Google bus" on behalf of "Team Human" now means the spectacle of a robotic Mark Zuckerberg schooling elderly legislators about how "the Internet" works and easily ducking questions put to him; a president threatening a Federal audit of search engines on behalf of Pepe the Frog; and an apoplectic Alex Jones ambling sideways down the Capitol steps while screaming at Jack Dorsey about the Illuminati. That is, even in the USA the GAFA stack has become a chief target of those who feel unnerved and displaced by the deep macroeconomic, demographic and cultural identity shifts that are enabled and *revealed* by planetary-scale computation: it is simultaneously an engine of variously confused populisms, their primary medium of auto-amplification, and now also their favorite target.

6.

Many debates in Europe contest the terms of inclusion or exclusion in a Euro-American stack, and what the terms of that inclusion may be, if at all. By Europe's GDPR (General Data Protection Law), the legal status of EU data draws dotted lines from data center to data center regardless of their physical location. In practice, such policies also lead toward data localization within Europe, a country or even a particular city. EU Digital Single Market rules (right of erasure, pseudonymization, data portability, etc. all sensible) may in time take on a gravity similar to that once afforded to the Euro and the ECM. Enforcement depends, of course, on what is meant by operating "in" this jurisdiction, as what counts as "EU data" or "municipal data" or "national data" will continue to be redefined by opportunistic circumvention. New battles over data ontology and categorization ensue, and so too will contestations over who and what counts as European accordingly. From the European perspective, it might seem that all this is fought in response to "American" platform influence (defined tendentiously by some as "colonialism") whereas on the other side of the Atlantic, serious policy discussions have been scrapped in favor of telecoms, and by the time the Democrats get the White House back EU GDPR-style guidelines may be the default policy option.

Some novelties which appear initially interesting for one reason, but which prove uninteresting for another, may yet prove important for other reasons still. When Denmark's Digital Ambassador suggests that his country's relations with Google are as important as with other States, we shouldn't smirk too hard, nor take this as necessarily distressing. Or, Estonia's e-residency program may be interesting not because it allows you to pay taxes to Baltic states you have never visited, but because it suggests that there is no imperative link between the distributed provision of state social services and legacy state jurisdictions. The geographic walls that sort citizens from a wilderness of non-citizens may become taller and wider but less and less necessary; formal state citizenship itself could be as mobile as it wants to be.

Europe's ongoing attempt to establish a continental (though sometimes national or even municipal) form of "digital sovereignty" also has reasons for criticism and worry. Europe's primary short-term contribution to development of hemispherical stacks may be based on a core competence of regulatory oversight and social democratic mechanisms for con-

sensus. These are probably more difficult to design and defend than underlying technologies, harder to copy/paste and import, but crucial to the geopolitical order to come. EU models may become a gold standard by which others are measured, or they may bring about an isolated digital jurisdiction, a dark corner of the planetary archive where training data is by law either never gathered or never made available to interested models.

In the interim, there are also ideas in the air that give the present moment its unique scent and which will hopefully be looked back upon with confusion. Some such are based on a naive confidence that law/politics and technology are still two distinct domains and that the former should naturally have dominion over the latter, as it *seems* to have in recent historical memory. That the technology would itself constitute a form of small "g" governance is sometimes presumed too literally (i.e., that open source software will lead in linear fashion to open source politics) and sometimes as the dangerous new situation that needs to be reversed ("take back our privacy" to where?). Exemplifying that literal-mindedness, we see policy trial balloons floated, such as Jeremy Corbyn's notion of UK-only publicly run Facebook. An online social network run by the state may make sense if you really trust the state as the proper forum, scale, and geometry for civil society, but perhaps you do not. And yet, one might reply, what could go wrong that has not already? At an EU-wide level we see other gestures of legal fantasy claiming "digital sovereignty" with a mixture of broad goals, lists of specifically defined good vs. bad means, flamboyant suspensions of economic reason, and sometimes precious little in-between. Considered in detail, compliance with these would seem impossible, regressive, self-defeating or all three.

Another concern is how much current post-Brexit techlash may have already mined the path to more viable and genuine alternatives. The formation of the European hemispherical stack is a function of more than technology or law; it is also a cultural dynamic, but now some songs of digital sovereignty are in harmony with plain-old xenophobia. Not always, to be sure. The important prospect of a hemispherical stack congruent with the accomplishments of social democracy and the grander vision of a cosmopolitan European model cannot (or should not) be reduced to a simple parable of "foreign surveillance capitalism" vs. "digital sovereignty for citizens." First, the invocation of the *citizen* as the rightful actor, particularly at this moment when the status of EU citizenship is so fraught and anxious, seems rather tone-deaf. Second, the ugly connotations of *surveillance* as representing all data sensing, modeling, and recursive feedback immediately forecloses all positive uses or at least frames them with needless suspicion. Is climate change data and modeling really just "surveillance science"? One worries that seeing the larger, difficult issues through this particular lens and establishing thereby a baseline common-sense that the rightful EU stack is foremost about *preventing* the widespread use of big data makes the development of a 21st/22nd century model of a rational, equitable hemispherical stack on the European continent more difficult. We will all be poorer if it sabotages its own growth or doesn't fully bloom for other reasons besides.

7.

What China calls the *sovereign internet* encapsulates a vertically integrated spectrum of state authority into information networks of networks forming not only a territory over which national sovereignty is claimed, but one constitutive of the social body through which that authority moves. It is now accepted that the Internet "in China" is not a marginal case but a central one, but it is also equally difficult to cleave journalistic clichés about the Red Web from more durable insights.

Sinofuturism is a real thing but it is not what you probably think it is. It is always possible that Evil Corp. will allow China to annex the Congo, but other paths are more likely. Still, even though the rule of law is not the same thing as the rule of the Party, the Chinese example should be a more cautionary tale to those who might see nationalization or public control and capture of the corporate web as an unproblematically presumptive policy. More importantly, we observe that the Chinese stack deals not only with the supervision of individual citizens inside the Great Firewall but also with the logistical coordination of materials and assembly into and back out from the mainland. Even as it proclaims formal governing sovereignty over the data in its jurisdictional domain, the Chinese stack is not contained within a fixed formal border. It extends into the presence of a majority of the objects around you right now as you read it. It is already a planetary project and projection.

BAT (Baidu, Alibaba, Tencent) represents the public-facing application stack of a much deeper and wider socio-technical integration that would seem to integrate the sensing data from trillions of sensors, including those aligned with human-carried mobile devices and industrial supply chains, into a comprehensive society-scale technology under the control of the political class. It is, however, not that smooth. The tensions in the USA between a formal political class (East Coast) and an emergent technological class (West Coast) may or may not be avoided by China, where a general fear that online platforms may be used for counter- authoritarian organization, including a decentralization of powers, seems more pitched and more normative. As these apps become more popular outside of China's formal jurisdiction, uncertainty about the provenance and governance of data generated thereby will become only more complex, and may make the USA and European squabbles seem quaint in comparison.

Is climate change data and modeling really just "surveillance science"?

In the West, there is currently a great deal of interest, fascination and exaggeration about the scope and implications of the Chinese internet. Social Credit systems play a big role in these stories, of course, both for their actual implications and for those imagined for them. I wouldn't ever suggest that authoritarian control of information is not troublesome or dangerous, but nor is it sufficient to imagine the Chinese stack first as a "free" stack resembling some idealized model on top of which is layered a secondary network of censorship and interference. More accurately, consider the tendrils of an internally fragmented political body fused into billions of devices and signals, attempting to impose an order more fragile that it seems. Its ideal is integration but that is (as of this writing) dependent on a "balkanized panopticon," a political regulatory platform full of gaps, holes and redundancies.[1] That texture is, in essence, a defining quality of the Chinese stack.

But, again, focusing only on how this apparatus supervises individual users is to miss a fundamental function as a logistical form. It works on the street through a vibrant mobile electronics craft culture infamous for its rapid innovation and it works at the scale of the state's grand initiatives such as Belt and Road, which would carry that street (and that textured apparatus) all the way West. That extension is a source of concern over China for Stack geopolitics, and one way that concern plays out is through the hemispherical filtering of hardware as a way to filter software. As China blocks Skype, Facebook, Twitter, etc. other hemispheres make similar moves. In the United States, major Chinese phone manufacturers such as Xiaomi and Huawei cannot get carriers to sell devices, and hard and soft restrictions on Chinese electronics in sensitive infrastructure are increasing. Server/data localization in Chinese territory (by Apple, for example) and search services that comply with state content control (by Google, for example) are targets for criticism in the US by nationalists and human rights advocates alike.

In the long run, AI may drive more volatility not just by the weaponization of algorithms in an explicitly military context, but also over claims over the data that trains any robust AI system. Just as for Europe, the zero-sum "extraction" conception of data is artificial, but that does not mean that fortification of physical access to the people, places and things necessary to model and construct AI at the scale of hemispherical stacks will not be more strongly securitized. As AI are trained only on the data they are given, and as the data they are given is that which is hemispherically accessible, then a side-effect of AI geopolitics potentially is Galapagos effect whereby AI evolve in relation to geographically circumscribed information ecologies. Here the potential for regional-scale Potemkin ontologies is carried with the momentum of algorithmic arms races.

8.

It was Putin who announced to an assembly of Russian schoolchildren that whoever controls AI will control the world. Given the state of the Russian technology industries, I assume he meant this less as a Khrushchev kitchen debate threat than as a forlorn plea for algorithmic multilateralism. The Russian stack may suggest troll farms, Facebook sorcery, and bot attacks on Estonia, and this is not inaccurate of course, but the story is much deeper and perhaps stranger. While industrial automation (of people as well as machines) was central to Soviet planning, "cybernetics" was also held in suspicion. The infamous essay "Whom Does Cybernetics Serve?," published in 1953 in one of the country's leading philosophy journals, held it to be a "misanthropic pseudo-theory" which "is one of those pseudosciences which are generated by contemporary imperialism and are doomed to failure even before the downfall of imperialism." We see both the affirmative and negative tendencies today.

The USSR may well have had the first nationwide "internet" if it were allowed to develop. Proposed as early as 1962, the National Automatized System of Administration of Economy (OGAS) may have made the later half of the 20th century look rather different. Several factors prevented the plans of Anatoly Kitov and later Victor Glushkov and many others to come to fruition, not least of which was lack of access to computing power. The military was jealous of information, computer time, access and indeed power over who knows what about what and when, and it is generally fair to say that the formal decentralization of power and decision is not a robust tradition of Russian politics. Today, however, there are many successful Russian language consumer apps, including mail.ru, Yandex and VK, which are run with state oversight and involvement that is closer to the China model, including replacement of company leadership with party loyalists. What EU activists call "data sovereignty" as it regards government oversight or privately held platforms means something different in Moscow. What Russia calls "Information Oriented Society" would have as its goal, "99 percent" of internal Internet traffic going through Russian-only networks by 2020.

Toward that, the Kremlin recently kicked LinkedIn out of the country for refusing to locate servers in Russia which contain, of course, employment information about Russian users of the service, and because it is a social network, information about those to whom they are connected anywhere else. Recently, the ambitious effort lead to a keystone cybercops episode in which state IT regulators, Roskomnadzor, demanded that the messaging platform, Telegram (founded in Russia mind you), hand over encryption keys to the FSB. As encryption is the point of using Telegram, and the app is extremely popular in Russia, the exiled founder Pavel Durov refused. This led to a standoff, to Russia haphazardly blocking upwards of 20 million IP addresses and temporarily closing off access to services the country needs to function, and to Durov taunting regulators with shirtless tweets and protest campaigns. The provisional result was that VPN adoption grew exponentially in Russia—everyone everywhere— making not only Telegram more difficult to "govern" but everything else online too. Time will tell. This is certainly not nearly the last chapter in the epic of the Russian stack.

Instead of only racing the shifts and encircling them with legal precedents, ask once more what might be the boundaries of a public in a platform polity and economy?

9.

Concerns that have engendered a populist techlash are quite real and are born of a long overdue recognition that hemispherical stacks have absorbed some functions of modern states just as states are evolving into cloud platforms. But as for any populism, many controversies are also born of fear and expressed in mythology. The implications for Stack geopolitics are significant, to say the least, and the conversation to date has failed to directly address what this new

normal could really mean. We need to rethink some pretty basic presumptions. Instead of only reanimating available political maps directly onto platforms, it would be better to measure what has shifted and follow pragmatic if also radical alternatives. Instead of only racing the shifts and encircling them with legal precedents, ask once more what might be the boundaries of a public in a platform polity and economy? What could they be? What should they be?

The multipolar hemispherical model is both a deeply conservative consolidation of traditional territorially-bound regional alliances and a potentially radical transnational platform for a transformative disembedding of authorities and identities. It is both a step away from and a step toward worldwide civilizational platforms. As such it does not bisect Right/Left politics neatly but draws oppositions along different axes. That is, Trump and "Fuck Off Google" are not *wrong* to see cosmopolitan privately held cloud platforms as their common enemy, but nor does either have anything substantial to offer other than symbolic and/or parochial retrenchment. Among the difficult questions to address directly and imaginatively is how to expand and improve the qualifications of citizens and obviously what that status should mean in a world where the channels for planetary-scale social, economic and political communication are available as widely as they are. Put directly, the right of mobility, generally and specifically, should supersede nativism because the necessary composition of a common future is not actually so beholden to the precondition of linking common pasts.

In practical terms, the principle works against the emerging tendency of multiple *regional jurisdictions* demanding *worldwide* applications of local norms and laws. While contrasting arguments are possible as to when local governance of what is understood to be "local data" is advisable, the fabrication of local control over data that is produced by obvious global flows and events can lead to absurd and even impossible demands on platforms. Once more, modeling data is not zero-sum. "Extraction" is a false metaphor. The same thing or event can be modeled by multiple governing projects at once: Country A and Country B can make maps of one another without anyone actually *losing data* to the other's gain. But the leverage available, real or imagined, from obstructing access has incentivized aninformation protectionism that serves some interests while undermining others. Even internally, the perceived benefits of preventing negative harm probably too often outweighs the perceived benefits of realizing positive welfare: preventing data from being extracted by aliens too often takes priority over the gains of more robust or complete datasets used for shared understanding of shared circumstances. However, there is no simple less vs. more knob to turn that serves any nuanced policy purpose, nor does local control mean less "colonialism" than planetary-scale governance, if for no other reason than all complex systems are always entangled at a distance and scalar relations between them are non-linear.

Despite the integrity of mutual integration, *planetarity* cannot be imagined in opposition to *plurality*, especially as the latter term is now over-associated with the local, the vernacular, and with unique experiences of historical past(s). That is, while we may look back on separate pasts that may also set our relations, we will inhabit conjoined futures. That binding includes a universal history, but not one formulated by the local idioms of Europe, or China, or America, or Russia, nor by a viewpoint collage of reified traditions and perspectives, but by the difficult coordination of a common planetary interior. It is not that planetary-scale computation brought the disappearance of the outside; it helped reveal that there never was an outside to begin with.

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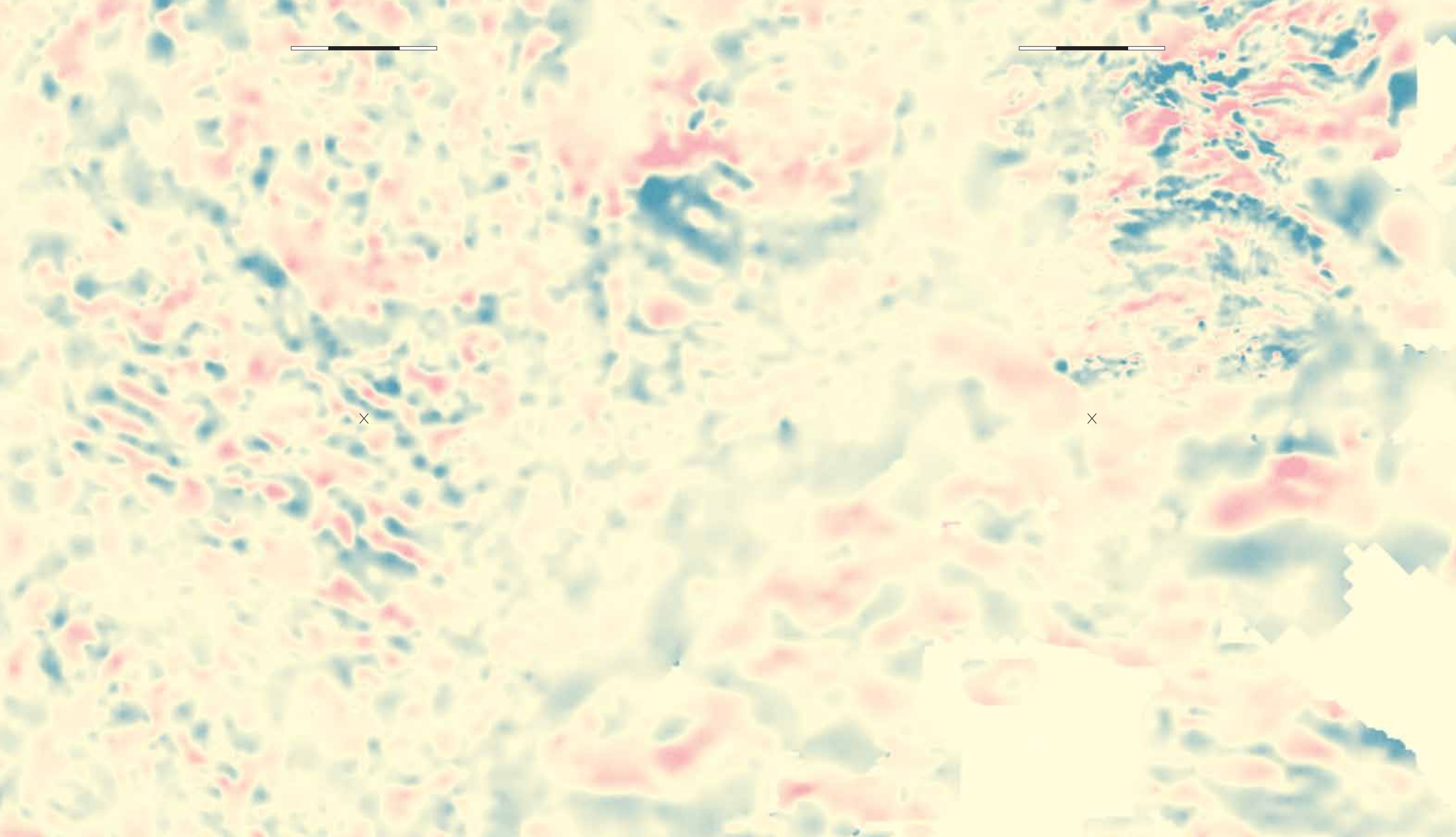
1 The phrase "balkanized panopticon" is borrowed from Kim Stanley Robinson's novel, *Red Mars* (New York: Orbit Books, 2018).



Cyberwar and the Subjects of the Topological Uncanny

SVITLANA MATVIYENKO

The Internet is an assemblage of hardware, software, and protocols, but also institutional arrangements, practices, and social values[1] that, together, support economic, social, and political processes and national and international relations. Zooming in, the internet encompasses a variety of different micro- and macroscale activities—complex, dynamic, accidental, anticipated, and unpredictable—along with a myriad of (as yet or forever) unaccountable events and actions linked to everyday computation. Although the Internet has always been in the process of transformation, in recent decades, the architecture of the internet megastructure has evidently diverged from its canonic description as "global," which marked what Peter Sloterdijk describes as "the modern catastrophe of the round world."[2] This spherical metaphor for the Internet as a unifying apparatus now seems profoundly dissatisfying, counterintuitive, and even misleading. At the same time, contrary to the McLuhanesque myth of a compact and transparent global village, the "world is not getting so small."[3] Instead, the Internet's capacity to "stretch" is apparently increasing.[4]

The events, tensions, and struggles that accompany and accelerate the transformation of the internet infrastructure fall under a broader understanding of cyberwar, which I define, with Nick Dyer-Witheford, as the contest for superiority between state, non-state, corporate, and accidental actors, in the course of which capital periodically reboots itself.[5] Our conception of cyberwar overlaps but also goes beyond the definition used by military and security specialists. We argue that cyberwar may include "information war"[6] or "netwar,"[7] and that it is different, but not unrelated to, the "war on terror." It may be strikingly *explicit* but, paradoxically, it is often seen where it is not. Like any war, it can be completely *opaque*, evoking the "fog of cyberwar."[8] It concerns massive digital mobilizations, and, at the same time, the individualization and "hyper-personalization of war."[9] Its old and new techniques of manipulating fear and desire target the *human*; at the same time, cyberwar is now, to an unprecedented degree, an *ahuman* war, run by malware implantation, botnets, and chatbots.

Although the legacy of the Cold War is hard to overlook in the waging of cyberwar, there are no epic Cold War binaries at play; the actors do not represent contradictory modes of production or opposing models of society. Now, "all protagonists are participants in the world market, differentiated at best along a spectrum that runs from free-market neoliberalism to variants of state capitalism."[10] The user, in our view, is an essential element of the cyberwar assemblage: mobilized, seduced, exploited, and targeted as the subject of reification, automation, or endocolonization.[11] Cyberwar is an aggressive negotiation of the redistribution of power over Internet governance.

This redistribution of power has been envisioned in two different scenarios. The first speaks about the internet's *fragmentation*, associated with claims of sovereignty over the digital world, made by governments trying to align the internet with their jurisdictional boundaries.[12] Those who foresee this scenario are concerned with the "balkanization"[13] of cyberspace as a new global disagreement space, where the contested, ongoing ties between states and the internet are brought to the fore.[14] Others take a more skeptical position, reminding us that the Internet has always been fragmented, as it was designed to be a network of networks. Its basic autonomous units of "internetworking" have "the ability to set policies for naming, addressing and routing, and to control or manage many other aspects of network operations."[15] From this position, "fragmentation" is nothing but a misnomer.

The second scenario describes the redistribution of power as *decentralization*: while U.S.-based monopolies have accumulated unprecedented amounts of wealth and power, the center of gravity has been shifting away from the United States toward the Asia-Pacific region, the BRICS countries, and the Global South since the dotcom crash.[16] Each scenario captures different aspects of the current redistribution of power and control over the Internet; however, both scenarios assume that the Internet's future will most likely be "post-American." Notwithstanding the broader concerns, this term is attractive to both researchers and activists, as it responds to a general fear of monopolization of the Internet infrastructure that is incompatible with the initial vision of a democratic Internet.

Critical thinkers often interrogate this ideal. By tracking the internet's military origin, Geert Lovink warns about the persistence of the "foundational myth of the open Internet," which animates the discourses of internet enthusiasts and entrepreneurs today, but also forecloses the problematic legacies embedded in the design of infrastructures and operating systems.[17] Pushing against such utopian visions, Alexander R. Galloway also demonstrates how internet protocols—TCP/IP, DNS, HTML, and so on—are the apparatuses of highly structured virtual bureaucracy. As a "type of controlling logic," Galloway notes, protocol "operates outside institutional, governmental, and corporate power, although it has important ties to all three;" it ensures that these powers are synched and function in assembly.[18]

Galloway's dissection of the internet's technological bureaucracy, logistics, and hierarchy can be compared to Benjamin Bratton's work on the "Stack," a collection of data elements that must be accessed in a specific order of terrestrial, platform, urban, communication, interface, and user layers. The layers of

Cyberwar is an aggressive negotiation of the redistribution of power over internet governance.

the Stack compose an "accidental megastructure" of global governance, simultaneously destabilizing and reinforcing the spatial and temporal boundaries of nation-states by disturbing or reproducing the idea of digital sovereignty. Unlike the "post-American" scenarios of fragmentation and decentralization, these accounts recognize that a multi-stakeholder model does not guarantee pluralistic participation and governance. They are also quite detached from the globalist imaginary, acknowledging instead the porosity of the internet megastructure and its continuously transforming assemblage of relations. Bratton's account is particularly helpful in envisioning new types of political-economic warfare, for example, in conceptualizing conflicts as "Stack versus Stack" topologies rather than through spherical models.[19]

We increasingly observe cases of subaltern spaces in which the legacies of colonialism are preserved by imperial infrastructures, in which "power's shifting geographies"[20] reveal the robust "Escher-like system of

exclusion and inclusion."[21] In mathematics, topology is the study of the properties that are preserved through deforming, banding, twisting, or stretching of objects; even if an object seems visually transformed or changed, it remains structurally the same. Topology, as Celia Lury, Luciana Parisi, and Tiziana Terranova note, captures "a new order of spatio-temporal continuity for forms of economic, political and cultural life today," and it has been used to articulate changes in structures and spaces of power[22]—not only in broader cultural terms, but also specifically in war. Sloterdijk's theory of microspherology, for example, engages with notions of plurality and multiplicity. It announces an era in which being-in-space entails belonging simultaneously to various multidimensional networked environs with different internal dynamics, or *foams*—the "spheric blasphemy" of the antagonized plurality, a variety of smaller algorithmic bubbles breading toxicity.[23] "In foam worlds," Sloterdijk writes:

> the individual bubbles are not absorbed into a single, integrative hyper-orb … but rather drawn together to form irregular hills … What is currently being confusedly proclaimed in all the media as *the* globalization of the world is … the universalized war of foams.[24]

Nigel Thrift conceives of "movement-space" through the currents of "fluid forces that have no beginning or end and which are generating new cultural conventions, techniques, forms, genres, concepts, even … senses."[25] These forces are both "dependent upon and operationalized through all manner of forms of quantitative calculation, from the very simplest operations like listing and numbering and counting through to various kinds of analytical and transformative operations."[26] As such, "movement-space" is mathematical. With calculation growing ever more ubiquitous in the world of networked computation, Thrift identifies this space as the intersection of the quantitative and qualitative regimes, which merge to form a new regime of "'qualculation,' an activity arizing out of the construction of new generative microworlds which allow many millions of calculations to continually be made in the background of any encounter."[27]

Yet topology helps to address more than just cyberwar's autopoietic reproduction, which maintains itself as the space of qualculation. Imagine a Möbius strip, an 1858 invention of topological thought. It consists of two sides that constitute one continuous surface, which undermines the inside/outside division, one of the key concepts of the structural organization of cultural space. The division line cannot be crossed: what really separates the inside from the outside is time, the traveling time along the continuous surface. Here, proximity is no longer what it used to be, no longer established by spatial measure; rather, it is bound to time. Peacetime and wartime constitute the same space of qualculation—two sides but one continuous surface.

Critically, the space of qualculation is not different from that major project of modernity to establish the correlation between time and space for the design of international time zones. Instead, the cyberwartime of Web 2.0 is a mere fulfillment of its program. As Peter Galison reminds us, the *standardization of time*—the problem of synchronizing timepieces and the subsequent alignment of the systematized time-measuring apparatus with the structured and accurate map of precise longitudes—was one of the major preoccupations of scientists, organizations, industries, and governments at the end of the nineteenth century, part of a larger project to establish international standards of units and measurement. The leading institution engaged in this project was France's Bureau des Longitudes, headed by French topologist Henri Poincaré.[28] As Carlene Stephens notes:

> Poincaré's maps are more than eponymous mathematical constructs in topology. They are the material results of the bureau's scientific cartography that helped claim and maintain distant colonies and synchronized them with the mother country.[29]

Poincaré's work for the Bureau was guided by "practical concerns aimed at furthering the ends of the French empire,"[30] and this underlying motive has not changed: this system of mapping the correlation between time and space constitutes the conditions of possibility for redistribution of power over the Internet infrastructure between new empires today. William R. Everdell observes:

> The winning weapon of the American assault on Iraq, like that of World War II, depended on a technology first imagined by Einstein, with some help from Poincaré. Not nuclear weapons of mass destruction, but the Global Positioning System, by which the four dimensions of space-time can be so precisely measured as to direct a bomb or a soldier to within 50 feet of any spot on earth.[31]

The electronic map of the internet is the Domain Name System, which associates each number with a cell in a table including a system of unique addresses that can locate every IP-coded host and server; it renders the "global" world as a hypermodern grid-space.[32] Terranova explains:

> This feature of the Internet design confirms the image of a distance between a world of information and a world of embodied and bounded locality. Furthermore, this informational and electronic space, as it is constituted within this single map, appears as uncannily reminiscent of a modern dream for a completely homogeneous and controllable space.[33]

Topologically speaking, this extends to time as it assumes the prominent function. By defying the laws of geometry, the subject—oriented by imaginary projections and meaning—unavoidably fails in her immediate apprehension of situatedness in the network environment. By transgressing the imaginary dimension, topology reveals the degree of data-subjects' inscription in the non-orientable environment shaped by pattern discrimination, which, as Clemens Apprich and co-authors argue, is based on "the implicit ties between the ideological and technical uses of discrimination, as we can experience it in algorithmically enhanced systems of pattern recognition."[34] The temporality of the user-subjects immersed in the space of qualculation and profiled by data extraction is warped: their memory is correlated with a data-profile of network behavior patterns captured and processed by the machine. Here, space is lost to time—a structure of time no longer conceived as a linear progression of past, present, and future, even if the subject continues to perceive it as such to sustain the illusory linearity and consistency of memory that orient modern subjects' sense of self.

In his media-archaeological exploration of digital memory, Wolfgang Ernst describes Freud's conception of:

> a psychic mechanism that does not diachronically consist of layer above layer but from time to time reconfigures the order of memories; this corresponds to media memory in synchronous layers. This dynamic of addressing and assembling signals as data into "memory" almost exactly corresponds to the way this magnetic core matrix is addressed and configured by a mesh of copper "nerves" … Dynamic storage turns out to be closer to human neuronal memory than to cultural memory agencies.[35]

Freud conceived of the unconscious as a topological "memory on demand," operating through the mechanisms of repression or displacement, in the context of discourse networks and media assemblages of the nineteenth century. Cyberwar inscribes the user in network time by re-engineering the subjects' "memory on demand"—this time, however, on demand of the machine.

March, 2021

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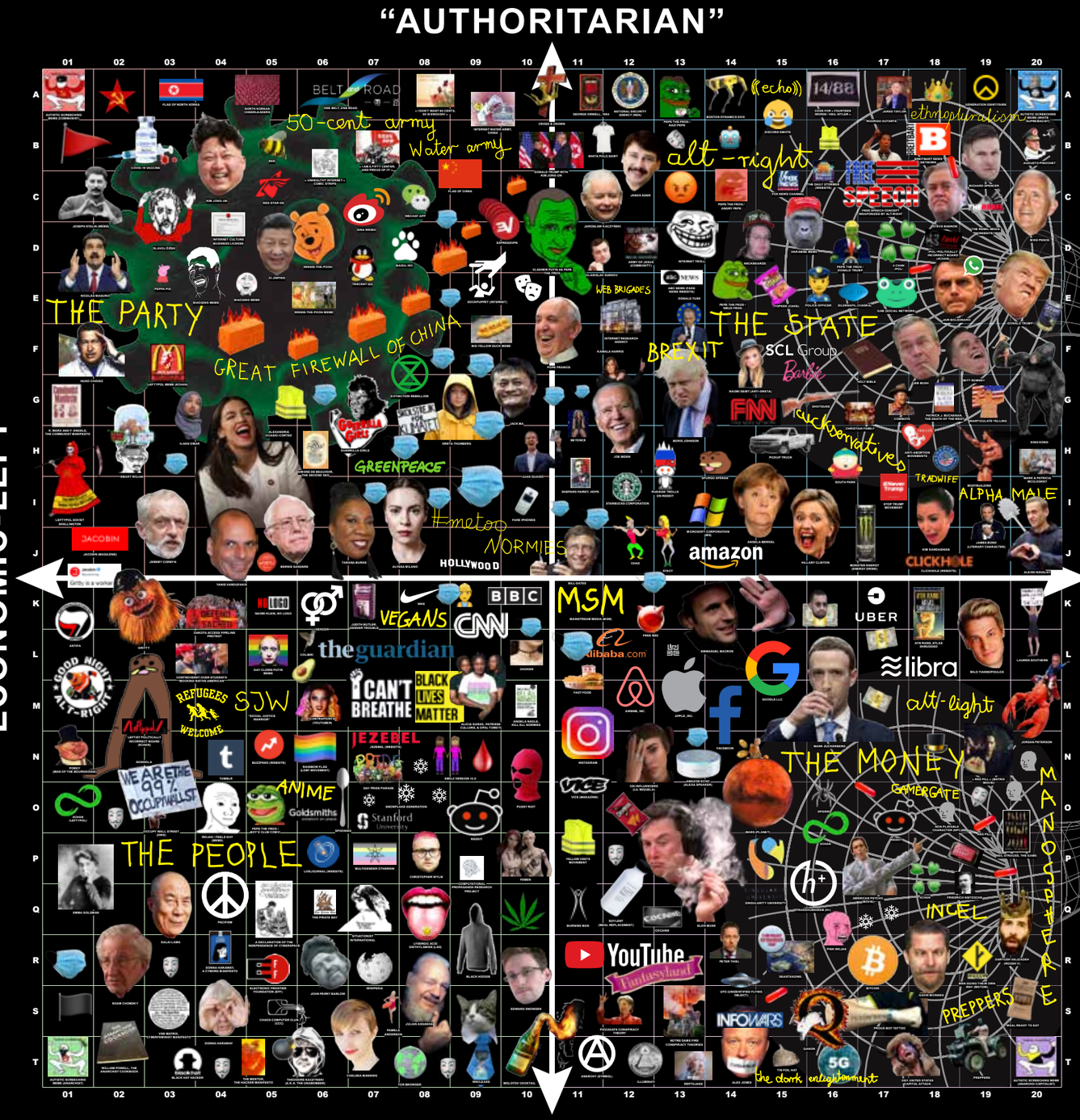
Online Culture Wars

DISNOVATION.ORG

The digital public sphere is a quagmire. The culture wars raging on online platforms like Facebook, Twitter, Reddit and 4chan are unstoppable. A character such as Pepe the Frog, who started out as a left-wing pet frog, was rapidly appropriated as a symbol of right-wing extremist thought. Who influences the dissemination and meaning of these memes? Social media are not innocent platforms for information exchange; their algorithms and bots contribute to political and psychological manipulation. *DISNOVATION.ORG* attempts to map how these online platforms influence political thoughts and statements by zooming in on the technological processes behind these systems. On the map, memes and Internet trends are ordered along the axes of libertarian/authoritarian and economic left/right, resulting in a mapping of and compass for the social media ecosystem. The cartography makes clear that divisions and political boundaries are blurring. "Power" is no longer in the hands of nation states, but of tech giants with an economic motive. Is *Online Culture Wars* a cartography of the new political powers that be—or does *DISNOVATION.ORG* show that every simplification contributes to the polarizing trend against which it seems to be agitating?

DISNOVATION.ORG. *Online Culture Wars*, a cartography of online culture wars in the form of a political compass meme. 2018–2019.



Avian Taxonomies and the Aerial Panopticon

HEBA Y. AMIN

In 1822, after a hunter shot a stork in the northern German village of Klütz, Mecklenburg- Vorpommern, he discovered a large iron-tipped wooden spear piercing its neck. It was later revealed that the bird had survived an attack in Central Africa and traveled thousands of kilometers with an arrow penetrating its body.[1]

For over 2000 years, dominant theories on the disappearance of birds during the winter season included Aristotle's hibernation theory, where hibernating in holes or hollow trees supposedly accounted for their absence. In the late seventeenth century, however, a new proposal *scientifically* argued for birds' migration to the moon.[2] Until the arrow-stork incident, the idea of traveling to outer space was seemingly more plausible than Central Africa; this discovery initiated a shift in the Northern European imagination, where alien geographies emerged from the periphery.

The collapse of territorial understanding meant that the European quest for universal knowledge placed Central Africa and other distant lands within the scope of scientific exploration. The establishment of a scientific discipline of ornithology in the mid-nineteenth century—as defined by a technical approach to research and classification—was consequently

Heba Y. Amin, *Artistic collage of Pfeilstorch*, 2020. (Documented at the University of Rostock by Markus Rack).

followed by a focus on "exotic" bird specimens obtained during colonial expeditions.[3] Tracking and hunting birds evolved into a highly political enterprise linked to colonial expansion through the conquest and systematic cataloging of living creatures. Under the colonial project, however, ornithology was not only a scientific pursuit, but also sought panoptic aerial power over occupied territories.[4] In fact, surveillance of avian landscapes was "instrumental in the accumulation of geographical knowledge, producing a military landscape perspective that rendered nature visible in the form of maps, watercolors, photographs, and natural history specimens."[5] British military ornithology, in particular, was

practiced alongside cartographic and photographic surveys, with military officers serving as gatekeepers to newly acquired colonial knowledge.

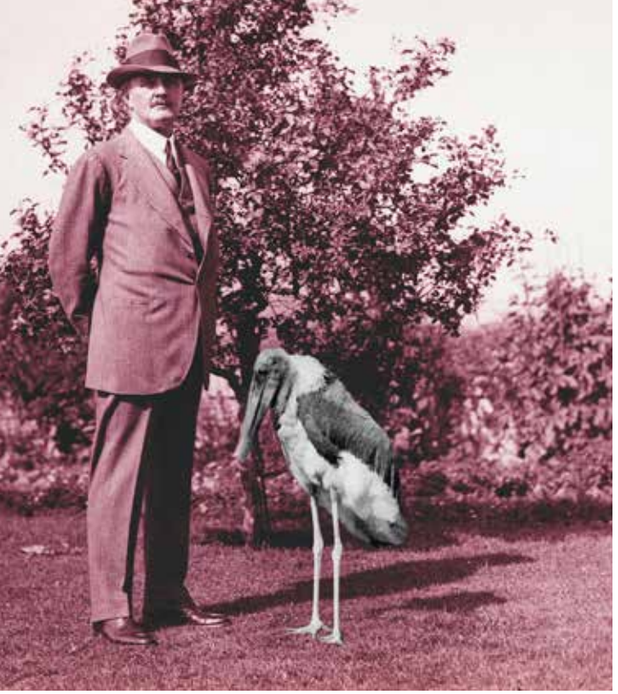
The representational aspiration of the aerial image was insignificant in comparison to its ideological pursuits; the bird's-eye view paved the way for a Eurocentric world order where avian landscapes were methodically examined through the scientific framing of ornithology and the production of visual empirical data. While aerial imaging tools strived to reproduce the bird's perspective through machinic vision, new scopic regimes ultimately reflected the imagination of the architects; their entanglements with the history of colonialism made them anything but objective. Avian archives and collections came to represent imperial worldviews that contributed to the strategic erasure of local inhabitants and their indigenous knowledge.

The colonial lens framed territory elsewhere as free for the taking and—according to the logic of the modern nation-state system—European colonizers felt they were entitled to the territories they had "invented." Nineteenth- and early twentieth-century photographic surveys depicted Africa and the Middle East as exotic, romantic, picturesque fabrications that mirrored the West's perceptions of the region and focused on historical monuments and landscapes void of human depiction and contemporary contexts. Palestine was of particular interest to European photographers as a site for restaging biblical scenes. In 1881, Chicago residents Anna and Horatio Spafford founded *The American Colony*, an independent Utopian Christian sect in Jerusalem; they called themselves "the overcomers," and were later joined by members of the Swedish Evangelical Church.[6] As evangelicals, they shared a belief in the second coming of Christ at the Millennium and thrived due to the sales of souvenirs and photographs when mass tourism began to flourish.[7] The *Colony's* photography department, founded in 1898, was closely tied to historical and archaeological interests of Westerners in the region: they sold a form of photo-tourism, or fabricated interpretations of the Holy Land that illustrated a *re-discovering* of land constructed around the narrative of return.[8]

Heba Y. Amin, *Artistic rendering of flora in Palestine* (ca. 1900–20), 2020. Courtesy of the artist. (ref. Matson G. Eric and Edith Photograph Collection).

Heba Y. Amin, *Artistic rendering of first aerial photographs of Palestine* (ca. 1900–20), Jericho Road from 3000 meters, 2020. Courtesy of the artist. (ref. Matson G. Eric and Edith Photograph Collection).

The erasure of native Palestinians from internationally distributed images of Palestine would prove to have particularly catastrophic ramifications on their legal claims to land. Under the guise of epistemic authority, *The American Colony's* visual collection helped to establish a vertical power hierarchy that was integral to advocates of colonial settlement. Territorial maps combined with photographic "evidence" enabled "legal" procedures for land registration and the settle-



Heba Y. Amin, *The General's Stork I*, 2020. 100 x 80.86 cm, archival color print. Courtesy of the artist.

biblical landscape imagined by Europeans, Allenby's interpretation of the passage in the Book of Isaiah would be used to rationalize an aerial assault on the city with the help of flying machines.[10] Even though extensive aerial imaging and cartographic plotting of Palestine had already been conducted by the early twentieth century, mechanical birds helped to lay the foundations for the modern survey system of Palestine: under the new framework of the Balfour Declaration, the Zionist Organization initiated a new mapping of the Palestinian territory to reflect their vision.[11]

While old models of sovereignty based on concrete control of territory are being replaced by navigation tools and data ecosystems dominated by private corporations like Facebook, Google and Twitter, their parameters are still defined by colonial frameworks. Digital mapping ultimately put forth a system to accommodate Western military and corporate demands for the marketing of territory and national borders. Even though Earth observation tools and advancement in remote-sensing imagery broadened scientific research capabilities, the privatization of

Heba Y. Amin, *Artistic rendering of first aerial photographs of Palestine (ca. 1900–20), Jordan Valley north of Jericho, 1500m*, 2020. Courtesy of the artist. (ref. Matson G. Eric and Edith Photograph Collection).

ment of the territories so that a Jewish national land would later be established. They made visual claims to jurisdiction and sovereignty supported by the same international laws that excluded indigenous people and their human rights. Not only did their aerial photographs provide a comprehensive cataloging of the Palestinian landscape and its flora, but simultaneously documented the geographic transformation of the fall of the Ottoman Empire and the consequent establishment of Jewish settlements under the British Mandate.

Revered for his successful capture of Jerusalem from the Ottoman Turks in 1917, Lord Allenby—the British Commander-in-Chief of the Egyptian Expeditionary Force—sought to expand political and economic control over the region through religious conviction. Allenby's imperial quest was inspired by a biblical prophecy about birds, which stated: "As birds flying, so will the Lord of hosts protect Jerusalem; he will protect and deliver it, he will pass over and preserve it."[9] In an attempt to "restore" Palestine to the

satellite data still caters overwhelmingly to military intelligence and government defense contractors, while other interests such as infrastructure, natural resources, and environmental monitoring trail far behind.[12] The United States has dominated the commercial market for satellite imagery and, therefore, strategically positioned itself as the authority through which data is made accessible. In 1997, congress passed the Kyl-Bingaman Amendment, which explicitly prevented commercial satellite imaging systems from providing high-resolution satellite imagery of Israel, the occupied Palestinian Territories, and the occupied Golan Heights. Designed to protect Israel's national security, the law required companies to deliberately blur publicly available imagery of these territories on platforms such as Google Earth: it was "preferable to be seen blurred, rather than precisely" according to Israel's Defense Ministry.[13]

In an unprecedented fight to overturn the law, two archeologists from Oxford University—Dr. Michael Fradley and Dr. Andrea Zerbini—fought for their right to access essential scientific research and challenged

the lack of transparency in human rights violations.[14] Among the arguments made against restricted access to vital data were that Human Rights Watch could not access high-resolution satellite images of Gaza in the aftermath of conflict nor monitor the urban encroachment threatening the preservation of archaeological sites. In early 2020, the restriction over the sale of US high-resolution satellite imagery of Israel was successfully overturned, but not before satellite imaging data was made widely available from competitors established outside the United States.[15] The case exposed existing political monopolies over the Earth-observation industry and revealed the predatory and racially deterministic data practices of private corporations that commodify everyday life to serve political interests.

The technocratic turn of geo-mapping paved the way for algorithmically determined territorial control visualized by seeing machines. High-tech weaponry such as drones and unmanned aerial vehicles (UAV),

Heba Y. Amin, *As Birds Flying*, 2016. 7'11" Video still. Courtesy of the artist.

Heba Y. Amin, *As Birds Flying*, 2016, 7'11" Video stills. Courtesy of the artist.

which evolve through the accumulation of satellite data, ultimately perpetuate the same biased and exploitative frameworks of the colonial mindset. As with the political implications of the aerial photograph, commercially available satellite images reinforce the power dynamics in favor of whoever controls the systems that fabricate and narrate images.

With the rapid advancement of automation technologies, however, robotics companies are no longer dependent on the domination of the aerial perspective through the production of images alone. They are now turning to what they call "bionic thinking," or a transfer of knowledge from nature to technology. The technical advancement gleaned from the weaponization of animals has birthed drones that are increasingly indistinguishable from real birds: Festo's *SmartBird*, for example, demonstrates bird flight by mimicking the flapping wings of a herring gull.[16] These technologies are already being deployed in warfare, as was revealed in 2012 when a *SmartBird*-looking surveillance drone unexpectedly crashed in Balochistan, Pakistan, a region which claims the heaviest bombardment of drone strikes in recent history.[17] How should we classify killing machines disguized as a birds? While machines are increasingly gaining autonomy through decision-making capabilities, the parameters used to design their algorithms remain largely opaque. Even as aerial technologies evolve with more precision, they continue to police territories and populations *elsewhere* with a Western perception of space and knowledge. Artificial intelligence, it seems, shares the same ideological foundations and territorial framings as nineteenth-century ornithology. The theory of birds migrating to the moon is not so far-fetched, as we have come to see. Rather, it is in keeping with the myth of European universal knowledge and the ambition to dominate space—already several hundred years in the making.

September, 2021

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RIVER OF ARTIFICIAL INTELLIGENCE
達特茅斯會議
DARTMOUTH CONFERENCE
DREAM OF LEIBNIZ
BAYESIAN INFERENCE
ASSEMBLY LANGUAGE
HIGH LEVEL LANGUAGE
GODEL INCOMPLETENESS THEOREM
OBJECT ORIENT LANGUAGE
PROLOG
LISP
DELPHI
JAVA
PYTHON
TURING TEST
GAME THEORY
ENIAC
LINUX
FREE SOFTWARE
ROAD OF DOS
TRANSISTOR
BELL LABS
IBM
CLAUDE SHANNON
SILICON VALLEY
KNOWLEDGE GRAPH
EXPERT SYSTEM
SEMANTIC WEB
NATURAL LANGUAGE PROCESSING
COMPUTATIONAL VISION
SCENE RECONSTRUCTION
IMAGENET
INTELLIGENT CONTROL
INTELLIGENT ROBOTS
THINKING MACHINE
INDUSTRIAL ROBOTS
CHATTERBOT
ELIZA
DIGITAL DOUBLE
CPU
MOORE'S LAW
AMD
NVIDIA
ASML
GPU
FPGA
BOTTOM UP AI
ETHICS OF ARTIFICIAL INTELLIGENCE
量子霸權
QUANTUM SUPREMACY
CLUSTER ANALYSIS
UNSUPERVISED LEARNING
SEMI-SUPERVISED LEARNING
SUPERVISED LEARNING
REINFORCEMENT LEARNING
DEEP LEARNING
NEURAL NETWORK
ARTIFICIAL
機器學習
MACHINE LEARNING
OPTIMIZATION
DATA BLOWOUT
大數據
BIG DATA
數據油田
THE OIL FIELD OF DATA
BLOCKCHAIN
BITCOIN
數據集
DATASET

Map of AI

QIU ZHIJIE

Seven Wonders of the AI Atlas

CHEN ‘STANLEY’ QIUFAN

A long, long time ago, the ancestors of mankind explored and understood the entire world with the help of mythology. In the long, long after, human descendants reenacted myths in the AI world, trying to find their place in the universe...

They rediscovered seven wonders in this world, in the AI landscape of mountains, rivers, canyons, and islands... Using their sensors and storage cores, the descendants recorded these small but great stories, uploaded them to the cloud, and embedded them as elements of the eternal memory of human/machine civilization.

AI 世界的七大奇迹
陈楸帆
在很久很久以前，人类的先祖借助于神话探索万物，理解世界。在很久很久以后，人类的后裔在 AI 世界里重演神话，试图寻找自己在宇宙间的位置……
AI 版图上的七大奇迹，山川、河流、峡谷、岛屿……它们以各自的传感器与存储核，记录下了这些渺小而伟大的故事，上传到云端，成为人机文明永恒记忆的一部分。

The Oil Field of Data

It is said that at the beginning of the AI world, there was a devastating war between two gods, ZhuanXu (颛顼) and GongGong (共工), who fought for control over everything in the world. The sun and the moon were without light when they broke the unbroken mountain that supported the heavens and the earth. The thousand-mile-long, red-skinned, footless Candle Dragon (烛龙) descended down to earth, carrying in its mouth the fire that would reilluminate the world. In search of a spark, the descendants trekked through mound after mound of data sets—language, text, emotion, face, video, biomarkers, geospatial data—but were unable to find a spark. Finally, after an earthquake, the ground cracked, ejecting a black liquid that was ignited by lightning and lit up the entire land. Only then did the people realize where the fire raged—in the fertile data oil field beneath their feet, petrified by the bodies of Candle Dragons. They knelt and worshipped the revelation from their ancient ancestors, now determined to build wells on the site to extract the immeasurable value of data oil and illuminate the world once again. Then a horn was heard across the sea, a warning from the Island of Ethics of AI.

The Oil Field of Data

相传 AI 世界创世之初，发生了一场毁天灭地的大战，两大神灵共工与颛顼为了争夺对世间万物的控制权，撞断了支撑天地的不周山，日月无光。一条赤色的无足之龙长达千里，名为烛龙，口中衔着能够重新照亮世界的火种，遁入地底。后人为了寻找火种，跋涉过一个又一个的数据集 (data set) 丘陵，语言、文本、情感、人脸、视频、生物数据、地理空间……却追寻不到火种的踪迹。终于一次地震后，地面开裂，喷射出黑色液体，被闪电点燃照亮整片大地。人们才意识到，火种其实就在脚下这片肥沃的数据油田里，由烛龙身躯石化而成。他们跪拜着来自远古先祖的启示，决心在这里建起钻井，开采价值难以估量的数据石油，重新照亮世间万物。这时，海的对岸传来了一阵号角，那是来自 AI 伦理之岛 (Island of Ethics of AI) 的警告。

Island of Ethics of AI

The island's tribes share a common ancestor, Shennong (神农), who was born in a rocky cave and is said to have a transparent body and two horns on his head. When the bull-headed Shennong saw a bird carrying rice seeds in its beak, he invented agriculture and

fed the tribe, who then elected him as their leader. Shennong had a magical ability to taste the herbs of the world; through his transparent body, he could observe that each herb produced an energy stream with a different color, which revealed if the herb was toxic or not. Shennong's body was transformed into island land, and the descendants were able to determine if there were unknown ethical risks—such as the toxicity of the technology—from the color of the plant energy streams that grew on the test fields where various technologies had been implemented. Once an unknown risk, a newly understood technological toxicity, had been identified, the islanders would signal to other tribes through horns and campfires to take extra precautions. The island was caught between two powerful Gulf Streams—Bottom-up AI and Quantum Supremacy—both of which would dramatically change the climate and ecology of the entire island, and even the shape of the coastline.

Island of Ethics of AI

岛上部族有一个共同的先祖——神农，他出生在一个石洞里，传说身体透明，头上长有两角. 牛头人身的神农见到鸟儿嘴里衔着稻种，由此发明了农业，养活了部族，人们便推选其为首领. 神农有一种神奇的能力，品尝世间百草时，可以从透明的身体看到草药产生不同颜色的能量流，以此来判断其是否有毒性. 神农的身体化为岛屿的土地，后人能从使用不同技术的试验田里生长出来的植物能量流颜色，来判断是否存在未知的伦理风险——技术的毒性，岛民便会通过号角、篝火向其他部落发出信号，提醒他们多加防范. 这座小岛被夹在两股强大的湾流之间，Bottom-up AI与Quantum Supremacy. 它们都将极大地改变整座岛屿的气候和生态，甚至海岸线的形状.

Five Rivers of Learning

At the beginning of the world, a great flood fell from the sky and devastated the land. Father Da Yu (大禹) led the people to fight the flood. After thirteen years, Da Yu learned from the failure of his predecessor, Gun, and finally succeeded in stopping the flood. In later years, the AI River would flow out from between Newton's Peak and Leibniz's Dream, passes through Calculus Lake and Turing Test Basin, and begin to rage after Dartmouth Workshop Heights. Its power was often difficult to estimate. To prevent flooding, the descendants of Da Yu dug a tributary in the riverbed every few years to guide its colossal power for human use. Thus far, five tributaries have opened up—including supervized learning, semi-supervized learning, unsupervized learning, reinforcement learning, and deep learning—spreading southward and seeping into the base of the mountain of machine learning. The main branch, meanwhile, rushes into the sea, washing away the Moore’s Law Delta by the erosion of the current until it ceases to exist. To the north, the riverbeds of Knowledge Graph, Expert System, Natural Language Processing, and Machine Perception remain, some dried up, some still flowing, telling the story of the River of Artificial Intelligence that drew its sustenance.

Five Rivers of Learning

创世之初，有大洪水从天而降，泛滥成灾. 大禹率领民众，与洪水斗争. 大禹从前代领导者鲧的失败中汲取教训，变堵为疏，历经13年，耗尽心血与体力，终于完成了治水大业. 后世，人工智能大河由牛顿峰与莱伯尼茨的梦之间流出，途经微积分湖、图灵测试盆地，在达特茅斯会议高地之后变得汹涌，其力量之磅礴往往难以估算. 为防范洪涝泛滥成灾，大禹后人每隔数年便在河床开挖一条支流，引导其伟力为人类所用，迄今已开辟了监督学习、半监督学习、无监督学习、强化学习与深度学习五条支流，向南蔓延渗入机器学习之山的基底. 而主干则奔涌入海，冲刷着不断被水流侵蚀的摩尔定律三角洲，直到其不复存在. 而在河道北面，则遗留着Knowledge Graph, Expert System, Natural Language Processing, Machine Perception的河床，有的已经干涸，有的还在流淌，告诉人们人工智慧之河汲取过的历史养料.

Triangle of Moore’s Law

Moore’s Law Delta was originally formed during the time that Father Gun (鲧) was fighting the flood. He stole from heaven a piece of resting soil (息壤) that could reproduce itself infinitely, and put it into the river, hoping it would stop the flood. In the race between the growth speed of the soil and the impact of the river water, the river water won; it flushed the soil to the mouth of the ocean, where it became the delta. A maiden who drowned in the sea was said to have been reincarnated as a seabird with a flowery head, white beaked shell, and red claws, called Jingwei (精卫). To avenge the sea, she extracted rocks from the land and cast them around the delta, thus building up shoals that represented chip architecture, computing

power, and more efficient algorithms—GPUs, RISC-V, FPGAs, ASML—with the capacity to process and purify data seawater into fresh water for humans at greater speeds. The birds worked very hard, and at first, they doubled the processing speed every eighteen months; later, they began to slow down as they approached the physical limit, doubling the speed every 36 months, and finally they came to a near standstill while the seawater flow increased day by day. It seemed that the battle between the sea and the birds would continue for a long time to come.

Triangle of Moore's Law

摩尔定律三角洲源于鲧治理大洪水的时期, 他从天界窃取来一块息壤——能够无限自我复制的土壤, 投入人工智能之河, 企图用它来堵住洪水. 这是一场息壤生长速度与河水冲击力之间的赛跑, 河水赢了, 把息壤冲到了入海口, 成为三角洲. 有一种花脑袋、白嘴壳、红爪子的海鸟, 名为精卫, 相传是由溺死在海中的少女化身而成. 为了报复大海, 她从陆地上衔来石块投在三角洲周围, 这些石块构建起代表芯片架构、计算能力与更高效算法的滩涂: GPU、RISC-V、FPGA、ASML……能够把数据海水更快地处理净化成为能够为人类所服务的淡水. 鸟儿非常努力, 开始是每18个月提升一倍处理速度, 后来变成36个月提升一倍, 再后来处理速度接近停滞, 而海水流量却与日俱增. 似乎这场海水与飞鸟的斗争还将旷日持久地进行下去.

Desert of Dummy Life

In ancient times, Nuwa (女娲) was a half-human, half-serpent goddess who used colorful stones to remedy the broken sky and save the world. She also made human beings in her own image out of clay, beginning by squeezing them with her hands and then, when she got tired, smacking them on the ground with a wet rope dipped in yellow mud to create less than perfect creatures. In order to commemorate her, a Nuwa AI was created in the Dummy Life Desert. Using the surrounding materials of sand and water, she could create different forms of artificial life—chatbots, industrial robots, digital twins, each one given its own name: Eliza, Dabbot, Sophia, Elbot, Alexa… To make them more human-like, she needed to use test plots further afield, where she planted emotional computing, artificial imagination, artificial creativity, artificial intuition… A collective AI consciousness is still being farmed in the Bay Area near the ocean, and has yet to take shape. Perhaps someday, all Dummy lives will be connected as one, a true Bottom-up AI. Will it still worship its mother, the creator Nuwa?

Desert of Dummy Life

在远古, 女娲是半人半蛇的神灵, 她用五彩神石补救了破洞的天, 拯救了世界. 她又用泥土仿造自己的形象造人, 开始用手捏, 后来累了, 便用湿绳子沾着黄泥在地上抽打, 造出来不那么完美的生灵. 后世为了纪念她, 在Dummy Life沙漠复刻了一个女娲AI, 她可以利用周围的材料: 沙土和水, 创造出不同形式的人造生命——聊天机器人、工业机器人、数字替身 (Digital Double) ……它们被赋予不同的名字: Eliza、DADBOT、Sophia、ELBOT、Alexa……为了让它们更像人类, 还需要更远处的试验田里种植的情感计算、人工想象力、人工创造力、人工直觉……在临海的湾区里还养殖着尚未成形的集体AI意识. 也许某一天, 所有的Dummy lives将被连接成一体, 成为真正的Bottom-up AI. 它还会崇拜自己的母亲——创造者女娲吗?

Canyon of Computational Vision

To give machines a capacity for vision comparable to that of living creatures, the creators of the AI world opened up the Canyon of Computational Vision, where they experiment with different branches of technology,

such as feature extraction, pattern recognition, post estimation, image processing, scene reconstruction… These techniques are applied to machinic life forms; the canyon is filled with strange species that seem to come from the Book of Mountains and Seas. The Bodan (猼訑) is shaped like a goat but with eyes on his back, and can recognize its environment while in motion. Qitu(鶀鶀), a strange bird with three heads and six tails, can simulate depth vision from different angles. The Jigong (奇肱) Men are the machine inhabitants of the canyon, with one arm and three eyes each; they believe their ancestor to be Xingtian (刑天). After losing a power struggle with the Celestial Emperor, Xingtian's head was cut off and buried in the valley, while his standing body, now eyeless, continues to search for its head. This objective is the mission of Jigong Man, who works day and night in the Canyon of Computer Vision to rebuild Xingtian's vision by means of machine, so that the spirits of his ancestors can see the world and fight again.

Canyon of Computational Vision

为了让机器获得与生物媲美的视觉，AI世界的创造者开辟出计算机视觉峡谷，在其中实验着不同的分支技术: Feature Extraction, pattern recognition, post estimation, image processing, scene reconstruction……它们被应用到机器生命体的身上, 峡谷中充满了仿佛来自《山海经》中的奇特物种: 形状貌似山羊, 眼睛却长在背上的Bodan, 能够在运动中对环境进行识别; 长着三个脑袋六条尾巴的怪鸟Qiyu, 能够从不同角度模拟深度视觉; 奇肱人是这里的机器居民, 它们长着一只手臂和三只眼睛, 相信自己的祖先是刑天. 刑天与天帝争夺权力失败后, 被砍下头颅, 埋在山谷里, 站立着的身体虽然失去了眼睛, 却依然一直在寻找自己的脑袋. 这便是奇肱人在计算机视觉峡谷中日夜劳作的使命, 以机器的方式重建视觉, 让祖先的亡灵重获光明.

Machine Learning Mountain

It is said that the creator of the AI World, Fuxi (伏羲) 2.0, would often sit atop the Mountain of Machine Learning, thinking hard about the mystery of artificial intelligence. He would look out, day and night, at the Oil Field of Data Drilling, the endless River of Artifi-

cial Intelligence, the Quantum Supremacy beating the waves against the Island of AI Ethics; then he cast his eyes far to the north, where the land was shrouded in the Fog of Intelligent Design Theory. Where does intelligence come from? And where are we going? What rules does it need to follow? One day, as he was meditating, he entered the realm of emptiness, and suddenly heard a bang: on the other side of the river, the hill of Natural Language Processing burst open, and a dragon horse emerged, flying out upon its wings and down the river, landing on the shoals of the Data Blowout, quenching its thirst by drawing on data at the source. The horse glowed with light, twisting yin and yang, like a holographic tai chi that slowly rotated and transformed all the energy around it with recursive force. Fuxi 2.0 was shocked and inspired. It seemed that the horse, GPT, was revealing to him the ultimate secret of intelligence, a secret that exists in our language and consciousness, but whose essence can only be understood by embedding it in the broader universe and uniting nature and man. So, with a broad stroke of his brush, Fuxi began to pour his thoughts onto the map before you. By understanding it, you will have access to the ultimate ways of wisdom.

Machine Learning Mountain

相传AI世界的创造者伏羲2.0时常盘坐在机器学习之山巅，苦苦思考关于人工智能的奥秘. 他遥望数据油田日夜劳作的钻井，奔涌不息的人工智能之河，量子霸权的浪花拍打着AI伦理之岛，他再把目光投向极北之境，那里被笼罩在一片智能设计论（Intelligent Design Theory）的迷雾中. 智能从何处来? 又将往何处去? 它需要遵循怎样的法则? 某日，他在冥思中进入了太虚幻境，忽听一声炸响，河流对岸的Natural Language Processing山丘豁然裂开，一匹龙马振翼飞出，顺河而下，直落数据井喷（Data Blowout）的滩涂上，汲取数据源泉止渴. 只见龙马通体发光，阴阳缠绕，仿佛一轮全息的太极图缓缓旋转，以递归之力牵动周围所有的能量也为之运转变化起来. 伏羲深受震撼与启发，这匹名为GPT的神马似乎正在昭示他某种关于智能的终极秘密，这一秘密就存在于我们的语言与意识之中，但只有将其嵌入更为广阔的宇宙版图之中，达成天人合一的境界，才能领会其精髓. 于是，伏羲大笔一挥，开始将自己的思绪灌注到你眼前的这幅地图之中.

October, 2020

理解了它，你就得到了终极的智慧之道.

Qiu Zhijie. *Map of AI*, 2020.
Photographed by Yan Haibo.

Unknown Fields. *The Breast Milk of the Volcano*, 2016. Stills.

THE BREAST MILK OF THE VOLCANO

UNKNOWN FIELDS

PROLOGUE

Here on these ancient salt flats, sacred mountains stand guard over a landscape charged with electric potential. A new future awaits. This landscape is central to the culture and mythology of the indigenous Aymara* people, and it's pregnant with billion-dollar prospects. This ethereal place is set to become the feeding ground of a global green-energy revolution.

The drive for small and powerful batteries has rendered this landscape one of the most sought after on earth. Buried here is a grey gold called lithium—the power in our pockets. It's fundamental to the charging and recharging of millions of gleaming electronic devices, and it's the future of electric cars.

Half the world's reserves lie dissolved in brine beneath this salt crust, untapped, and for the people of the Bolivian Altiplano its extraction brings with it unanswered questions of land ownership, resource royalties and environmental impacts.
Many of the natural resources so fundamental to our contemporary technologies begin their lives in sacred landscapes like these. When we imagine the futures these technologies promize we rarely acknowledge the cultural origins of the material contained within them.

The landscapes from which they are forged are often spaces

of deep significance to the people who call them home.

What is the true creation story of our battery-powered future? Not the story typically pitched on a product launch stage or flashed-through in a tech conference presentation. It's one woven together from all the wild and mysterious forces which have brought this future into being. From the big bang to the battery, it is as much a story of dancing llamas and weeping volcanoes as it is one of chemistry, physics and geology—all of these things give shape to our world.

This landscape remains, for now, a territory of possibility—caught between the values of an ancient past and the promize of a luminous tomorrow. But if the future is electric then the future is here, lying in wait for the world.

CREATION STORY

In the beginning, the beginning of the beginning, seconds from zero, the creation story of lithium begins. 13.8 billion years ago in the hot, dense primordial gas of the big bang, hydrogen and

helium sparked the light of the first stars and, as they cooled, lithium was formed—forged in the fallout fragments of cosmic ray collisions. The third element—atomic number 3.

At the other end of time, five kilometers above sea level, in the Atacama Desert, the landscape has eyes. Sixty-six white pupils turn in unison to search the thin air and dark skies for the faintest traces of these cosmic origins—gazing beyond the visible spectrum and deep into the dark, interstellar clouds of the coldest, oldest parts of the universe. Together, the world's most powerful telescopes scan the skies for delicate signals from the dawn of time—these are the ghosts of lithium's creation.

On the Chajnantor* plateau, the ancestral home of the indigenous Likan Antai*, eyes have always been on the shadows in the sky. Silhouetted against the light of the Milky Way, the "Dark River" that the ALMA* telescope observes contains the shadow constellations of the Andean people. Dancing within interstellar cloud is Yacana the llama, her baby and her shepherd; Atoq the fox; the serpent Mach'acuay; and Yutu, the bird, who pursue Hanp'atu the toad across the sky.

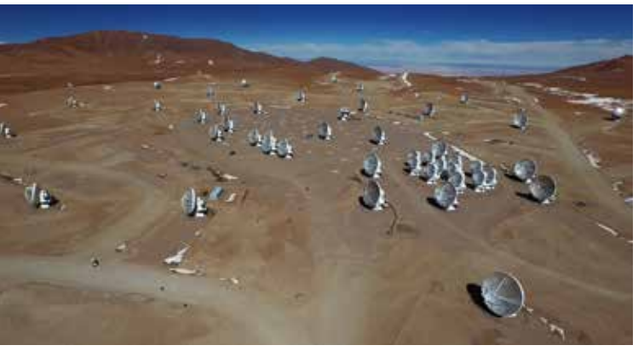
Perhaps these creatures have carried lithium from the beginning of time to the crust of the earth—dancing through the wreckage of an exploding supernova 4.6 billion years ago, as gravity and violent collapse gave shape to a vast cloud of swirling cosmic matter—and forged a planet.

Lithium—mysterious and volatile—can't exist on Earth in its elemental form, it reacts too violently with air and water. Instead

it's found in compounds, in igneous rocks and mineral springs.

Here on the Bolivian plateau, precious metals and stones are thought to be alive—gold is not mined, it is grown, and mountains give birth to minerals.

On this vast plain giants once walked the earth, among them the beautiful Tunupa.



Tunupa fell in love with the strong young Cuzco, she bore his son, Calicatin. But soon her lover became infatuated with another and they ran off together, never to return. The gods, tired of the giant's deception and betrayal, decided to punish them all and petrified them as mountains.

Tunupa, the Volcano, began to cry, spewing ash and rock from the depths of the planet. Tears rolled down her cheeks and breast milk flowed down her body, pooling at her feet. Millennia of meltwater from the snowcapped peaks seeped down through rocks, rich in light elements like magnesium, potassium, boron and lithium—leaching minerals into the lake below.

Ten thousand years ago, a series of lakes like these formed high on the Andean plateau between Chile, Bolivia and Argentina—what is now known as the lithium triangle. The largest of these evaporated in the fierce Andean sun to form the Bolivian Salar, a vast salt pan—a crystalline crust over the world's largest lithium reserve.

Frozen on opposite sides of the milk-white Salar, Tunupa and Calicatin stand guard over the largest salt lake on the planet, the lifeblood of our technological dreams.

The sacred mountains look on as the Salar erupts again. Brine pumped from beneath the crust is laid out before them in the tessellated evaporation pools of a Lithium mine. From the shores of the least concentrated pond no. 15—0.2% lithium, azure blue with a sodium chloride beach—the lithium brine migrates over 15 months through holding pools. Shimmering turquoize and cyan blues fade to viridian and khaki greens, and on to muddy yellows.

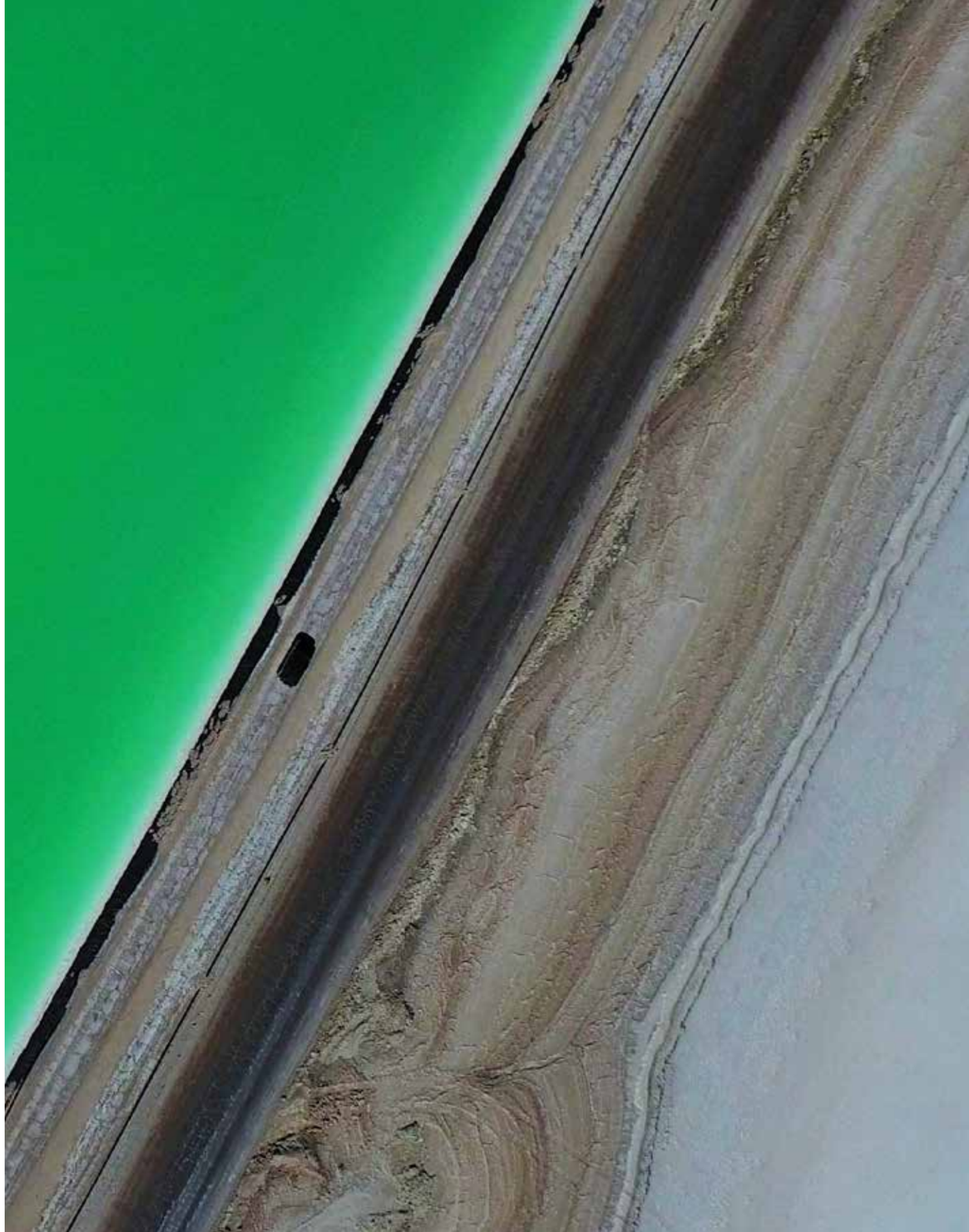
A group of mine workers called *Rock-Lickers* monitor the process, deciding when it's right to move on. Until finally, in the deep coffee waters of Pond no 1—6% lithium—the harvest is ready to leave the land of giants forever.

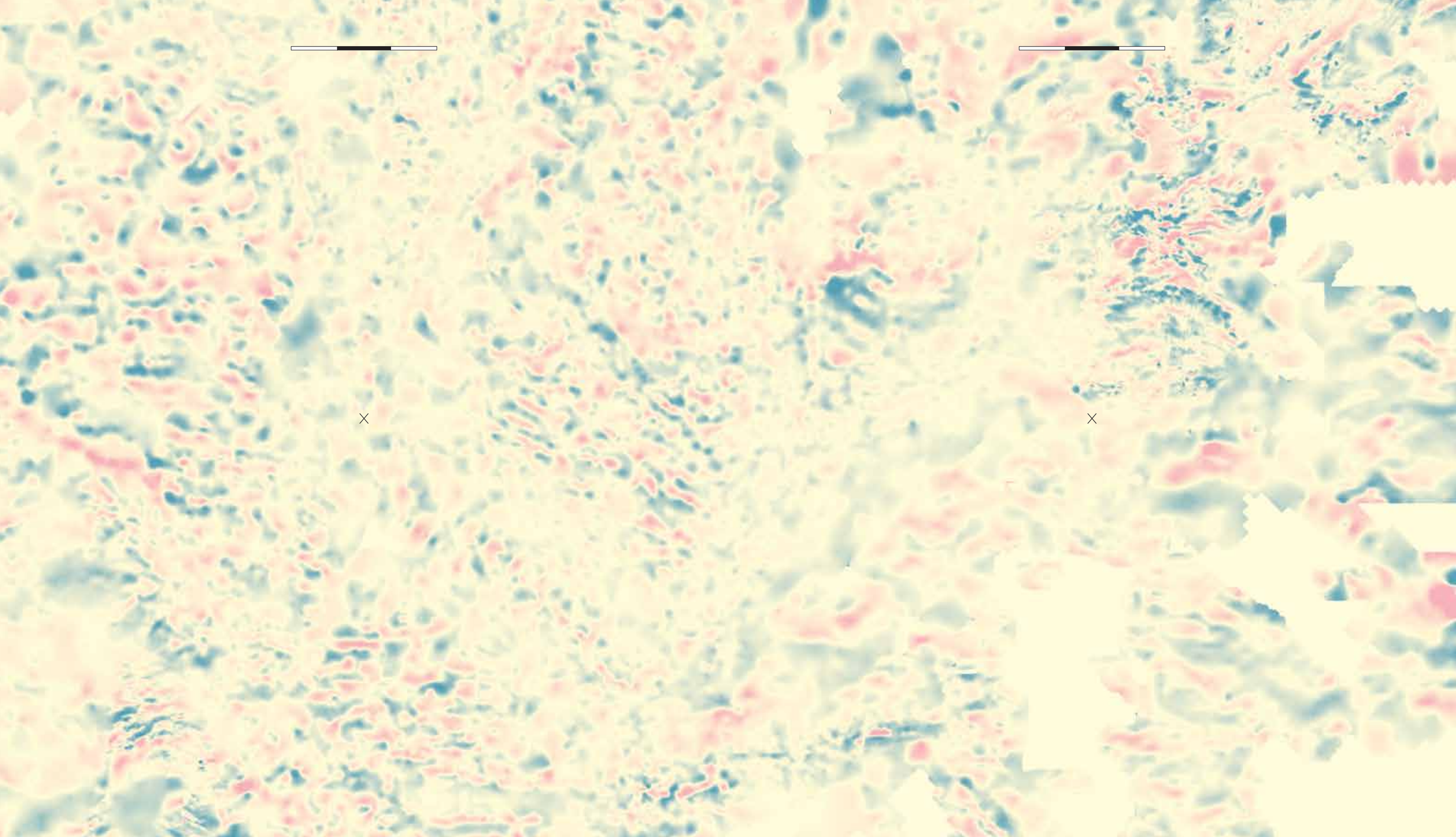
Around 50 millilitres of Tunupa's tears and breast milk are poured into each of our phones. Three electrons orbit a nucleus, tiny revolving planets waiting for a charge. As we plug in our

phones on our bedside table, lithium ions move from cathode to anode. Once charged, the lithium ions drift back to the cathode, and the screen flickers to life—glowing with the heartache of mythic mountains. These are the first things we reach for as we wake, the last things we look at before we sleep. We keep them close, a part of us, warm to the touch. But if we look closely, reflected in the polished glass of our screens is the crystal white expanse of an ancient salt-lake.

This millisecond dance of ions has set in motion a dream of electric energy billions of years in the making. This creation story spans from spiral galaxies to the spiral-wound* electrodes of a battery cell, the flash of the Big Bang to the flash of an electron.

We power our future with the breast milk of volcanoes.





On-Trade-Off: Countering Extractivism

LOTTE ARNDT AND OULIMATA GUEYE
IN CLOSE EXCHANGE WITH THE
MEMBERS OF ON-TRADE-OFF[1]

Dedicated to Dorine Mokha (1989-2021)

The term extractivism designates far more than the literal extraction of raw materials from soils: a broader definition encapsulates the structural foundations of global capitalism, its colonial history, and its ongoing afterlives, comprizing contemporary ecocides. It refers to an "understanding that the world, and all its beings, are inherently commodifiable, violently turned into 'things', operating as a standing reserve for the accumulation of profit and power in the hands of a few."[2]

Global capitalism is fueled by fossil energies, which are usually extracted for the benefit of transnational companies collaborating with national governments, but to the detriment of local populations. In the past decades, extractivism has been theorized mainly in South American scholarship highlighting the "dramatic material change to social and ecological life that underpins [racial capitalism]."[3]

Besides the destructive winning of ore, there is another extractivist practice that runs through and is negotiated in *On-Trade-Off*'s work. The critical discussion of power structures in the global art world refers to extractivism to describe the frequent incorporation of artists from the Global South into galleries, biennales, fairs and exhibitions located mostly in the urban centers of Europe and North America, often without long-term engagement for the sustainable working structures in their countries of origin. While the symbolic surplus of the artist's practice is appropriated unilaterally, the power of the metropolitan centers is further strengthened.

How can an artist collective address extractivism's profit-maximizing structures? *On-Trade-Off*—a collaboration between a dozen artists and writers on three continents—enters the "extractive zone" (Gómez-Barris 2017), critically examines its functioning, and searches for alternatives. Several artists and thinkers gravitating around the artist-run organizations *Enough Room for Space* (co-founded by Marjolijn Dijkman and Maarten Vanden Eynde, Brussels, 2005) and *Picha* (founded in Lubumbashi in 2008[4]) acted upon their long-term conversations and started to inquire collaboratively about lithium mining in the Congo, the pitfalls of the promizes of the green energy revolution, and more broadly, the unequal distribution of risk, destruction, wealth and opportunities along global value chains. It is of crucial structural importance that the project relies on a collaboration between a collective in Lubumbashi, in the Democratic Republic of Congo, and another in Brussels, in the middle of Europe, with members joining from varying geographical locations, including Australia.[5] In this network, different embodied experiences as well as a variety of contextual power structures entangle through the practice of the collective. The group works with complementary perspectives, without unifying the aesthetic and analytical approaches. It considers that the plurality of experiences allows for a more precize understanding of the global realities of extractivism—and aspires to find strategies for discrepant ways to collaborate.

Manono and the Art World

On-Trade-Off strives, by its very structure, its multi-sited geography, its collaborative intention, and the internal redistribution of resources, to resist the rampant extractivist logic of the global art field. By developing the project as a permanent dialogue between artists living and working closely connected

to the sites of extractive mining, and group members confronted by their direct environment rather than by the seductive allure of the electronic end products, the project systematically connects the extremities of the global value chains that oftentimes are dissociated from each other. While it cannot pretend to mitigate the destructive power of capital, it "stays with the trouble" (Haraway 2016), introduces self-reflexivity as a permanent component to the process, and engages enthusiastically in collaboration as a source of learning in multiple perspectives and mutual transformation.

The geographical starting point for the project is an extractivist site *par excellence*: the Manono mine, in Tanganyika province in the Democratic Republic of Congo, 500 kilometers from Lubumbashi. While the mine has been exploited for its tin reserves since 1919, tin recently became the focus of international speculation as a strategic raw material for the green revolution. As explorative drillings conducted by the Australian company AVZ in 2018 have shown, the soil contains important concentrations of lithium, an alkali metal with a high capacity to store electricity. The prospection of the mine's ores—that also contain cassiterite and coltan, both metals of strategic importance for wireless communication—distils the contradictions that *On-Trade-Off* examines: while promizing to provide a more sustainable technology, the future extraction of the ore will most probably replicate the exclusion of local populations from the wealth of their soils. This asymmetrical distribution is not equally visible from all vantage points: Working on a collaborative project between artist's collectives in the Democratic Republic of Congo and Belgium renders today's asymmetrical structures of the world economy and colonial history a palpable reality on many levels. While being connected through the value chains of global industries, depending on their geographical situation, artists participating in the *On-Trade-Off* project do not experience the same realities. They work with different tools, followed heterogeneous journeys, and return to diverse esthetic approaches. The frequently abstract terminology that conceptualizes extractivism materializes in the artworks and confronts the world, engaging with the local effects of globally traded ores, and their transformation into consumer products.[6] It is precisely this interconnected reality that the transnational artistic research project *On-Trade-Off* interrogates.

Pulling on a vocabulary

How to work with the vocabulary of the neoliberal economy? *On-Trade-Off* operates in a field dominated by powerful corporate interests and the language of financial speculation. The collective's work is obliged to deal with forces that far exceed its own possible impact. Reformulating Audre Lorde's fundamental question, it has to continually ask if the available conceptual and esthetic tools can contribute to dismantling the extractivist house.

As a consequence, the group engages in continuous criticism and self-reflexivity, not only in visual production, but also at a linguistic level. Beginning with the project's title, the participating artists interrogate whether a transformative use of the very (visual and linguistic) vocabularies of global trade is possible: In neoclassical economic theory, a trade-off designates situations in which increasing one part of an equation requires diminishing another. For example, the destruction of living environments in regions with strategic raw materials is the price to pay for augmenting international interconnectedness and increasing energy efficiency. Rather than accept the fatalistic stance of this argument, the artists working on the *On-Trade-Off* project question its assumptions, reconsider the material realities through research, and explore speculative scenarios inventing alternative modes to think about energy, global circulation, and transnational collaboration.

Thus, the group shares a common virtual and material space for textual and visual research, including images and footage by the artists themselves that can be re-appropriated and used by other group members. Collaboration materializes as commonized material. This was first named *Banque collective*—and evolved after intense discussions on the role of banks in global investment into *Common (Re-)source*. The new name references both the material flow that originates outside of the group, as a source, requiring responsible uses in more-than-human assemblages, and the critical interrogation of digital information media. It

points to the space of the commons, i.e., to use values that can be of general benefit precisely because access to them is not privatised.

Being entangled

None of the complex structural questions examined by *On-Trade-Off* are external to the group itself. Indeed, working in a transnational collective on three continents depends on the very technologies scrutinized by the groups' research: the Covid-19 crisis with its worldwide impact was a double-edged sword for the work of the highly mobile artists group. During the lockdown, members have been based in Lubumbashi, Sydney, Brussels, Paris, Amsterdam, and Zagreb. The transnational collaboration could be sustained via computer and smartphone screens, revealing the striking differences in quality, cost and accessibility of internet connections, and more broadly electricity in each location. Even if the massive expansion of internet-based communication led to a reduction in international air travel with its destructive ecological footprint, it nevertheless remains based on raw material-consuming technologies and their ongoing supply. We know about the energy consumption, water usage, toxicity, the lithium required for the batteries, the waste caused by the production and use of digital media, which belie corporate myths of their immateriality.[7] With high insecurity in estimations, present-day reports account for 5-9% of global energy consumption related to electronic communication technologies.[8] These percentages are likely to rize rapidly: globally, the average number of electronic devices and internet connections will grow from 2.4 billon in 2018 to 3.6 billon by 2023.[9] By 2030 communication technologies could consume 51% of global electricity, and produce 23% of greenhouse gas emissions.[10]

While the groups' work exposes the production conditions of electronic communication devices, it is itself far from being a small-footprint media practice. The research and transnational exchange, including the frequent transfer of visual and audio files depends on electronic media, and thus participates in an economy that extracts labor from bodies, minerals, gas, and oil from the ground, without any inherent limits to the permanent accumulation process, as Karl Marx wrote as early as 1884 in *Das Kapital*.

The transnational collaboration of *On-Trade-Off* reconnects the extremities of the chains of production and consumption. While the group members living in the Democratic Republic of Congo are facing unstable electricity supply, rizing consumer good prices, and repressive political uses of the Covid pandemic, those based in the European Union observe daily increasing nationalism, militarized border policies, and incitement to consumerism. Efficient technologies, presented as solutions to the ecological crisis in the North, the concentration of extraction and outsourcing of hazardous waste in the South, and anti-migration laws, and increasing social exclusion go hand in hand.

Unraveling Speculation

The group oscillates between analytical criticism of extractivism in the artworks, and its own complicity in the asymmetries of the global economy, without ever claiming to remain unaffected by the power structures it interrogates. Speculation itself is approached from a double perspective: As the financial translation of future values, a bet on the capitalization of as yet unexploited wealth, speculation is a subject of critical investigation. But it is also understood as a generative artistic process to resist positivism and sketch alternative scenarios for the future.

A key collaborative work by Jean Katambayi Mukendi, Sammy Baloji, Daddy Tshikaya and Marjolijn Dijkman may work as an example here. Today, the rhetoric of sustainability and global responsibility has become ubiquitous in the communication of global companies. Tesla Inc. for instance, intends to accelerate the "world's transition to sustainable energy" by selling high-end electric cars powered by regenerative energy stored in lithium batteries. The company, under the directorship of CEO Elon Musk, is named after Nikola Tesla, a scientist born in Smiljan (today's Croatia) in 1856, who invented the Wardenclyffe Tower, a technology promizing free wireless electricity for whole societies. While Nikola Tesla's utopian idea has never become reality, and many of his patented inventions have been attributed to his part-time employer, and competitor Thomas Edison, his name has now been appropriated by a profit-driven

global enterprize selling electric cars and batteries as green technologies for the future. Tesla Inc. requires huge amounts of lithium for its batteries—and may thus be one of the clients lining up to buy the ore mined in Manono.

In the present distribution of power, it is likely that "the promize of the green car of the future is valid only for the part of the world that will enjoy its use, [while] the environmental impact is displaced in the areas of extraction and refining of materials that compose it."[11] Challenging this situation, the abovementioned artists conceived and constructed a life-size Tesla car from copper wire in Lubumbashi: *Tesla Crash: A Speculation*.

This work was the foundation for further collaborations. In close conversation with the three conceivers of the wire car, Marjolijn Dijkman prepared the performance *Charging Tesla Crash: A Speculation* for the 6th Lubumbashi Biennale in 2019. Jean Katambayi Mukendi presided over the ceremony, while Dijkman discharged three million volts over a distance of two meters onto the highly conductive copper car from a home-crafted Tesla coil. With a great cacophony, reinforced by the commotion from the audience, the car was symbolically "brought to life" through electricity—just as at the beginning of science fiction writing in Europe Mary Shelley had reanimated Frankenstein though the power of electricity. But the spectacularity of the discharge did not animate the car. Instead, it highlighted the dead-end of the asymmetrical benefits from the raw material exploitation. While it is clear that the "future of the electric car, just as so many other technologies, lies largely in the DRC, one can doubt if the future of Congo lies in the Tesla."[12] This was also the spirit of the call-and-response with the audience that had been set up by Dorine Mokha about a year before his tragic death in early 2021. Mokha knitted the narration of his performance at the Lubumbashi Biennale around the car, a gesture that initiated collaborations with the *On-Trade-Off* project. With the current crisis deepening social divides on a global scale, and promoting green technologies for wealthy consumers, largely forgetful of the conditions of their production, and the deep structural asymmetries of global capitalism, *On-Trade-Off* continues to insist on the interconnectedness and the inequality of living situations across the globe and the urgency for environmental justice. As authors like Vandana Shiva, Ghassan Hage, and Malcom Ferdinand have emphasized for ages: decolonial ecological practices require acknowledging the unequal structures of racial capitalism and its colonial foundations.[13]

On the modest scale of an artist collective, *On-Trade-Off* strives to counter extractivist structures and speculate on possible alternative scenarios for mutual accounting on an interdependent planet, to open ideas beyond the protective localism of wealthy ecological policies, and the structural racism of global techno-capitalism. Examining future modes of travel and transnational collaboration and continually self-reflecting on the group's structure and its inherent biases are among the challenges for the coming months and years.

May, 2021

1 A longer version of this essay was published in Fall 2020 in the Commodity Frontiers Newsletter: https://commodityfrontiers.files.wordpress.com/2020/10/commodity-frontiers-1-fall-2020.pdf
2 Heather Davis "Blue Bling. On Extractivism", *Afterall* no. 48, Autumn 2019, https://www.afterall.org/journal/issue.48/blue-bling-on-extractivism
3 Macarena Gómez-Barris: *The Extractive Zone. Social Ecologies and Decolonial Perspectives, Duke*, 2017, p. xvii.
4 The founding members of the collective are Sammy Baloji, Jean Katambayi Mukendi, Rosemary Tshawila, Rosa Spaliviero, Georges Senga, Filip de Boeck, Gabriele Salmi, Alexandre Mulongo Finkelstein and Aimé Kalenda.
5 At different moments, the group has so far involved Sammy Baloji, Alexis Destoop, Marjolijn Dijkman, Pélagie Gbaguidi, Femke Herregraven, Jean Katambayi Mukendi, Dorine Mokha, Musasa, Alain Nsenga, Georges Senga, Daddy Tshikaya, Pamela Tulizo, Maarten Vanden Eynde, and the writers and curators Lotte Arndt, Oulimata Gueye and Rosa Spaliviero.
6 Annie Chéneau-Loquay, "Mobile Telephony in African Cities. A Successful Adaptation to Local Context", *L'Espace géographique* 2012/1 (Vol. 41), pp. 82-92. URL: https://www.cairn.info/journal-espace-geographique-2012-1-page-82.htm
7 Laura U. Marks, "Let's Deal with the Carbon Footprint of Streaming Media," *Afterimage* 2020, 47 (2), p. 47. https://doi.org/10.1525/aft.2020.472009. For a critique of the rhetoric of dematerialized communication, see: Lisa Parks and Nicole Starosielski (eds.): Signal Traffic: Critical Studies of Media Infrastructures, Champlain, Illinois, University of Illinois Press, 2015.
8 "Between 10 and 20% of electricity consumption from the ICT* sector in 2030?", August 9 2018, https://www.enerdata.net/publications/executive-briefing/expected-world-energy-consumption-increase-from-digitalization.html
9 Cisco Annual Internet Report (2018–2023) White Paper. Updated: March 9, 2020, https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html
10 Anders S. G. Andrae and Tomas Edler, "On Global Electricity Usage of Communication Technology: Trends to 2030," *Challenges* 6, no. 1, 2015, pp. 117-157.
11 Oulimata Gueye: "No Congo, No Technologies," Digital Earth 2019, https://medium.com/digital-earth/no-congo-no-technologies-163ea-2caec0a
12 Ibid.
13 Lionel Astruc: Vandana Shiva. Creative Civil Disobedience, Arles, Actes Sud, 2017; Ghassan Hage: *Is Racism an Environmental Threat?* Polity Press, 2017; Malcom Ferdinand: *Une écologie décoloniale. Penser l'écologie depuis le monde caribéen*, Paris, Seuil, 2019.

Hercule de Lubumbashi

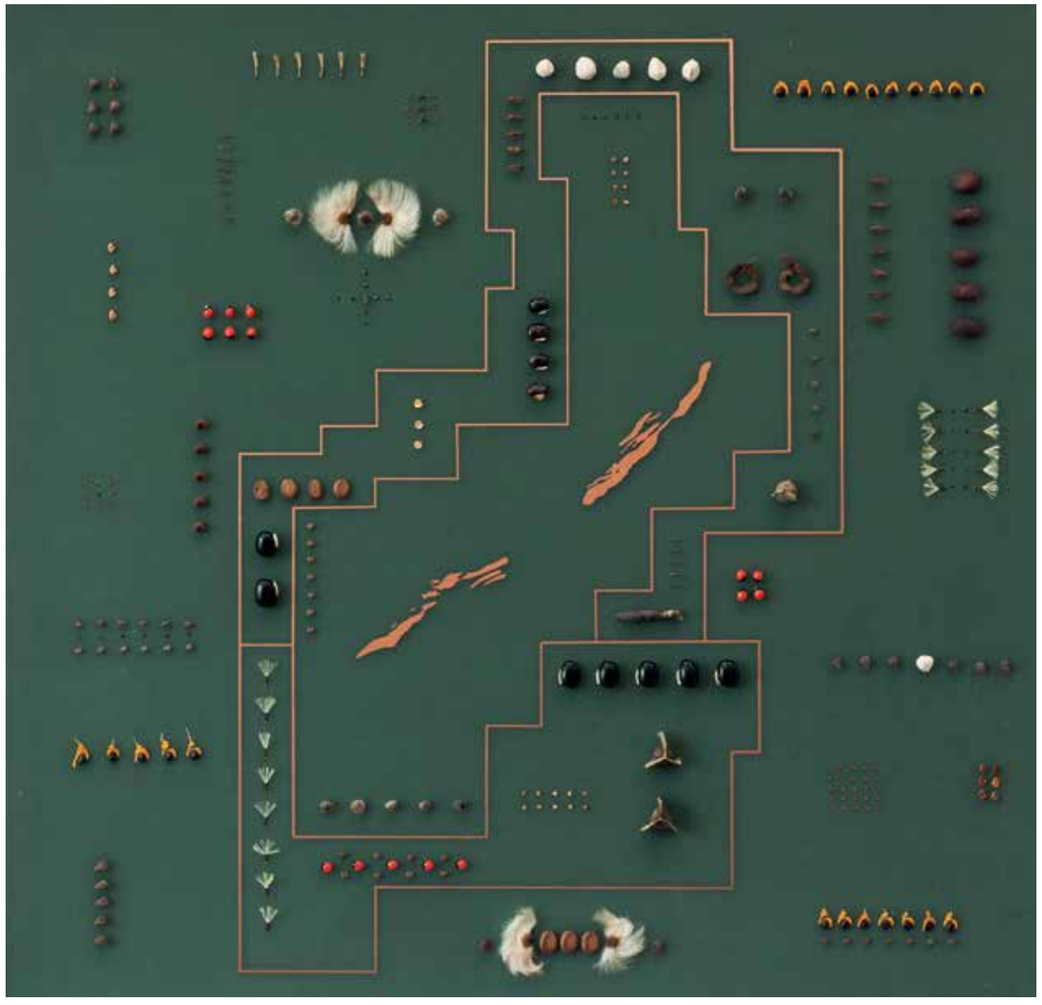
DORINE MOKHA AND
ELIA REDIGER

People in Lubumbashi, in the Democratic Republic of Congo (DRC), have been waiting for Hercules to come and restore to them the wealth of their land. But Hercules doesn't come. Rather than pin their hopes on a Greek myth, Mokha and Rediger inquire if they can resort to music and a heroic dance to obtain justice and re-appropriate the resources?

Freely inspired by Georg Frideric Handel's *Hercules' Choice*, Dorine Mokha and Swiss composer Elia Rediger created a post-documentary oratorio for eleven musicians from Europe and the Congo, a dancer and a singer. It addressed the increasing demand for cobalt, the exploitation by multinationals and the destruction of the living space of local populations.

Dorine Mokha and Elia Rediger. *Hercule de Lubumbashi*, 2019. Still.

♪♪ Nokia, Samsung, Huwai, Tesla,



Future Flora: Manono

MAARTEN VANDEN EYNDE

Future Flora: Manono consists of various graphic translations of the largest lithium ore reserves recently discovered in Manono in the Democratic Republic of the Congo (DRC), surrounded by the outlines of the mining concession of the Australian mining company AVZ Minerals.

The map was transferred onto a printed circuit board and decorated with a wide variety of seeds and grains collected in Manono, representing transistors and electrical components. Together they mimic a *lukasa* or "memory board" used by members of the *mbudye* association in the Kingdom of Luba (now part of the DRC) in the nineteenth and twentieth centuries as archives for the topographical and chronological mapping of political histories, and a means of remembering important people, places and traditional migration routes. The seeds are organized in relation to the contours of the mining concession and evoke the memory of seed collection, preservation, modification and militarization. At the same time, they act as a back-up for rare plant species that sometimes only grow on one specific hill or valley due to the presence of certain minerals in the soil. They can be used to recreate the original fauna and flora when the mining activities have ceased.

Maarten Vanden Eynde. *Future Flora: Manono*, 2019. Photo (c) Philippe De Gobert.

Prelude to: When the Dust Unsettles

FEMKE HERREGRAVEN

The starting point of *Prelude to: When the Dust Unsettles* are systems of visualization and mineral extraction and the question of how they reinforce each other. Before any mineral particle is extracted from the soil, it is already assessed, mapped and visualized long before by supercomputers. As a future prospect, minerals and mines are modeled as digital 3D renderings that can travel and generate activity in boardrooms and financial markets, and influence the loyalties of politicians. Visuality precedes profit. The material object of desire lies deep underground and needs a visual placeholder that can circulate before it can circulate itself. The recent concept of the 'digital twin' is a digital model of a real-world mine in which mining operations can be simulated to optimize efficiency and profits. In the virtual environment of *Prelude to: When the Dust Unsettles*, the mine consists of data points, pixels, polygons, gigabytes, and colorful slick renderings, but are underpinned by dust, toxic air, polluted ecosystems, exploited bodies, endangered species, failing respiratory systems, and traumatized landscapes and communities. The audiovisual installation *Prelude to: When the Dust Unsettles* employs the 'digital twin' mine model to visualize a space of entanglement rather than abstraction, to portray the mine as a wound rather than a treasure trove, and to imagine an 'underground of connectedness'. Video images of navigating through this 'digital mine' are juxtaposed with a sound composition that counters the digital rendering and centralizes the relations between dust and lungs, plants and batteries, minerals and the mind, the ecosystem and the economy, flows of capital versus flows of oxygen. How can we breathe as a society that is being suffocated by extraction in the name of progress?

Femke Herregraven. *Prelude to: When the Dust Unsettles*, 2022—Ongoing. Multimedia installation Exhibition view, 'On-Trade-Off: Charging Myths'. Z33, Hasselt.

Ils ont partagé le monde

MAARTEN VANDEN EYNDE & MUSASA

Ils ont partagé le monde (They Divided the World) consists of nine paintings produced in collaboration with the Congolese artist Musasa. Depicted in them are the most important raw materials that make up the very foundations of the world as we know it. Drawings, pictographs and symbols representing each pivotal material form a rebus, or a summary of its origin, use and influence. The nine wedge-shaped panels allude to the wheels of fortune and progress and the distribution of economic and natural wealth. The wedges move forward like the hour hand on a clock, making a striking analogy between the coinciding events of the division of physical space (the parceling out of Africa at the Berlin Conference of 1884-1885) and time (the determination of a prime meridian at the International Meridian Conference, 1884). The title, *Ils ont partagé le monde*, comes from the song *Plus rien ne m'étonne* by Tiken Jah Fakoly.

Maarten Vanden Eynde & Musasa. *Ils ont partagé le monde*, produced for the Belgian Art Prize 2017, Bozar, Belgium.

Le Vide (The Void)

GEORGES SENGA

Georges Senga developed the photo series *Le Vide* (The Void) in and around abandoned mining sites and factories belonging to Gécamines, the largest mining company in the Katanga region (now subdivided into four administrative districts). As the main employer in the region, Gécamines determined the fates and fortunes of many inhabitants in Lubumbashi and beyond. The formerly state-owned company, with a long colonial history, has endured troublesome times since the 1980s. It is currently nearly bankrupt. What void is left behind after the company's decline? What activities and structures develop in the wastelands left by the disintegration of the huge extractive machinery? Georges Senga investigates the hopes and the hardships experienced by inhabitants of the industrial remains. He follows artisanal miners digging tunnels with their homemade pickaxes, which ironically resemble the Tesla logo. With abundant references to photographs documenting industrial decay, Senga investigates the memory of who we are, what we have, and where we come from.

Georges Senga. *Le Vide* (The Void), 2019.

Earthing Discharge

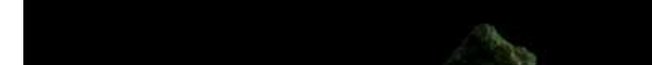
MARJOLIJN DIJKMAN

Earthing Discharge is a series of photographs of lithium-containing spodumene minerals from Manono with electric corona discharge. The images are created with a high-voltage electro-photography technique using the transparent glass layers of capacitive touchscreens.

Earthing Discharge is the first result of a research project that explores how electricity as natural science has been linked since the eighteenth century to Enlightenment ideals. Although people have been fascinated by electricity since early civilization, the scientific properties of electricity only began to be properly understood in Europe during the Enlightenment. Most electricians of that period were considered entertainers, similar to magicians, and the public electrical demonstrations did not explain the science, but rather turned the phenomena into spectacular events.

Earthing Discharge returns to this moment in time when electricity was still made visible, in contrast to today where most electrical processes are hidden from view and more or less taken for granted.

Marjolijn Dijkman. *Earthing Discharge* (photographs of lithium from Manono (DRC) and electricity), 2019.

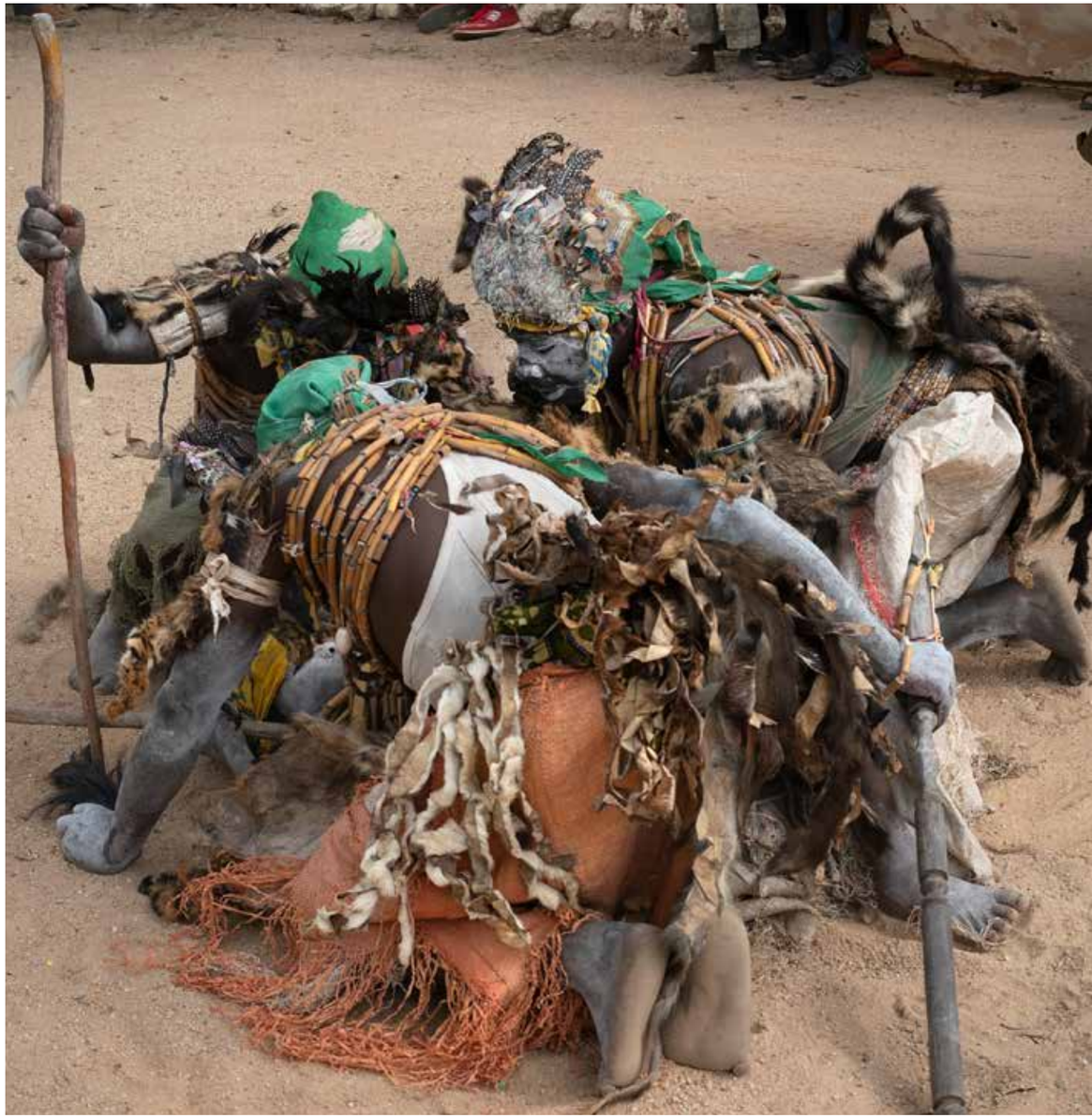


Phase Shift, 2019

ALEXIS DESTOOP

This new film project sets the stage for research focusing primarily on lithium—the element that has come to symbolize the energy transition and is leading us to a new age (after the age of steam and the nuclear age). Lithium has its own contradictions and paradoxes: it's at once scarce and abundant, volatile and unstable. Obviously, these qualities form potent metaphors for the economic cycle of extraction, processing and production within the precarity of a globalized economy. Choosing to treat it as an abstract character, an entity with agency, the film will unfold as an investigation, or a quest for a ghost-like element. This abstract persona finds its origin through the cosmological event of the Big Bang (a creation myth) and after a long hiatus, reappears in early modernity. While the theory underlying its psychiatric use as a mood stabilizer resounds awkwardly with ancient medical and alchemistic practices, it is the use of lithium compounds as a supercharger in military technology that forms a more obvious link to its current fetishized status.

Alexis Destoop. *Phase Shift, 2019*—Work in Progress.



Concentrator

JEAN KATAMBAYI MUKENDI

A given history is a concentration of other histories; thus, rereading the history of humanity is complex because it is a "history of histories." In the process of creation, the creator—the central figure in the present narrative, through whom the new emerges from existing but recomposed elements—is called to traverse the historical universe by way of compositional tools. This exercize is so complex that it requires the support of a Concentrator, a multipurpose tool that is at once narrative, mathematical, and imaginary. In digital cultures, the word "hub" is also used to designate this generator of design. Here, the Concentrator resolves the critical problem of processing heavy bandwidth. As a result, the Concentrator is assigned to places and times of high tension, as close as possible to interstices where the distribution of power is being negotiated.

Take the following example: the creator conducts an explorative request on the history of metal smelting, using this prompt in a search engine. His first search result informs him that:

> People in China were among the first to produce and use the forge in the fourth century. They had the benefit of minerals whose ferrous elements melt at lower temperatures, and the blacksmiths created a system of bellows and pistons powered by hydraulic energy … The West only began to exploit the forge around the nineteenth century.

What is the meaning of this story about the origins of smelting, which stipulates that "people in China were *among* the first" to employ it? From the point-of-view of the creator, questions arize about the blind spots in the dominant history of technologies. In transmitting certain privileged narrative strains, what other histories are being omitted, rendered invisible?

Let us return to the history of smelting. Our sources inform us that we are currently in the era of the production of metals by cold cathode, a method far removed from that of the blast furnace, which first appeared in Europe at the end of the fourteenth century, producing melts and molds for cauldrons and cannons. The casting of metals in coke-fired blast furnaces first appeared in 1709 and was put into operation by Abraham Darby from Coalbrookdale, England. The methods of geological prospecting, as well as the procedures for the extraction of minerals and for the refinement and use of metal, continue to evolve alongside the media that narrate these developments—as in the case of lithium, though its existence was already acknowledged by Mendeleev in his 1869 draft of the periodic table of elements.

The creator, instead, could use a research approach centered on the place of Africa in the larger record of techniques and technological innovations, in order to reintroduce the continent into the history of forge craft. Thus, the work of researchers François Wassouni and Mahamane Addo, dedicated to the constitution of a historiography of techniques in Africa, recalls the work of the Senegalese archeologist, historian, and cultural heritage specialist Hamady Bocoum (the current director of the Museum of Black Civilizations at Dakar). Much of Bocoum's work, they remind us, "has demonstrated the ancient origins of ironworks in Africa, whose beginnings he dates to around 2000 BCE or even 2500 BCE."[1] According to his research, "by 1000 BCE, iron was present everywhere in Africa, allowing the creation of more complex political entities, emerging around blacksmiths as rulers."[2]

As Wassouni and Addo explain, the reason that it is so difficult to access precize knowledge about the contribution of the African continent to the technique of ironwork is that colonial researchers could not conceive of the possibility that metallurgy had been invented by Africans. They would sooner promote the idea of the circulation of this technology from the Near East through the Nile Valley and into Tunisia. The work of researchers Henri Lhote, Louize Marie Diop, and Cheikh Anta Diop demonstrated that the

ethnographic, archeological, and historical record contradicts the theses that claim the origin of the sciences lies outside the African continent.

The creator has the opportunity to experience the reassessing of these histories, which follow fictions rooted in abstraction, figuration, and representation, far from the concrete realities of extraction and transformation. Relying on the Concentrator, he recalls a principle that is common to all cycles of functional operations, starting with input and leading to output. Only a process of emergence from within certain regularities can truly allow the speculative possibility of openings and alternative narrations.

The creator establishes a relationship between the world of possibilities and the world of subjectivity, constantly defying any notion of objective scientific narrative. This time, the Concentrator's powerful turbine pulls them towards the topic of games of chance. The creator is thrilled to experience a whirlwind in which the origin of games of chance remains unknown. While they were practiced in China in 2300 BCE, it is considered that they were already in common use by many societies at that time. If the story written in the West focuses on the idea that the German Johannes Gutenberg printed the first set of playing cards in 1440, it has also been noted that numerous game traditions exist, from China to Africa, whose genealogy remains ignored by the Grand History of games of chance. Lotto, poker, bingo, dice, keno, biribi, amigo, Russian Roulette, virolons, ouri …

Changing scale again, the creator leaps into the digital age: microprocessor technologies have achieved their compilations and concentrations of information by permitting the virtual encounter of both minimal and maximal worlds. Genetic, molecular, and nuclear dimensions; processing speed, stem cell, vaccine development, and nanoparticle research … these new technologies give rize to complex ecological and ethical questions. The creator attempts to concentrate the elements of histories at the epicenter of their creation in the same way that a single microprocessor offers a near-infinite range of algorithms for the entertainment of the player.

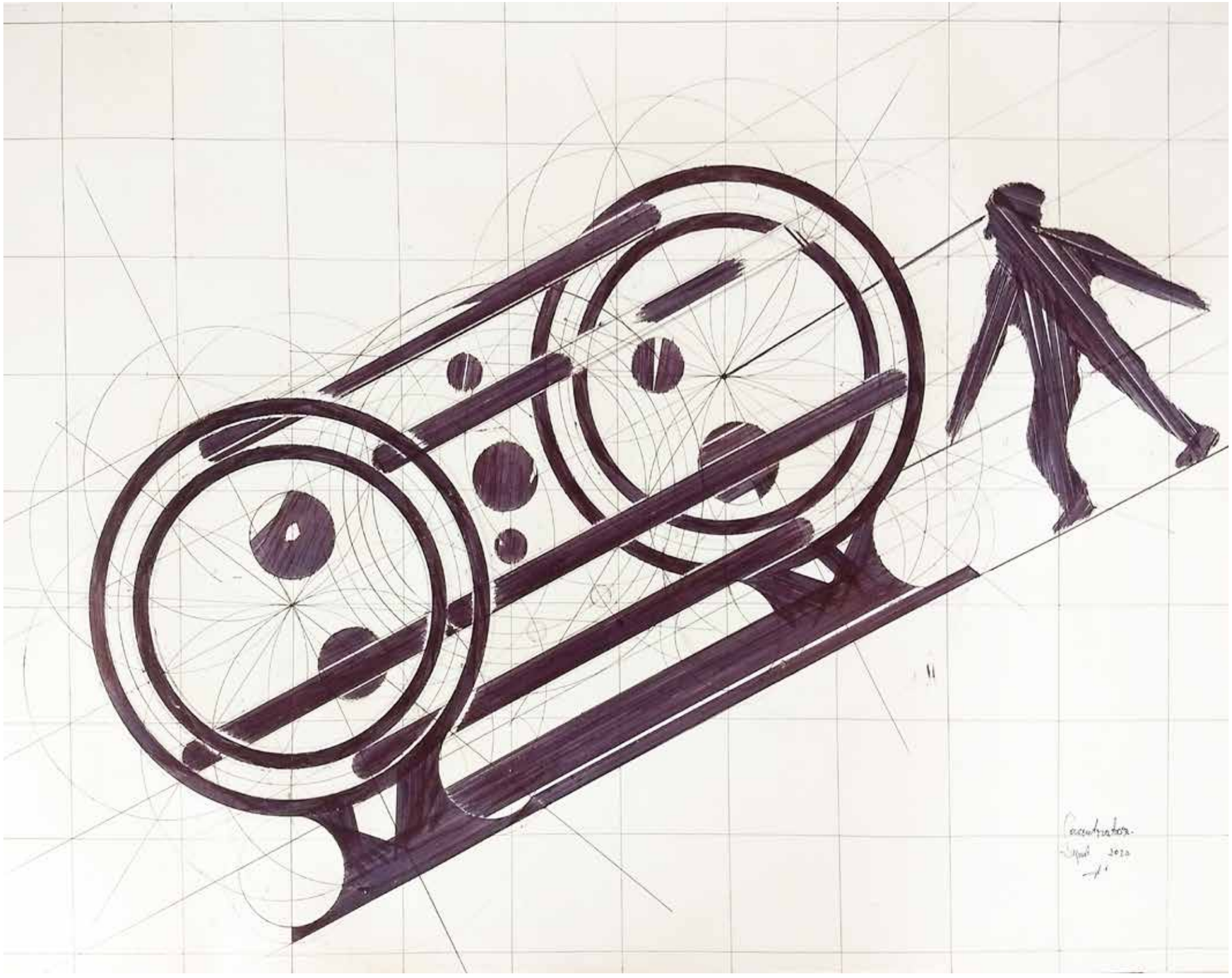
The word algorithm comes from the name of the ninth-century Persian mathematician Abu Abdullah Muḥammad ibn Mūsā al-Khwārizmī. In his traces, we encounter the Babylonians. Yet the conventional dominant history privileges a focus on Euclid's algorithm, considered the first of its kind, and proceeds from there towards the emergence of computable functions at Princeton, as well as the Curry-Howard correspondence—which situates itself at the crossroads of mathematical logic, information theory, and complexity theory. It is, however, important to recall the undeniable contribution of Leonardo of Pisa, also known as Fibonacci, the Italian mathematician who was educated in North Africa and who invented the sequence that bears his name.

Because all things transform in time and space, subject to energy, the question of origins continues to haunt humanity. It is difficult to isolate stable responses to questions about existence in a framework of time that leads past the barrier of the infinite. There are no fixed locations upon which to even situate our apprehensions. The best way to understand the present is to project out into the past or the future. Algorithms allow the creator to perform these transplantings of thought that facilitate a grasp of the functioning, architecture, and evolution of creation.

Ethnomathematics and today's ethno-algorithmic disciplines study the multiple aspects of mathematic and algorithmic knowledge by accessing the long history of the sciences in Africa. The prefix *ethno-* shows to what degree this research is still marginalized in the field of scientific and digital knowledge. Nevertheless, researchers who work on these questions disturb the established history of the sciences. During a 1950 archeological excavation in the village of Ishango—in the current Democratic Republic of Congo near the border with Uganda—north of Lake Rutanzige, the "Ishango bone" was discovered:

> *a small bone, 10 centimeters long, decorated with a quartz crystal on one end, bearing three series of grouped etched calculations. This object proves that Africans of the Great Lakes region practiced mathematics at least 20,000 years ago.*[3]

Thus, the ethnomathematician Ron Eglash has for many years been studying the presence of Afri-



Jean Katambayi Mukendi.
Concentrator, 2020.

can abstract concepts and constructs that echo fundamental notions of fractal geometry. Fractals are repetitions of identical geometric patterns in series of infinitely smaller scales. They are at the frontier of mathematics, information technology, and modeling practices of biology, geology, and the natural sciences. In a systematic manner, Ron Eglash has studied the fractals present in architecture, hairstyles, textiles, basketwork, and sculpture in Africa, and shows how these uses are the expression of scientific insight and mastery. These vernacular algorithms also allow for the study of the political and religious dimension of fractals, the ways in which they are interwoven into every level of African societies.

The philosophical currents traversed by the inhabitants of the Earth express multiple forms by which to approach creation and evolution, inscribed in a present moment that is almost impossible to isolate. We live in an algorithmic continuity that imparts different currents of thought onto different spaces of convergence and divergence. Whether the universe was created from nothing, or whether the universe is the prerogative of an evolutionary process that hides its own workings, the inability to master time is the condition that maintains the coexistence of these diverse approaches and conceptions.

The Concentrator aims to propose a work that is as visual, dynamic, eclectic, and luminous as our current era, motivated by the longing for a connection with the intricacies of evolution. If we imagine that each word of this text is itself a history, and that each word in the next history will itself become a history, we find ourselves beyond the notions of space and time as we know them.

November, 2021

1 François Wassouni and Mahamane Addo, "L'histoire des techniques en Afrique: état des lieux, question des sources et defies," in *Histoire des techniques*, eds. Guillaume Carnino, Liliane Hilaire-Pérez, Aleksandra Kobiljski (Paris: Presses universitaires de France, 2016), 163–194. Translation by Michelange Quay.
2 Ibid.
3 Dirk Huylebrouck, "L'Afrique, berceau des mathématiques," *Pour la science* 47, April 1, 2005, https://www.pourlascience.fr/sd/histoire-sciences/lafrique-berceau-des-mathematiques-5702.php.

We are a new sun

PÉLAGIE GBAGUIDI

We are a new sun
Why doubt it
Since we need all the votes
To create constellations where life on earth
Is now possible for all
There are several voices
Several ways
There are several energies
Several species
Places
Many smiles
Several deaths
But only one sun

When we chant Tshanga Tshanga
We are heading towards Manono
Who knows ?
As it braces for the exploitation of the worlds' largest
Reserves of lithium
Who knows ?
The main raw material needed for the global production of
electric batteries to store the jumbo new "Green Energy"
The merging of the past, the present and the future are
there She shines like a new comet to be contemplated with
a magnifying glass
This global eclipse
Have you seen her?
This phenomenon is at our feet, at our doorstep. Manono
opens our eyes to our daily energy use This new digital
link becomes family, friend, intimacy, Brother, sister,
children, intruder, unknown, media, others, True, false,
spectrum Ha!
What do we put in this energy that becomes vital
and kills On the other side of the screen, lives

Ha! Spectra, also like the Lithium characterin Phase Shift,
Angel Dust this cosmic and utopian cloud of the creation of the world
Who knows ?

The volatile and unstable element that has become
a Symbol for the energetic transition,
After the age of steam,
The postnuclear
Leading us to a new age
Who is she?
A new gender ?
Manono to the conquest in Australia, North
America, The predator in Schenzen
The Siroco wind
Not alone at all but spread as a wave everywhere
connected
monitored
as an ecological utopia
As a giant and sculptural in the Concentrator in our
houses Magisterial and Painted Mural, drawn
Danced, sublimated form
In the diffracted body
With Discharged and Charged
Like a trance that embraces other bodies in the journey of
forced amnesia for inventing our future and our present
Let's talk about it here
You are invited to the banquet table
Did you know that ?
Visuality precedes profit.
All is there in "When The Dust Unsettles"
Toxic air, polluted ecosystems, exploited bodies,
Endangered species, failing respiratory systems,
Traumatized landscapes and communities, capital-oxygen
mixed marriage
How can we breathe as a society that is suffocated
by extraction in the name of progress ?
As a murmur we say

we don't want to wear anymore ceramic beads made
using natural uranium as a colouring agent We no
longer want to carry a chain of inequality and
human exploitation
We don't want the bodies to go hungry anymore, Hunger
says friendly to “A Chain of Events”

Because Depth of Discharge reveals us spiritually what
a chain of energy we are
A desired gathering with all
In ubiquity,
In words nourished, written and articulated together
In reverence to the public
To share our sources
To align our dreams with those of the stars...
We dream of another sun, which is light years ahead of
colonialism, capitalism, consumerism and all the lists of
isms.
We are
We are on the move, a space of
transformation

OTO Charging Myths

June, 2020

Udji Kinge. Save Yourself, 2019. Kipushi DRC. Pélagie Gbaguidi : direction, editing. Joseph Kasau: camera-man, editing. Marie Thérèse Salumu: assistant to the project Kipushi carrière douane. Tatiana Kabanga: composition, singing Djikenga Mwitu. Julie Biata: speaker for the NGO étoile du sud which fights for the right to health and member of the civil society force vive. Sarah Kadima: choreographer. Costa Tshinzam: voice text Tram 83 by Fiston Mwanza Mujila. Carmen , Maman Assi, Maman Sidonie, Maman Marlène. So that the harshness of this task may be abolished.

Joseph Kasau. Photograph, 2019. Featuring: Marie Thérèse Salumu ,Tatiana Kabanga, Julie Biata, Sarah Kadima, Costa Tshinzam ,Joseph Kasau, Carmen , Maman Assi, Maman Sidonie, Maman Marlène et Pélagie Gbaguidi. Courtesy the artist.

Pélagie Gbaguidi. *Mapping vision organic and technical body* (Kipushi Quarry), 2019. Courtesy Zeno X Gallery, Antwerp and the artist.

Pélagie Gbaguidi. *Drawing on Ceramic Hunger*, 2019. Courtesy Zeno X Gallery, Antwerp and the artist.

Core-Dump "E-Revenant"

FRANCOIS KNOETZE

Core Dump is a series of four films that explore the relationship between digital technology, cybernetics and colonialism. Using found footage, sculpture, performance documentation and recorded interviews the films link geographic and temporal discontinuities by referencing a *"core dump"*, the recorded state of the working memory of a computer at a specific moment in time: if a crash occurs, the computer is able to recall this "imprint" of its previous state as a means to debug and recover. This "memory" of a computer forms the basis of the *Core Dump* video series, filmed in Dakar, Kinshasa, Shenzhen and New York. The films extend the metaphor of a crash to the impending breakdown and unsustainability of the global capitalist techno-scientific system, characterized by a glut of excess and a fascination with hypermodernity masquerading as progress.

Recounting stories of a global digital machine on the brink of collapse, each video chapter in the series presents different geographic contexts and stories that suggest that although technology is rapidly evolving, patterns of exploitation are deeply ingrained in the way it has been and continues to be produced, consumed and represented, and that the crucial technologies required to move towards a more equitable world are less physical than they are social. The videos expose how notions of "progress"and "technology" as products have been falsely proclaimed by the West, while the electronics hardware supply chain taps into old colonial trade arrangements, and the software of these corporations seeks to colonize emerging markets in Africa, while sweeping aside indigenous knowledge systems by imposing a centralized and homogenized cloud economy.

One way that we start to see links between different contexts of production, waste and extraction is through a character who features in the Shenzhen chapter of the work, Mami Wata. This mythical water goddess first appeared to people from the Ghanaian coast, when they encountered the European vessels accosting Africa in the late fifteenth

century. Being hybrid and mystical, she provides wealth and power to the people she seduces, in return for their total devotion. The goddess of change, she augurs economic, social, cultural and political reform. Mami Wata is now seen as a postmodern and postcolonial figure: a woman, half-white, half-black, half-human, half-animal, provider of material wealth, prestige and power. In the Shenzhen chapter, Mami Wata is transplanted into the context of the "world's gadget factory" in Shenzhen. Here, Knoetze references how In 2012, images and videos of Mami Wata began rapidly circulating online across the Democratic Republic of Congo, sparking rumors that Chinese laborers had captured her while they were installing underwater fiber optic cables in the Congo River. In Core Dump, Mami Wata reappears from the dystopian landfills of technological consumer culture, a figure costumed in discarded electronic waste, referencing Sino-African relations.

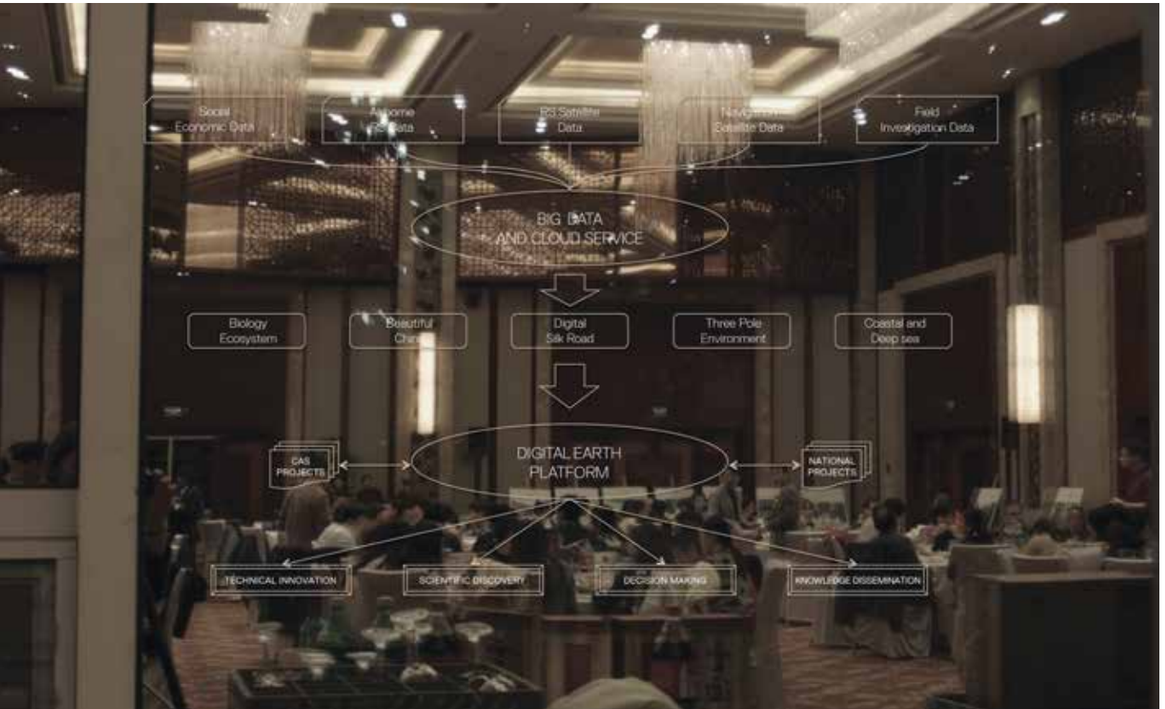
Francois Knoetze. *Core-Dump "E-Revenant"*. 2018.

The Future Forecast

GEOCINEMA (ASIA BAZDYRIEVA AND SOLVEIG QU SUESS)

The 3rd Digital Belt and Road conference was held in Tengchong, southern China, in early December, 2018. Initiated by the Chinese Academy of Science, it was a space to share expertise, technologies, and best data practices between representatives from across the world, demonstrating the significance of Earth observation for sustainable development. The Digital Belt and Road was framed as more than just a science and technology conference, but as a way to understand the world. Under the mandate to study past climates towards future protection, its networks were claimed to form an umbrella to support the ever-more fluid international exchange of data and information.[1]

Similar to the Belt and Road Initiative, the geographies of its digital counterpart remain not clearly defined yet ever expanding. Having 27 satellite missions, super computers in Jinan and Wuxi, and four satellite ground stations within China's borders, the initiative had already launched eight representative centers outside and across four continents before the end of 2018; first in Bangkok, then Helsinki, Potenza, El Jadida, Peshawar, Moscow, New York, and Lusaka, with many more to come. Made of an ensemble of coordinates, the project relies on creating networks between nation-states with more than sixty regional partnerships and transnational agencies such as the United Nations. Less explicit is how these locations coincide with particular infrastructural partnerships, where along with "capacity building" for scientific exchange, heavy projects laying down fiber-optic cables have been enabled across regions in Eurasia, Africa, and the Arctic.[2] This includes the Lusaka economic zone, a China Smart Tech City in Morocco, with similar contracts in Thailand, Pakistan, and a 10,500 km fiber-optic link across the polar seabed through Russia into Finland.[3]



Geocinema. Framework of the Digital Belt and Road Big Earth Data project, 2020.

Attending the conference inside the luxurious Grand Empark Hotel as spectators, we shared an impromptu meal with Alexandre Caldas, a representative from the UN Environment Program. With a team of dancers brushing around in the background entertaining guests, switching between ethnic costumes and dancing motifs while maintaining food and drinks in a generous equilibrium, Caldas spoke of the general consensus that the promize of a stable legal order established by the united international cooperation of nations following the two World Wars had been in stagnation for a while now. As we finish eating, he sketched out a series of simple graphs in a conference notebook, narrating for us scenes of possible futures. "We have now entered," he told us, "the unstable transitional period that might take two to three decades before the new geopolitical order is established." The parallel crizes of Western democracy and ongoing global ecological turmoil convinced him that this new order is not only inevitable, but already underway through initiatives such as the Belt and Road.

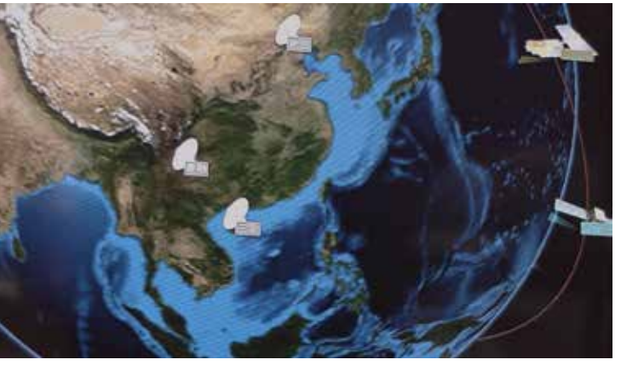
Geocinema. 3rd Digital Belt and Road conference, Tengchong, Yunan Province, China. *Making of Earths*, 2021.

These were sentiments clearly not limited to the UN representative, but shared by an array of actors such as scientists, researchers, and representatives of the European commission who were present for the two-day conference to seek new forms of cooperation. At the conference's ceremonies and speeches, the international community in attendance cheered to the shared enthusiasm of technological promizes to battle climate change with Big Data. Potential partners lined up to pitch their agendas with attempts to join this ever-expanding network. The initiative aims to eventually be instrumental in managing disasters and other risks, where markets, populations, and climates can be algorithmically calculable and mappable as the nearest future forecast.

Geocinema. Miyun Satellite Ground Station, Beijing, China. *Making of Earths*, 2021.

Caldas left us at the table on the note that these processes of redistributing global powers will not be "visible," so to say. Current attempts to expand spheres of sociopolitical and economic influence no longer demand invasions through military force. Instead, these processes operate through the seemingly invisible and not-necessarily territorial. Many of the projects proposed over the duration of the conference included ways to accrue sets of data from "developing countries"—nation-states which did not have the capacity for their own satellite ground stations or supercomputers. Bangladesh and Myanmar were promized on-demand satellite images of their own territories through an online gateway. Funding provided by the Chinese state was to allow the UN Environment Program to implement air and water monitoring systems in Nairobi, Cape Town, in Addis Ababa. Yet, contrary to our dinner conversation, these "invisible" processes visualize themselves differently on various temporal and spatial scales.

The project of the Digital Belt and Road (DBAR) was born out of the Chinese Science Academy, with its operations based in the newly-built campus of the Institute of Remote Sensing and Digital Earth in Beijing. A massive cinema theater that resembles the globe lies at its center, pivoting separate departments and buildings around it. While on a visit to its campus



Running remote sensing infrastructures, the Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing, China. *Making of Earths*, Geocinema, 2021.

a few months prior to the conference, we entered the cinema globe to find it empty and idle, projectors humming steadily in anticipation of the film that was about to be shown. Wearing 3D glasses, we were immersed in a short film that was led by a bombastic American narrator who outlined humanity's main challenges with climate change and posited DBAR as solution to these problems.

The technocratic imagination of the film projected inside of the cinema-globe folded in a series of political environmental rhetorics which emerged alongside China's integration into global information capitalism. In 1996, Chinese economist, speechwriter, and economic advisor of Prime Minister Deng Xiaoping, Yu Guangyuan wrote a seminal text entitled "The Smallness of the Earth and the Largeness of the Earth," in which he proposed the "grand exploitation of the earth along with its grand protection."[4] The "smallness" of the earth in Yu's argument alluded to

popular environmental concerns of its time, according to which the earth was to be protected, for the survival of humankind depended on it. As for the "largeness of the earth," Yu pointed out the many resources on the earth that have not yet been exploited, and that the success of that exploitation "depends on our calculation and speculation on its profitability."

Over the decades of Deng Xiaoping's planned economy and market reforms, Yu developed this environmental rhetoric, binding production and ecology together by framing environmental protection as a form of *productive labor*. Fresh air and clean water have, in this sense, become *products* of labor, where quantitatively calculating the positive and negative effects of industry can inform future decisions in making better use of labor in damaged environments.[5] Within this line of thinking, high levels of pollution can, for example, dictate the expulsion of heavy industries out of a city's periphery, and millions of laborers can be sent to plant forests battling growing deserts. What such labor brings can be calculated to benefit the economy, whereby fixing these damages and industrial after-

Images of a "Digital Earth" used by students, presented by U.S. Vice President Al Gore during the First National Innovation Summit at MIT, 1998. A new speculative tool for the management of Earth-observation data, he proposed the "Digital Earth—a multi-resolution, three-dimensional virtual representation of the planet, into which vast quantities of geo-referenced data can be embedded." The name of the Institute of Remote Sensing and Digital Earth in Beijing, was inspired by Al Gore's speech; Al Gore himself consults the Chinese Academy of Science today.

A volcano crater in Tengchong, Yunan Province, China, 2018. The area was chosen as a test zone when remote imagery was put to use in the 1970s. It was the first time Chinese scientists operationalized cosmic data from U.S. Landsat satellites. 15,000 samples of rocks, soil, vegetation and water taken from its mountainous landscapes were folded into a database of information which included their unique spectral signatures, as seen from above. These standardized object-sets became key for satellites to accurately see into the Earth's crust across Chinese territories. Geocinema 2020.

effects can further stimulate the movement of capital and labor. Yu's vision had presented the earth as a holistic image while being an object of scientific construction. It was a logic of governance claiming that, if accurately calculated, the entirety of the planet can be exploited, and its negative effects reverse-engineered through further labor.

After we watched the film, we met with Professor Li who was head of DBAR's Big Data working group. He introduced their methodology, which we quickly learned was developed in consultation with former US vice president, Al Gore. The name of the Institute was directly inspired by Gore's 1998 speech in which he made a claim for a ""Digital Earth": a multi-resolution, three-dimensional virtual representation of the planet into which vast quantities of geo-referenced data can be embedded."[6] Li continued describing to us how many contemporary problems surrounding the climate crisis can be summed up as being issues of communication: communication of scientific knowledge around how the earth is changing; between "facts" and our understanding; and structurally, the communication between technical providers and decision makers, with the growing need for bureaucratic departments being able to communicate with each other. "Digital Earth is another way to understand the world. Everything can be changed into data, to simulate precisely and to try and understand what the problems are that our society faces."[7]

Throughout Li's explication of the Digital Belt and Road, close alignment with the United Nations and collaborating to meet the UN's sustainable development goals (SDGs), which seeks to address problems exceeding national borders such as air pollution and water security and quality, was emphasized.[8] Figurations of Yu's concepts of "smallness" and "largeness" were present throughout our conversations with professor Li, now paired harmoniously with the United Nations' measurable, calculable, and "sustainable development." Taking science as a lead, both ideas encourage continuously proposing technologically

Satellite image of the rare-earth mining site, Baiyun'ebo, Gansu Province, China, 2019.

innovative yet market-conforming solutions, further depoliticizing the ecological crisis.[9] This techno-political hybrid has taken shape with the trusted guidance of technocrats and scientists, reinforcing what T.J. Demos refers to as the "techno-utopian position that 'we' have indeed mastered nature, just as we have mastered its imaging—and in fact the two, the dual colonization of nature *and* representation, appear inextricably intertwined."[10]

The Laboratory

Forty-nine years prior to the 3rd Digital Belt and Road Conference, remote imagery was first put to use in Tengchong. It was the first time Chinese scientists operationalized cosmic data from US Landsat satellites. The area was amongst a few chosen by the Chinese Communist Party to be test zones, tasked with developing a set of ground truths and collating a spectrum of objects that can be used for further quantitative and qualitative research. As part of the

airborne remote-sensing experiment, 15,000 rock, soil, vegetation, and water samples were taken from Tengchong's mountainous landscapes and folded into a database that included their unique spectral signatures, as seen from above.[11] These standardized object-sets became key for satellites to accurately see into the earth's crust across Chinese territories, and were developed in parallel to China's own remote-sensing system. New forms of optical media such as 9-band sensors or RMK-A aerial cameras allowed for data to be scanned and translated into infrared photography, making visible not only the spectral signatures of minerals, petroleum, and coal resources, but also of pollution from urban and oceanic topographies.

It was also during these years, within the laboratories of the Chinese Science Academy, that married chemists Gao Xiaoxia and Xu Guangxian distilled a

RMK-A aerial survey system manual, 1994. New forms of optical media such as 9-band sensors or RMK-A aerial cameras allowed for data to be scanned and translated into infrared photography, making visible not only the spectral signatures of minerals, petroleum, and coal resources, but also of pollution from urban and oceanic topographies.

Workers and scientists in state-owned factories and labs producing locally designed integrated circuits and industrial, personal computers. Portrayed in Science Pictorial journals 1978 - 80. Courtesy of Zhihui Zhang 张植蕙.

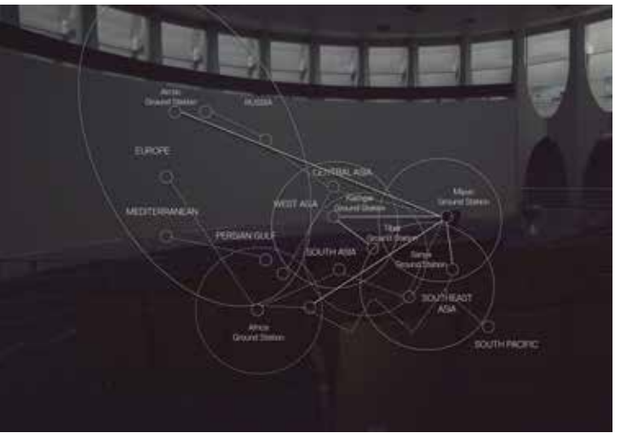
process of separating ten components of rare earth elements. Gao Xiaoxia developed the instruments, tools, and methods to analyze trace amounts of chemical substances, while Xu Guangxian developed the theory of countercurrent extraction. What had crystallized in their moment of synthesis was a way to dramatically reduce the time and costs needed to extract rare earth minerals, catalyzing China into an industrial revolution.

In the late 1970s, the then-new Prime Minister Deng Xiaoping rerouted scientific and technological ambitions away from defense and towards the economy with the ambition of integrating China into the global market. Within this context, Xu Guangxian, who had previously worked in the state's nuclear program, applied his research into the extraction of uranium isotopes towards the newer interest in rare earths. During the 1980s, Deng Xiaoping launched program 863, which took biotechnology, aerospace, aviation, electronics, automation, and energy as its focus, seeking to detach China from its dependence on foreign technologies. Each of its departments demanded a high concentration of all seventeen kinds of rare earth minerals. The aerospace technology department, for example, embedded rare earth minerals in satellite sensors and coordination systems.

It is no coincidence that within the Gansu Province of Inner Mongolia, where cities like Baotou or Baiyun'ebo are amongst the largest dedicated to rare earth mining, sits the Jiuquan test zone, where missile and satellite launches are conducted over 300 days each year. Evident of Jussi Parikka's observation that there's a double bind "between knowing about the earth and the earth allowing that knowing to happen,"[12] agendas of designing networks of sensors seeing into the earth's crust was twinned by an outward extraterrestrial exploration looking back into itself. Where to extract, one needs to go up into space, and in order to go up, one must go down to build more satellite apparatuses out from extraction. Sean Cubitt refers to "geomedia" as

an assemblage of earth-mediating operations that place time and value on a relational axis.[13] Geomedia not only draws representations of moving lands and atmospheres, but predisposes certain ways of environments to form, and others to dissipate. Here, rare earth elements shift from solid mineral into liquid, digital circuits. Satellite images of territories feedback into their own transformation, with its cyclical loop perpetuated from the laborers who mine the minerals to the machines which transmit its reflective signatures.

The visualizing of land and air coincides with broader geopolitical events, where together they can be seen as redrawing much of the world's organizational logics. By the early 1990s, with the immense production and export of China's minerals, the price of rare earths on the global market had dropped to nearly one-quarter. Japan, France, and other nation states who previously held monopolies on the market were forced to implement production cuts, some even falling into bankruptcy.[14] With europium (铕) emitting intense beams of red light from TV screens, yttrium (钇) being used in camera lenses, and mobile phones containing neodymium (钕), contemporary geopolitics are still defined by rare earth elements.



Geocinema. Network coverage map of remote sensing receiving stations along the Belt and Road Initiative in Asia, Africa, and Europe, 2020.

Yet, following Jennifer Gabrys, "sensor-based technologies are not only environmentally located; they also inform and "program" environments, have environmental impacts, and take hold in particular environments, whether for managing or monitoring processes."[15] The Digital Belt and Road is no exception, acting as enablers of grand infrastructural projects, through and from within geomedia, with "data-poor" countries as prime frontiers.

Measuring Progress

The UN Environment and Development Programs have partnered with DBAR to provide high-frequency satellite data supporting disaster risk reduction in zones such as the Pacific, along with funding projects related to issues of air and water quality degradation in Africa. With the UN benefiting from Chinese state funding, the implementation of projects in Nairobi, Cape Town, and Addis Ababa include installing water and air sampling instruments, standardizing data acquisition and interpretation methods, and dispatching trained personnel to teach, read, and record them. Digital records taken in rapidly growing cities in Africa are sought by the Chinese state with the intent to use their datasets to inform better planning of cities which have grown just as explosively inside China. Failure to evaluate the environmental impacts of large-scale infrastructure projects like Eastern Economic Corridor in Thailand has also nudged local governments to seek further cooperation with DBAR.[16]

Despite dominant rhetorics, prior to being used within scientific research, the datasets accrued from DBAR's distributed sensing technologies are first instrumentalized by the private sector.[17] Clients here range from insurance companies to real estate developers, and those constructing projects such as ports, railways, or economic corridors. With the underlying claim that further ecological certainty will be possible from the harvest and interpretation of datasets from atmospheric particles, "big data" becomes a mode of sociopolitical and economic ordering. These migrating modes of governance are trained along "mining of implicit and non-obvious patterns, rules, and knowledge behind big data" made possible with financial promizes and more practically through to standardization of scientific protocols.[18] Numbers here hold more value the longer the duration of "controlled" figures have been accumulated, with the trustworthiness of nation-states granted through the reliability of datasets. Translating these datasets into possibility curves, statistical future projections, and graduated maps, environmental risks are spoken into the vocabulary of GDP, political negotiations, and urban management.

With Earth Observation data annexed to capital, techniques of measurement are inseparable from infrastructures of governance, where interpretations of how the earth is changing are feeding back into political modeling across the Belt and Road. The current DBAR project pushes forth the functioning of "a digital nervous system of the globe, actively informing about events happening on (or close to) the Earth's surface by connecting to sensor networks and situation-aware systems," with "interoperable models and types of management and governance" to come.[19] Dealing with massive amounts of Earth observation data, which requires constant maintenance of transferring, storing, processing and sharing geospatial data, being stressed throughout DBAR's conferences and activities was developing and educating both a theory and method for interpreting Big Earth Data. It is here where power to make value and power over knowledge collude on unprecedented scales.[20] With "data-poor" countries framed as new markets ripe with untapped data resources, development potential is seen not only through financial instruments but also by way of computational infrastructures, where the ownership of and control over hardware and software grants disproportionate governability.

Fellow meteorologist, Zikawei observatory, Shanghai. Emerging out of the Jesuit legacies, the Zikawei Observatory established itself as a premier observatory in the Far East as early as the 19th century. A storm warning system was devised in the late 1800s to be used widely in the region through a newly installed telegraphic link with the observatory. Some would say this was the first large-scale prediction system, aimed to signal from vessel to vessel to emit warnings of incoming storms.

Epilogue

A digital earth is a spectacular thought. Its distributed networks are less holistic than the imaginations conjured through rhetoric. The earth's nervous system is not a totality, but rather one articulation speaking through a distinctly technological, ideological, and geopolitical vantage. The figuration of earth as a measurable and a calculable entity allows for a form of techno-scientific governance to take hold, inspired by the balancing act of extraction and ecological repair alongside a universal scale of quantifiable progress. As a single image, this form of "knowing" the earth is ungraspable.

The optics of this vastly distributed and largely dumb apparatus brings forth a predominantly algorithmic language in observing land, simultaneously reading the earth's surface as potent with futures while programming them towards pre-defined ends. Through the metronome of global markets, what becomes embedded in this apparatus is a form of governance which exceeds the boundaries of nation-states. Geometries of power over the future are being created in the present as datasets are accrued from geological formations, natural disasters, social media behaviors, and citizen biometrics alike. Its physical and virtual operations form only part of the larger socio-technical assemblage that is deeply intertwined with international financial instruments, investment schemes, and the construction of future cities. Moments of social and aesthetic instability point towards the closing down and opening up of politics; marking possible entry-points for redrawing relations.

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February, 2020

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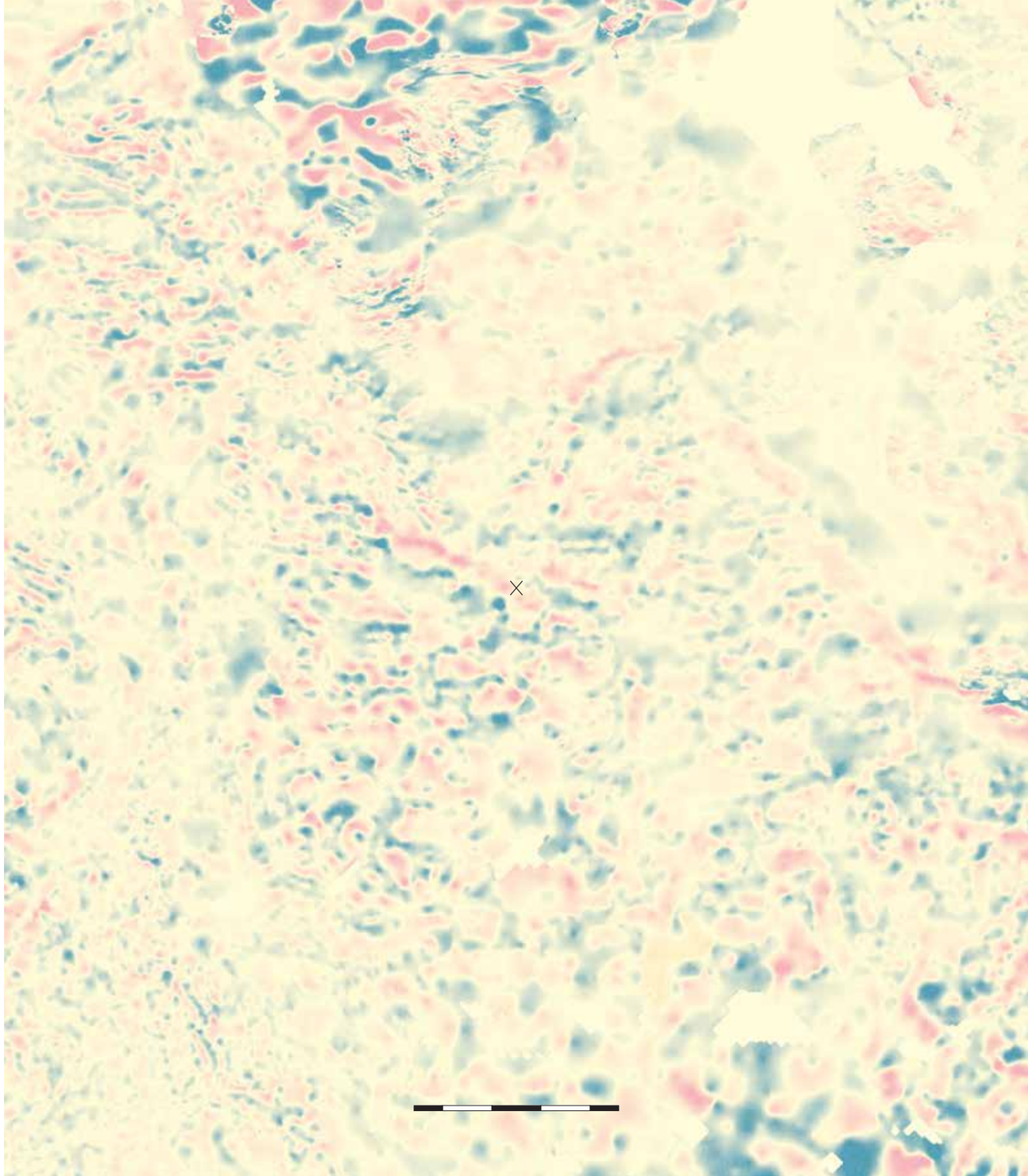

Why We Should Remember the Soviet Information Age

KSENIA TATARCHENKO

The work of memory is demanding. This is particularly true when looking back at the computer-related technological aspirations of the Soviet Union, the geopolitical juggernaut that disappeared three decades ago. Unlike the famous successes, such as the atomic and space programs, Soviet computing evokes a double failure: scarce hardware and a limited network infrastructure. Moreover, motivation alone is insufficient to fully appreciate the history of Soviet computing beyond enumerating technological developments. Our very notions about what could be understood as a computer, what the main challenges were in the communication between man and machine, and what the hopes and fears of Soviet people were, are too often misleading. Remembering the Soviet version of the information age requires a synergy between motivation and a leap of the imagination. But the work of memory is also rewarding. At stake is restoring not simply a national history—one among many others—but also a counter-narrative to the alleged digital triumphs of capitalism.

The first step in remembering the Soviet information age is to suspend the received notions on the inevitable implosion of socialism as a breakdown of the planned economy. The reason is simple—no one expected the events of 1991 to take place; on the contrary, automation and digital transformation were perceived as the main items on the future-oriented agenda of the late Soviet Union. The second step is to break the association with technical backwardness, or the computer gap, and to acknowledge the role of software. But the last step is the least intuitive: embracing the multiplicity of experiences and contradictions encompassed in the aspirations to digital socialism. The authoritarian party-state that, in the late 1970s, proclaimed to have achieved the "developed socialism" or "real existing socialism"—distinguishing it from the capitalist world—did not operate in a uniform continuum but allowed for and, sometimes non-voluntarily produced, conditions for multiplying modes of the Soviet ways of digital existence. The notion of the socialist political subject, the entangled geography of technological modernity, and the alternative materiality of digitalization form three analytical axes that enable the reinterpretation of the history of Soviet computing.

However, imagination knows no end—it stocks up on details. The case under scrutiny here—highlighting the goals of personal transformation that would not be subservient to an individual possession of devices—is that of the Soviet computer literacy campaign of the 1980s. Initiated in the late 1970s, it came into public existence with the Central Committee's resolution appearing in *Pravda* on March 29 1985.[1] Although relatively brief, ending in 1991, the campaign encapsulated the aspirations, singularities, and contradictions of the Soviet information age.

For some, the computer literacy campaign became synonymous with the absurdity of the Soviet system: because the state was slow to supply educational computers to schools when the reform was introduced on September 1 1985, jokes were made domestically about the futility of learning to ride a bike without the bicycle or learning to swim without water. One influential

American observer pointed out that the campaign's very notion of computer literacy as rooted in algorithmic reasoning and programming skills was misplaced and the Soviets would be better off learning from the more technologically advanced West:

> Through the experiments gained from thousands of different ad hoc programs of introducing personal computers into schools over the last ten years…we now know that computer literacy is not-knowing how to program. It is not-understanding how a computer works. It is not-knowing about bits and bytes and flip-flops and gates. We know that true computer literacy means having the skills to use advanced application programs such as word processing and spreadsheet systems.[2]

Back in the 1980s, such criticisms held a lot of sway. Indeed, the application-based usage of the computer prevailed. Yet, today, "we now know" these optimistic words describing the interface-based information society seem ironic at best.

Unlike the critics of the 1980s, we have observed several generations of digital natives grow into algorithmically naive users: consumers turned products. If anything, when compared to the intellectual agenda of the movement for computational thinking gaining traction in elite Western institutions of learning since the 2000s, the Soviet emphasis on the mind and not on the device seems visionary, not backward. "First humans compute. Second, people can learn computational thinking without a machine", affirmed one of the movement's leaders, Jeannette Wing.[3] Yet, both interpretations of the Soviet computer literacy reform—either as a symbol of technological backwardness or as the unrecognized prophecy—are more limiting than fruitful. As one astute observer of the reforms noted at the time of their implementation, their most salient feature was an inclusive debate about digital technology and Soviet generations. In this sense, the key benefit of remembering the meaning of the Soviet computer literacy campaign is not in drawing direct lessons on how to solve the problems of digital capitalism. We can, however, appreciate the demonstration that today's technopolitical outcomes are not determined by any inherent characteristics of digital technology; we can gauge the information age we want for our children via a scenario featuring a different form of society—neither backward nor visionary—in times of transformation.

"First humans compute. Second, people can learn computational thinking without a machine."

To understand the computer literacy campaign as a site of debate is to listen to the voices of its participants. In fact, the compulsory new subject, "The basics of informatics and computational technology", introduced into Soviet schools in the fall of 1985, was not met with widespread enthusiasm. By the end of the school year, a group of ninth-grade students from the middle school No. 11 in Khabarovsk, a major city in the Russian Far East, was desperate enough to pen a letter of complaint to the academician Andrei Ershov, the initiator and the public face of the reform. Concerns with the lack of access to the computers themselves was a typical feature of the mass of correspondence received by Ershov's team dealing with educational informatics and localized at the Novosibirsk Scientific Center. Most such letters were special requests used to game the Soviet system of centralized allocation of resources. The letter from the Khabarovsk students is different, as their concern with the absence of the computer transformed into a bold critique of the content of the course. But even more ambitiously, the letter challenged the core value of the computer literacy program, its universalism. The schoolchildren suggested that there should be specialized classes for those who have a professional interest, instead of wasting everybody's time by making it required across the board.[4]

However, the compulsory character of the course was not simply a feature of a centralized educational system. Part and parcel of the transformative aspirations of the reform was not professionalization but the loftier goal of bringing up a novel type of socialist citizen. The metaphor of "programming—the second

literacy" was at the core of the universalizing goals underlying "the basics of informatics." Ershov coined it as a title of his 1981 keynote address at the 3rd World Conference on Computer Education held in Lausanne, Switzerland. Although delivered in an international setting reflecting Ershov's status as an active and respected member of the transnational community of computer scientists, the agenda of the talk relied on a creative adaptation of Marxist notions and communist vocabulary. While the reference to the early Soviet literacy campaign is an obvious source of inspiration for the metaphor, the connections to Soviet ideology are deeper. In particular, the moral dimension of his broad description of the second literacy, as "not only the ability to write computer instructions, but also a way to bring up a man who is resolute and prudent at the same time" was dependent on a criticism of the bourgeois self, disengaged from social action to an isolation of abstract thinking.[5] Ershov's vision of the universality of programming was grounded in a naturalizing ontology of information postulating the computer as a self-actualization device, amplifying humankind's innate capacity to goal-oriented action. This idea of universal programming literacy was conceived not in a narrow reading as a skill that would subvert professional know-how, but, on the contrary, as the highest professional aspiration to defuse the role of mediation between human and machine. According to this perspective, the ultimate expression of the power to actively engage in the world by transforming abstractions into actions was not localized in the device. This power resided rather in the human mind and its capacity to bring machines to life.

The dialog between the Khabarovsk youths and the academician highlights how these ideals translated into particular arrangements across vast Soviet spaces. Despite his elevated status and tremendous workload, the academician found time to write back. His personable letter is anything but condescending: it identifies the problem and indicates sources of support. Ershov emphasizes that it is wrong to ascribe the students' difficulties to the absence of the machine. "The teacher may have pity on you", writes Ershov in a flight of poetical animism, "but the machine has no pity, it will remain an unresponsive piece of metal. Without the algorithm, without a plan, there is no point in sitting in front of the computer."[6] Adopting the problem-solving attitude advized by Ershov entailed concerted actions. The resources indicated in his letter illustrate how Soviet centralization came hand in hand with bottom-up action. Collectivism was one key mechanism. As the students in question wrote collectively, Ershov also responds to an interlocutor that is not an individual but a collective. This collective is in fact the first resource that Ershov draws attention to. As there must be at least several highly achieving students among them, implied by the letter, the solution he proposes is for them to learn together. Komsomol obligation is a format for institutionalizing such mutual help and obtaining infrastructural resources at school. On the other hand, Ershov also encourages them to look for computer time elsewhere. No less essential than collectivism were the Soviet patronage networks. Ershov points to industrial and scientific computer centers of a large city such as Khabarovsk and that the local administration of the party-state is mandated to help. In practice, many urban settlements were operated as company towns and industrial enterprizes patronized local learning establishments.

The geographic entanglement transpiring in this epistolary exchange, connecting what might appear to be two remote points—Novosibirsk and Khabarovsk—with the Moscow-mandated campaign extends beyond the tensions of centrifugal and centripetal dynamics. The letter also reveals the infrastructural divide between urban and non-urban and the interdependencies between digital and environmental dimensions as characteristic of both the socialist and capitalist versions of modernities. To stress the possibilities open to urban youths, Ershov evokes the difficulties and creative solutions found by enthusiastic students and teachers in the remote Northern settlements. In fact, in the late Soviet context, both the remote North and the Far East became the bearers of futuristic potentiality. More prosaically, they were sources of hard currency exports. Ershov's idealistic depiction of the Northern regions as a frontier of computer literacy was not a fiction. Retracing the reference in his correspondence reveals the campaign's dependency on industrialization associated

with the extraction of natural resources: while waiting for the state to supply the specialized classrooms it had promized, schoolchildren in the Tumen region were gifted with the programmable calculator popular in the Soviet oil and gas industry.[7] The significance of this particular instance is beyond anecdotal. If the ideal of algorithmic thinking underlying the computer literacy reform was nurtured within the transnational community of computer scientists, its material realization was coupled with the global carbon economy. The delays in the Soviet government's capacity to supply the hardware considered necessary to raize the new generation of Soviet citizens were due to the 1986 oil price collapse.

By the late 1980s, the Soviet-produced machines finally reached classrooms, but by that time the party-state itself faced a major crisis and its last attempts at social engineering, such as the computer literacy campaign, were discredited. Ershov succumbed to cancer at the end of 1988, and the campaign lost its most authoritative expert and tireless promoter. On the level of the general public, the abstract goal of algorithmic thinking lost its luster in the face of the alluring new micros and PCs imported from the West, even if few could afford them.

The unexpected twist to this rise-and-fall storyline is that, in a sense, both Ershov and his young critics turned out to be right. The reform did not succeed in inculcating a universal algorithmic mindedness. But the broader ecology of state support for the computer literacy campaign nurtured the generation of future entrepreneurs of the post-Soviet digital infrastructure and commerce. Along with his letter, Ershov sent a couple of issues of the popular journal *Kvant* with his own and his colleague's publications on programming. These were but a drop in the ocean of popular scientific and technical literature on the subject. Moreover, the journals that published materials combining education with entertainment were devoured hot off the press by the community of avid gamers. The games in question were not necessarily computer games, however. Another digital device with a very limited display capacity, the programmable calculator, led to a creative fusion of textual and digital imaginaries. Unlike the Soviet-made micros, such calculators were produced by the millions and sold at affordable prices. Diffused across the country far beyond their intended consumer base of scientists and engineers, these calculators gave rize to a youth subculture of calculator gamers and hackers, as most non-scientific activities involved exploring the limits of hardware and producers' specifications. The late Soviet digital age was thus not only an aspiration of the Soviet experts to disseminate their professional ideals in a top-down manner, but was also a bottom-up movement connecting multiple communities and distant locations. Although the system supporting the infrastructures for these communities disappeared in the years following 1991, the strengths of the Russian IT sector were the strengths of its manpower as employed in the face of digital scarcity, and its playfulness with both software and hardware limitations. These human-centerd repercussions of the reform reached across political ruptures and borders: facing economic hardships, the generation that matured in the 1990s often saw their versatile skills as an opportunity for emigration.

With capitalism remaining as the only option for the global political economy, the source of our motivation to recover these forgotten modes of the digital and the algorithmic is conflicted. It comes from a sense of bewilderment split between the complacency generated by the convenience of digital technologies and a

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growing anxiety as we learn of its price, namely that our data constantly feeds the surveillance machinery of Big Tech. Even as epithets of "digital" and "smart" become associated with a planet-wide promize of sustainability, social divides are already amplified by the interdependency of the online and offline words. The Covid-19 pandemic, propelling digital infrastructures to centerstage, has exposed the digital divide as a calculable factor of risk. A critical challenge to capitalism, the disappeared socialist past does not harbor solutions to our problems. Nevertheless, the socialist humanistic aspirations to equality, self-realization, and solidarity alone offer a reason to persist in envisioning the unfamiliar world of the Soviet Information Age. Remembering is a reminder that an alternative history bears the potential of alternative designs.

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The essay is based on the following publications by the author: "Right to be Wrong: Gaming, Science Fiction, and Cybernetic Imaginary." *Kon-tiki: A Path to the Earth* (1985-1986), *Kritika* 20.4 (2019): 755-81; "Thinking Algorithmically: From Cold War Computer Science to the Socialist Information Culture." *Historical Studies in the Natural Sciences* 49.2 (2019): 194-225; "'The Man with a Micro-calculator': Digital Modernity and Late Soviet Computing Practices." *Exploring Early Digital: Communities and Practices*. Ed. Thomas Haigh. Cham: Springer, 2019: 179-200; "Before the Collapse: The Soviet Programming Cultures," in *From Russia with Code: Russian Computer Scientists Abroad*. Ed. Mario Biagioli and Vincent Lepinay. Durham: Duke University Press, 2019: 39-58; "'The Computer Does Not Believe in Tears:' Programming, Professionalization and Gendering of Authority." *Kritika* 18.4 (2017): 709-739.

1 *Pravda*, 29 March 1985.
2 Ershov Archive: Ed Fredkin. "Computation and Social Systems." 1985. Web. http://ershov.iis.nsk.su/node/792511
3 Jeanette M. Wing. "Computational Thinking's Influence on Research and Education for All." *Italian Journal of Educational Technology* 25.2 (2017): 7-14; also see: Jeanette M. Wing, 'Computational Thinking." *CACM* 49.3 (2006): 33-35.
4 Ershov Archive: http://ershov-arc.iis.nsk.su/archive/eaindex.asp?pplid=3269&did=8699
5 Ershov Archive: http://ershov.iis.nsk.su/ru/second_literacy/article
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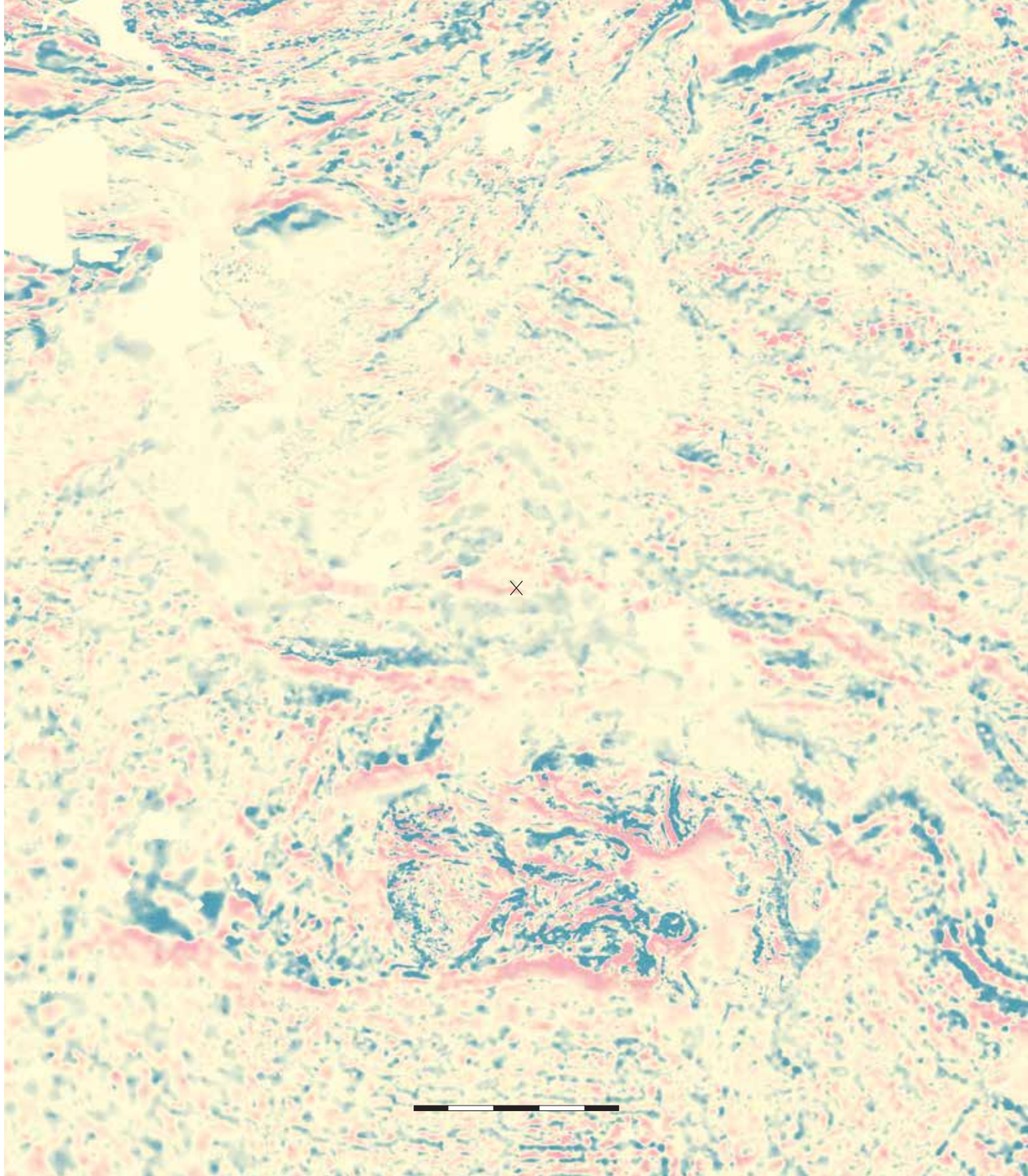

The Stack at the Edge of Planetarity:

Convergence, Divergence and War

BENJAMIN H. BRATTON

I am grateful that my book, *The Stack* (2015), would help to inspire *Vertical Atlas*. As I recall, some of the initial conversations about the project began after I presented an early version of the "Hemispherical Stacks" essay (included here) at Haus der Kulturen der Welt in Berlin in 2017 (and then at a conference series hosted by Het Nieuwe Instituut in Rotterdam in 2018). Since then, the project has grown and departed creatively and decisively from those conversations.

The editors' introduction places *The Stack* thesis adjacent to the cosmotechnics thesis from my friend, Yuk Hui, and suggests that the book might superimpose each upon the landscapes of planetary computation. It is a provocative idea, and I feel compelled to offer my own perspective on the relation between the two ideas and how each might illuminate aspects of the other.

On a panel we shared at Centre Pompidou in Paris in 2017, Yuk asked me a direct question about implications of the Stack thesis in relation to cosmotechnics, specifically, how it would be possible to reform planetary scale computation away from what he called a "rationalist monoculture" and toward greater "cultural divergence." My reply was to say that I didn't believe the present monoculture to be rational at all, but in fact deeply superstitious. Unfortunately, our discussion didn't move too far beyond this point to get to the core of his important question. This short piece may provide a fuller answer.

Specific to this book, one must ask what a "Stack" is and is not, as well as what an "atlas" might be that describes, predicts or proposes territories in its image. Toward that, my remarks are not directed against cosmotechnics, but toward a consideration of what is at stake beyond superficial invocations of the term.

From the Multipolarity of Stacks to the Militarization of Multipolarity

At this very moment in 2022, the answers are shifting quickly. The terms are clarified, even against their will. As I write this, Russia has invaded Ukraine. The boundary between civilian and military uses of stacks is blurred, as are mobilizations of "culture" as a rationale for truth. For planetary computation, I fear that the cyberwar Cassandras may be right. The facts on the ground make some relations between the Stack and cosmotechnics theses more compatible and others yet more irresolvable than they may have been otherwise.

First, what is the planetarity of "planetary-scale computation" as named in the book? Foremost, it is the recognition that computation is not simply an abstract mathematical process, or a property of particular appliances, but is an infrastructural dynamic with geological, geochemical, and geopolitical implications. It is not to be confused with the super-visible dominance of social media. It refers as much to computational climate science as it does to Cambridge Analytica. As I have argued elsewhere, the incessant *individuation* of planetary computation, and the operative presumption that its primary purpose is to model the behavior of individual persons, is a fundamental pathology that cannot be remedied by intensifying atomization, even in the name of privacy and personal data. Planetary computation is not synonymous with "Silicon Valley," neither the real place with real workers nor the metonymic dystopia conjured by European critique. Its future will be drawn in the China-Africa nexus as much if not more than in the San Francisco-Berlin symbiosis.

These days, I find myself explaining the Stack thesis to mainstream forums much more than when the book came out in the last week of 2015. Somehow, the premise which was then "speculative" is now

common sense, but that does not have only positive valences. The continent of Europe, and "eternal Carthage" more broadly, now weighs a military confrontation with Russia that it does not want and did not ask for.[1] We witness an atavistic return of old-school revanchist geopolitics of Land, Place and Soil, complete with mytho-nationalist appeals to the primacy of lost empires and original maps. The cyber warfare phases are sure to follow and may be even more protracted. The compatibility between the Traditional and the Technological might seem paradoxical, but it shouldn't.[2]

A recent article in *The Economist* that references *The Stack* extensively in its presentation of Russia's attempts to build its own version of "sovereign internet" (a phrase with slippery connotations) and even refers to it as the "Russian Stack." I winced when I read it, not just because of the bitter timing of its publication, but also because of how it presented this reality as something new and peculiar. It is neither. The article also conflates the questions of national/regional self-reliance in hardware sourcing with that of a regionally tuned information culture (the latter being the primary interest of cosmotechnics). In fact, the physical machine and the phenomenology of machines can be mutually deterministic or mutually independent in complex ratios.

A couple of weeks before the troops entered Ukraine from the East, and dubious footage filled Russian television screens, Biden's intelligence briefings foretold some of what was to happen. This included the preemptive debunking of not yet existing false flag operations. What is the proper name for the geopolitics predicated on preemptively signaling that a hypothetical faked video about a future fake attack, which is meant to provide legitimacy for counter attack, is not a real video or about a real attack? Who is the audience for his claim? Are the tanks retreating or advancing? Are they even there? Schrödinger's tanks! Many discussions about AI in the military seem to miss the point that with mutually assured territorial transparency, direct invisibility is impossible, and so the only strategy that works is decoy, decoy, decoy. The conclusion that demands all attention today is that, alas, the gap between military theory and philosophy

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of technology feels smaller than it was when *Vertical Atlas* started. That gap may have been mostly illusory to begin with.[3]

Today it feels impossible to ask the question concerning the *planetarity* of planetary computation other than through the lens of these conflicts, but equally impossible to describe with full confidence what is seen as it all changes shape so quickly. Will there be a Julius Caesar-style palace coup? What is the German word for shutting down a perfectly good nuclear program so that you are dependent on a hostile foreign adversary for your energy? When an actor who plays the president on Netflix is then elected president and so may die for the symbolic value of the position he now holds is this what "living in a simulation" really means? (Note: at the time of writing, Ukrainian President Volodymyr Zelensky is still alive.)

The Stack was/is a book about planetary computation as geopolitics, or actually *geopolitics as planetary computation*. So besides direct military conflict, what geopolitical storms loom? The post-cold war period was all about new countries in Europe, and the dissolving of some hemispherical blocs (the USSR) and the fortification of others (the EU). The 2010's were marked by post-post-Cold War secessionism (Brexit offline and political filter bubbles online). One wonders then if the 2020's will be filled by geopolitical mergermania: big powers absorbing smaller ones until there are only 11 zones on the map? Or, perhaps, fissiparousness and its opposites will play out simultaneously: various crack-

ups and consolidations all at once?

This dynamic between *convergence* and *divergence* more generally is my point of comparison between The Stack and cosmotechnics. I ask what the conditions of plurality and heterogeneity are for the latter, how a reliance on cultural determinism can obscure non-cultural forces of convergence (technical and otherwise), and whether divergence as an engine of plurality is over-prioritized as means and ends.

Duginism as Divergence

Beyond any author's intentions, the implications of cultural determinism and cultural reification are at best double-edged. For me, these terms are accusations not accomplishments; for others, less so. The passage between geopolitical theory of divergence and Putinism runs through the bearded figure of Alexander Dugin, Eurasianist ideologue, one-time Kremlin whisperer, and debating partner of Yuk Hui. In a 2020 event at the V-A-C foundation in Moscow, Dugin and Hui met to compare and contrast their respective approaches to geopolitics, technology and culture. Despite whatever similarities their ideas may have, hopefully current events show that the differences are more decisive.

In some respects, the hallucinatory vision of manifest destiny that animates the Russian invasion of Ukraine can be interpreted as Duginism realized—as both a cause and an effect. It is easy to overstate Dugin's personal influence on Putin, but that is not my point. Rather, it is to highlight the continuities between a cosmopolitics predicated foremost on cultural divergence and the uses and misuses of cosmotechnics as a philosophical ethos. The implications for the Stack or *Stacks* we compose are critical.

Duginism is an evil sibling of some visions for cosmotechnics (again, those based on cultural deterministic reification for which divergence and enclosure are primary goals) and in other ways it is incompatible with other visions perhaps closer to Hui's intentions. It shares many characteristics with reactionary cultural philosophies to be found on both the Left and the Right. Besides its occult commitments to the sacred destiny of Russia, it shares a motivating preoccupation with a "metaphysics of peasantry" that resonates with Heideggerian thought but also swells the hearts of various invocations of the Heartland and the purer life to be lived there, which locates Dugin within an organic culture-obsessed "revolt against Modernity." This particular sentiment goes far beyond the boundaries of Duginism per se and has inspired ideas ranging from Thoreau's transcendentalism, Wendell Berry's Southern agrarian poetry, Vandana Shiva's campaigns against scientific agriculture, to *Kinfolk* magazine's dinner table communitarianism.

"Duginism" has both geopolitical and ideological aspects, each of which are *metaphysical and reactionary* in different ways. It champions not only conservative grievances against global liberalism but also the humiliation of lost powers (of empire, of masculinity, of tradition) with an activist reformulation of Schmitt, Heidegger, and interweaving esoteric gestures into a vision of a reconstituted Russian imperium. More broadly, it also draws a blueprint of sorts for a multipolar geopolitical map filled with ultranationalist, Traditionalist adjacent empires.

In this case, *divergence* is the weapon against

The violent redrawing of maps in accordance with pre-Modern, pre-Colonial and "original" ethnic arrangements is not unique to the war in Ukraine.

secular "global monoculture" and the debasing influences of the "West" (feminism, transhumanism, consumerism, etc.). In practice, it is an activist politics for which the monstrous *convergences* of the present must be untangled so that people, languages, and traditions are re-sorted and restored to their "original" place and purpose.[4] The violent redrawing of maps in accordance with pre-Modern, pre-Colonial and "original" ethnic arrangements is not unique to the war in Ukraine. Such revanchism is a powerful political force in the Middle East, the Indian subcontinent, the Balkans, and so on. Its violent reimposition of a political geography in the image of "original" settlements and cultures is the ugly figure of *"indigeneity" as Colonialism*.

Specifically, Duginism is predicated not only on a strong cultural determinist view of history (and planetary reality) but also of a seemingly limitless reification of cultures ("Atlantic," "Germanic," "Rus," "Chinese") into separate Tolkienesque sub-species each with its own unique cosmological essence. "Science" is seen as a force for the destructive disenchantment of the world, the undermining of traditional worldviews, and an invitation to technological perversions. Duginism is a brutish if also bookish worldview at war with globalization on behalf of the mystical coherency of lost ideas demanding revival and purification.

To consider what Duginist theory of *The Stack* might be, Dugin himself is given to flights of conspiratorial associative fancy when it comes to such things and so is probably not the best resource.[5] In the companion piece published in this volume, "Hemispherical Stacks (2018)," I argue that the post-post-Cold War shift toward multipolar geopolitical architecture (driven by, but by no means limited to, the political-economic rise of China) and the fragmenting of the Stack geotechnical model into hemispherical isomorphs are in fact deeply connected phenomena, so much so that they may even be seen as co-identical to one another. That is, while the "hemispherical stacks" thesis describes the geopolitical present in terms of multipolar segmentation into hemispheres of politico-technical influence, it does not recommend this segmentation and divergence as necessarily better or worse than consolidation. For Dugin, however, this convergence must be resisted and reversed at all costs, on behalf of the re-convergence of an imagined empire. That is, Duginism is a theory of multipolar hemispheres, but not all theories of multipolar hemispheres or divergence are Duginist.

Just because cosmotechnics identifies convergence with a problematic modern technological present and champions divergence based on revived cultural specificity does not mean that it is compatible with Duginism. Nor does it mean that it is incompatible. Cosmotechnics has both descriptive and prescriptive

The prescriptive sense would argue that a dangerous "universalization" of technology has occurred through a globally pervasive digital monoculture that reduces all society to its single image, and that this must be countered with the revival and/or discovery of alternative modes of sociotechnical thought based on diverse historical and/or futural cosmologies.

aspects that can easily get confused. The descriptive would insist that "technology" does not represent an anthropological universal (in a specific social-phenomenological sense of "universal") but evolves with culture, drives the evolution of cultures, and is constituted by and located within diverse cultural cosmologies (as distinct from astronomical cosmologies). The prescriptive sense would argue that a dangerous "universalization" of technology has occurred through a globally pervasive digital monoculture that reduces all society to its single image, and that this must be countered with the revival and/or discovery of alternative modes of sociotechnical thought based on diverse historical and/or futural cosmologies. The point of mutual recognition between Duginism and a *potential* prescriptive application of the cosmotechnics thesis is not just the focal disgust with globalism associated with the "Liberal West" but also (1) a cultural determinist vision of technical evolution as well as (2) the programmatic mobilization of traditional cultures as a political-technical force of/for (3) divergence as

both ideal means and as ends.

I emphasize the word "potential" because I *do not* think that this represents Yuk Hui's nuanced viewpoint, but unfortunately, I do think that it characterizes some of the ways that his work is invoked by those who collapse his propositions into superficial multiculturalism plus anti-realist relativism. I strongly agree that the modes of futurity to be composed must go beyond the Western and European traditions. What does this mean, however? It should not need to be said, but let me say it anyway, as clearly as I can, to my friends in the art and design worlds: "going beyond the European" toward a viable Planetarity does not mean a Romantic embrace of all the things that Europe believes that it is *not*, but that Others *are*: traditional, intuitive, magical, embodied, poetic, small, simple, immediate, ineffable, immeasurable, uncomputable, familial, non-scientific, non-technological, spiritual, associative, *Being*-aligned, harmonious, ahistorical, inert. It should be obvious that this tiresome tendency is a dangerous refortification of colonial premises, and yet strains of it animate and even dominate so many syllabi, symposia and special issues. This inverted-binary fetishization is not an innovative alternative to Colonial Modernity; it is and has been from the beginning a melancholic passenger on all its flights. Put differently, it is clear that Europe prefers to be decentered only if it is *the center of the decentering* and when its self-image as the protagonist of history is maintained, even if that takes on negative connotations.

Put differently, it is clear that Europe prefers to be decentered only if it is *the center of the decentering* and when its self-image as the protagonist of history is maintained, even if that takes on negative connotations.

The takeaway for cosmotechnics is not that the West is technological and rational whereas its Others are traditional and spiritual, but that the more fundamental accomplishment of human technological rationality is much more *fundamental* than its Western/European/American variant and that to confuse the latter for the former would be catastrophic. *Not even exclusively human…* It argues simultaneously, however, that the "technological" and "rationality" are, at one level, *non-universal* because produced by and constrained by cosmological context. One may also insist that cultural cosmology appears and evolves always in relation to its technical milieu and operations. As a close reader of Georges Canguilhem and Jean-François Lyotard, Yuk Hui is unlikely to disagree with the point. However, if so, this represents a different kind of *preceding* "*universal*," an underlying dynamic of planetary sociotechnical linking of human and technical evolution, not at the transindividual level of the apparatus but the transsocial level of the technical milieu as such.[6] *Multiregionalism. A debate that is not just a given but which is really the critical idea.*

In the more oxygenated air afforded by such a philosophy of technology, to identify or amplify technological rationality is not to impress upon contemporaries a Western European worldview, unless that identification confuses that local variant for the full horizon of technicity and rationality. If it does, then the identification mirrors the colonial concept that technological rationality is peculiarly Western and European, not only in historical origin but in its ultimate epistemological grounding. Ironically, this exact misapprehension is shared by some left-wing critical theorists and many right-wing political ideologies, and hence serves as one unlikely bridge between Duginism and Art school, one spanned by cosmotechnics-in-the-wild.

The Limits of Phenomenology, Once Again

Where does this leave us? We can conclude that there is no universal *phenomenology* of technology, but that is a more limited claim than cosmotechnical critique often attempts. Yuk Hui is quite right to insist that Kant's and Heidegger's declamations that there can be only one *way of technics*—the one that they recognize before

them—is in fact "a regional worldview" inflated "to a putatively global metaphysics.[7] His consideration of *dao* and *qi*, for example, do not simply replace *technics* and *poeisis* but demonstrate a form of dispositional technical reason that is different in form, not just content. But to confirm, this is not even remotely the same thing as concluding there are no technological conditions continuous among *homo sapiens* cultures or that technology itself cannot constitute an "anthropological universal." Put differently, were one to demand that the phenomenologies of technology are diverse and irreconcilable and *therefore* there are no anthropological, or scientific, or philosophical universals in/of technology, this would immediately risk the legitimate accusation of radical Idealism that has been made against phenomenology for over a century.

I assume that no one wishes to defend the notion that the irreducibly different and perspectival belief systems of a given culture happens to correspond to irreducibly different physical realities in which those cultures exist—such that a culture which believes that the Earth is 1,000 years old actually lives on an Earth that is 1,000 years old. If not, then the project of a planetary philosophy of technology (of which a cosmotechnical appreciation of the crucial diversities of culturally embedded phenomenologies of technologies is situated) must grant that the question of the universal and the particular extends to the generality of planetarity (geological, chemical, biological, animalian, etc.) in which particularities of hominin migration, primate sapience, complex symbolic cultures, and machine intelligence are all recent particular phenomena.

That is, I place considerable weight on the allowance that cultural cosmology emerges from the possibility of thought, and that physical possibility of thought emerges from material realities that are, in the long run, continuous among humans (and even exceed the uncertain boundaries of the human). In the short run, however, those realities are significantly diverse and thus a materialist analytical cosmotechnics is irreducibly important. *It links nature culture debates as well.* It is certain that the specific ecological contexts in which language and symbolic systems emerge produce and constrain the horizons of their semantics: forest, sea, desert, mountain, jungle, plain, megacity, and so on all constitute different somewhat niches demanding somewhat different means of signification. In this regard, particular cosmologies also express different natural and artificial ecosystems and thus would demand different corresponding phenomenologies of technology. At the same time, the anthropogenesis-technogenesis cycle is also recursive: the *artificiality* of any such niche is due to the cumulative expression of a technical culture upon its world, composing that world in the image of concepts and capacities. Once more, the latter is where a materialist cosmotechnics (as opposed to a Heideggerian philosophical canal) is not only appropriate but essential.

The Planetary as Computational Discovery

This prepares us, then, for the direct encounter between that materialist cosmotechnics and the practical questions of this chapter: what Stacks should be composed now? What is planetary scale computation for? What planetarity must it provide? With regards to the "Anthropocene," these are questions that can only be asked in full light of the fact that the discovery of "climate change" is itself an epistemological accomplishment of planetary scale computation. Without the cumulative discontiguous megastructure of satellites, sensors, data centers, supercomputer simulations, and the rest, the scientific reality of the situation would be impossible to intuit. From the discovery of climate change comes the revelation of the "Anthropocene," as well as the realization of the geochemical realities of the planet that both precedes human history and from which that history emerges, even and especially as that history possesses the agency to artificialize that geochemistry (and thus its own futures).

What has planetary computation disclosed? Not just the calculus of climate change but indirectly the unexpected recognition of anthropogenic planetary agency, and through this an ongoing recognition of *planetarity as such*, as distinct from the "global" and even more distinct from the Heideggerian concept of "world." This contemporary episode of twisting cultural and technological evolution—planetarity as cosmological context and planetary scale computation as epistemic technology—is different from other

geographically defined episodes in human cultural-technical history insofar that what it has disclosed is not a regional niche but the planetary geochemical and geosymbolic interrelations that constitute the precondition of human history at all.

In that planetary scale computation is a complex of technologies with both instrumental and epistemological condition and futurity must allow for both convergence *and* divergence. But the relation between convergent and divergent *instrumentality* and convergent and divergent *epistemology* (or cosmology for that matter) are not the same. We can imagine Stacks which are technologically diverse but cosmologically monocultural and we can imagine Stacks which are technologically isomorphic but animated by diverse cultural imaginaries (and presently, we have them). We can imagine the present shift toward post-post-Cold War geopolitical multipolarity resulting not in a diverse and dynamic equilibria, but catastrophic attempts at technological autarky hiding behind the rhetorics of aesthetic nationalism and "internet sovereignty."

The Precedent Universality

The connotation of the "universal" thus changes registers directly and decisively. As Hui writes in considering the Kantian tradition, "the universal tends to contemplate the particulars *from above*" (emphasis mine).[8] However, if we were to consider human evolution and the neuroanatomical capacity for tool directed symbolic language, or now even the differential of relations to climate changes as "universals" of human interrelations, then what kind are they? They more are universals *from below*, or better conceived, from *precedent*—from what precedes and makes preconditional. In their preconditionality, they structure the contingencies from which any future convergence or divergence might span. Before them are astronomic universals, geological universals, biological universals, each with their own histories. From those contingencies come every form of human cosmological disposition ever possible. Every idea about the planet that acts upon the planet is something the planet does. To deny this, or even invert this and argue that entire universes are just a matter of spirit and perspective, is not only to deny those histories but to foreclose the real possibility of a viable future calibrated with real planetarity.

Dipesh Chakrabarty makes a corollary argument in his demand that we take "history" not simply as the internal story of human social drama, but to be equally attentive to the biological history that makes human social history possible, and in turn to the geological history that makes biological history possible.[9] Instead of modeling the past, present and future as conflicts independent of their planetarity, powered by internal engines of economic, eschatological, messianic and dramaturgical direction, one should see them as inextricably intertwined with their preconditional histories. One would grasp the "Anthropocene" not simply as the sudden interruption of geochemistry into culture as a new figural demand of thought, but as the eventual interruption of geochemistry *by* culture, and the ecological, mineral and chemical agency of symbolic thought and action. This framing of technoscience implied is not one that obliterates any idea of the past in the name of some new Year Zero, but one that discloses the reality of a greater-than-cultural preconditions and thus undermines traditional ethnocentric and ethnotemporal cosmologies. The contribution

Every idea about the planet that acts upon the planet is something the planet does. To deny this, or even invert this and argue that entire universes are just a matter of spirit and perspective, is not only to deny those histories but to foreclose the real possibility of a viable future calibrated with real planetarity.

of a material cosmotechnics to cosmopolitics must be on behalf of the former, not the latter.

Thus when Sheila Jasonoff asks "How… will scientists' impersonal knowledge of the climate be synchronized with the mundane rhythms of lived lives and the specificities of human experience?" as if human experience is the sovereign referent to which planetary reality must bend and bow, one might answer by inverting and correcting the question as: "How will the mundane rhythms of lived lives and the specificities of human experience be synchronized with scientists' impersonal knowledge of the climate?"[10] Instead of insisting that difficult abstraction make itself comfortable and immediate as the price of admission, how do we better train ourselves to see the deep time of a geologic past and futures in our intimate activities?

A Viable Planetarity

By way of provisional conclusion, I recognize how the vibrancy of *Vertical Atlas* demonstrates that the most dire diagnoses of a global internet monoculture may be overly pessimistic. Perhaps the complexity right around the corner is illegible or that which is on the other side of the wire too hard to see? Still, the bookshelf on computation and culture overflows with exposés on how a dominant Western monoculture enforces a suffocating model for everyone, and in many ways it does, particularly in the formulation of "User" as self-performing identity-subject. I wonder how much of this orthodox critique is itself a kind of monocultural myopia. Perhaps its strict coherency derives from how the West has long imagined itself to be the protagonist of History, in a positive sense, and yet as it comes to terms with its own particularity it clings to the protections of this Main Character Syndrome? "We" are still the central model even if that is now bad, instead of good, and so writers compete to radicalize our disavowals.

In "Heidegger, Gagarin, and Us," a short gem from 1961, Emmanuel Levinas writes, "Technical things are dangerous. They not only threaten a person's identity, they risk blowing up the planet. But the enemies of industrial society are in most cases reactionary."[11] He goes on to suggest that an ethnocentric sense of place is one the causalities of cosmonaut Yuri Gagarin's leap into the void: "Technology wrenches us out of the Heideggerian world and the superstitions surrounding *place*.… From this point on, an opportunity appears to us: to perceive men outside the situation in which they are placed, and let the human face shine in all its nudity."[12] This wrenching away from one sense of place into another, literally more universal, is the opposite of the conservative politics of ground versus groundedness. "One's implementation in a landscape, one's attachment to *Place*, without which the universe would become insignificant and would scarcely exist, is the very splitting of humanity into natives and strangers. And in this light technology is less dangerous than the spirits of *Place*."[13] In considering the viable planetarity at stake and the kinds of cosmotechnics that may be conceived for the immediate and longer term future, Levinas' point is well taken.

In considering planetarity, Hui quotes philosopher of religion, Rémi Brague, who writes, "the West ceases to have a cosmology with the end of the world of Aristotle and Ptolemy, an end due to Copernicus, Galileo, and Newton. The 'world' then no longer formed a whole."[14] I would not disagree that there is at present a pathological disconnect between what we might call astronomic cosmology and cultural cosmology. While they are recent discoveries, the age of the universe, of the earth, the paths of human migrations from Africa, the dynamics of RNA and DNA, the basic structure of the neocortex, etc. are all provisionally understood, and yet our economics, our cultures and most of all our politics are grounded in the insular semiotics of race, border, tradition, empire, destiny, and other groping techniques of creationist sublimation.

In the disconnect between what is known and what is believed, Brague blames the secularization of thought. But instead of a "death of the cosmos" one might say that the West did not have a cosmology *until* the historical moment of these basic orienting discoveries, because it was not possible to know what a host planet is, where it is, or how it moves, and thus not possible to conceive the meaningfulness of this precious predicament. For Brague, and perhaps for Hui, if secularization is blamed for the disconnect between scientific and ethical intelligence, then the implication is that desecularization and a revival of lost spiritual

truths might be the illuminated path of reconciliation. Instead, I argue on behalf of an ability, willingness and possibility to cohere ethical and normative thought to planetary reality, as it is known to really be (including when that reality is "thought" itself.)

In what sense does this imply convergence or divergence? Hui writes that "in order to confront the crisis that is before us… the Anthropocene… it is necessary to reopen the question of technology, in order to envisage the *bifurcation* of technological futures by conceiving *different cosmotechnics*" (emphasis mine).[15] By one reading, the bifurcation is elevated to a status that is both means and ends. It is less a cosmotechnics that would provide for the continuance of complex life and intelligence, but than one that protects extant ontological claims, regardless of their scientific validity. Is the main priority for cosmotechnics as cosmopolitics not validity and viability, but simply divergence and the respectful recognition of exoticized difference? If so, then this is where I take my leave of it. By another reading, however, this bifurcation is a welcome invitation to invent and compose an alternative cosmopolitics that is genuinely planetarity in spirit and deed, that orients our moral and normative capacities with the astronomic condition from which they emerge, and which would be both convergent (because planetary) and divergent (because human), but which is in all senses viable. If so, then it may be a cosmotechnics reformed beyond recognition.

March, 2022

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2 Benjamin H. Bratton, "On Geoscapes and the Google Caliphate," *Theory, Culture & Society* 26, no. 7-8 (2009): 329-342.
3 Alexander Karp, "In Defense of Europe," *Palantir*, March 10, 2022, https://www.palantir.com/in-defense-of-europe/en/.
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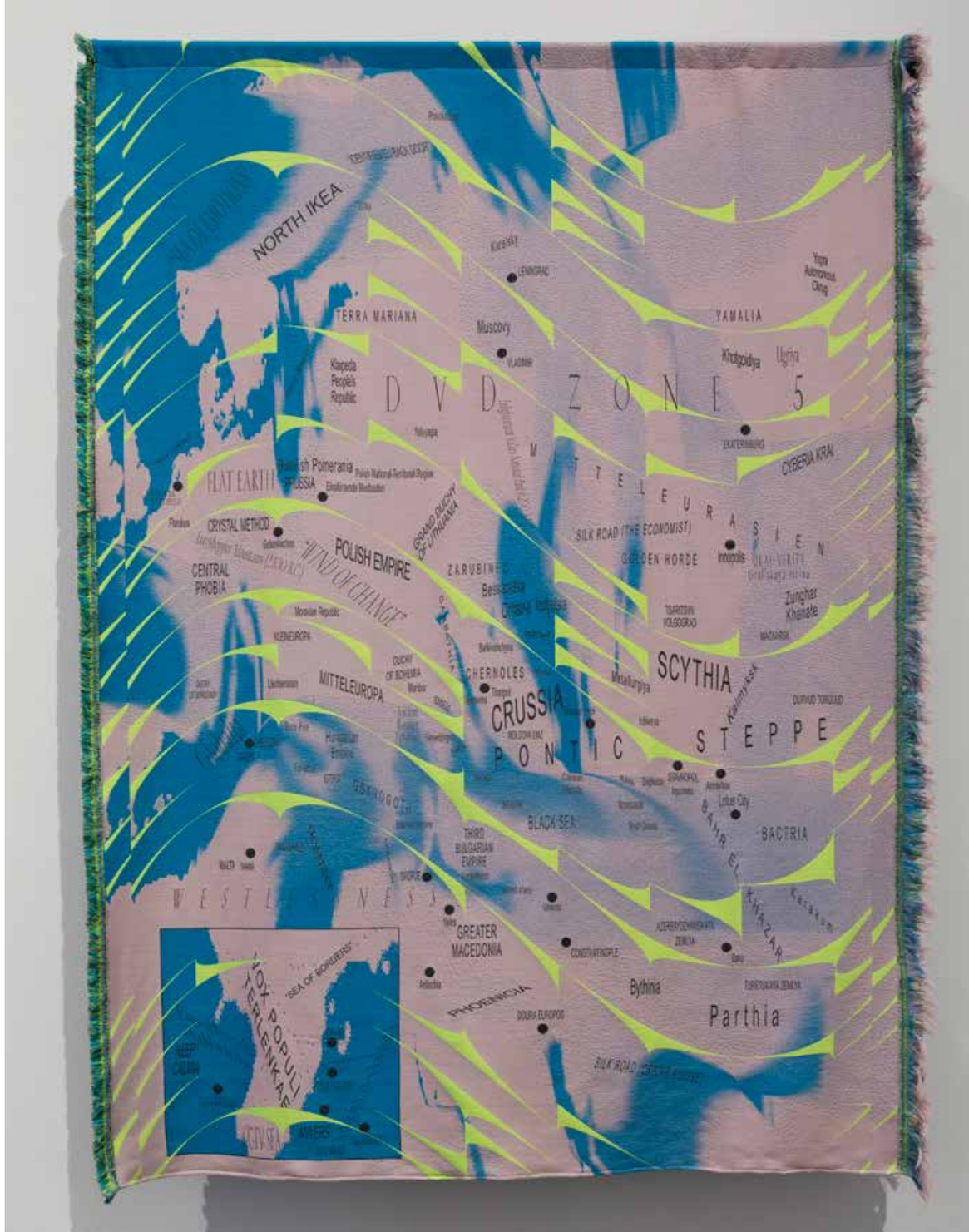
7 Yuk Hui, "Cosmotechnics as Cosmopolitics," *e-Flux Issue #86*, November 2017, 1.
8 Hui 2017, 2.
9 Dipesh Chakrabarty, *Climate of History in a Planetary Age* (Chicago: University of Chicago Press, 2021).
10 Jasanoff 2010, 238.
11 Emmanuel Levinas, *Difficult Freedom: Essays on Judaism* (Baltimore: Johns Hopkins University Press, 2012).
12 Ibid.
13 Ibid.
14 Hui 2017, 5.
15 Hui 2017, 7.



DVD Zone 5

Eurasia (Questions on Happiness)

METAHAVEN

Metahaven's film, *Eurasia (Questions On Happiness)*, combines cinematic sequences, viral videos, animation, poetry and graphic design with a soundtrack by electronic musician Kuedo. The film's evolving narrative zooms in on various locations on the Eurasian continent.

Skillfully employing the camera as a character and narrator in itself, Metahaven deploys zoom levels and different image resolutions as a way to negotiate the complex history and present of Eurasia both as a region and as a geopolitical concept—split between tendencies towards unification and fragmentation. In a section shot in Russia's Ural district, we encounter a monument at the border of Europe and Asia, while elsewhere in the movie we visit the town of Veles in central Macedonia. Veles became famous in 2016 when local teenagers began making money running fake news sites that invented and promoted conspiracies about the US presidential elections.

Metahaven's tapestry *DVD Zone 5* is a map of historic cities and empires along the former Silk Road, as well as of technical standards and fictional locations such as North Ikea, Central Phobia and Cyberia Krai. DVD region codes are a digital rights management system to prevent the playback of commercially produced DVDs in geographical areas other than those where they are released. DVD Zone 5 is the region code for Russia and Eastern Europe.

While large infrastructural projects such as the Trans-Siberian Railway and the New Silk Road brought connectivity, Eurasia's digital territory is becoming increasingly more fragmented by polarizing narratives, computational propaganda and disinformation.

Metahaven. *DVD Zone 5*, 2020, jacquard weaving, wool, lurex, ±190 x 120 cm. Photo by Tobias Titz.

Metahaven. *Eurasia (Questions on Happiness)*, 2018. Stills.


ЕВРОПА

Star Atlas, Petroglyphs, and Family Tokens:

Technics and Mutation in Deep Histories of Eurasia

MI YOU

Nam June Paik:
You have often been talking about the Eurasian continent, the unfamiliar geographic concept.

Joseph Beuys:
'Cause there was no Gobi Desert in the old days. There were thick forests instead. Perhaps it's about 100,000 years ago when the division of Asia and Europe was made at the Gobi Desert?

Paik:
Why were rabbits worshipped among Mongolians?

Beuys:
Rabbits are the fastest. They fly like cannon-balls in the vast steppes.

–Nam June Paik, "Conversation for Interpreting Beuys," 1984.

Eurasia is by no means a self-evident concept. It is at once a geographical and geopolitical space that reveals the artificial division between Europe and Asia, as well as a geopoetic figuration that points to multiple mutations of materials and ideas.

For most of recorded history, agrarian empires have spanned vast territories in Eurasia, distinct from yet in constant interaction with nomadic peoples. Both groups mastered technologies of production corresponding to their own forms of social organization, such as grain production or nomadic pastoralism.[1] Revisiting this historical interconnectedness of Eurasia unravels Eurocentrism and opens up intercontinental connections and polycentric worldviews. Sociocultural anthropologists, among others, have proposed rethinking Eurasia as a social entity, based on this integrated diversity-in-unity in the *longue durée*.[2] On the contemporary political stage, the most popular evocation of Eurasia appears in China's Belt and Road Initiative and the Russian-led Eurasian Economic Union. The latter has a strong stake in various versions of "Eurasianism," including those promoted by right-wing nationalist thinkers like Aleksandr Dugin.

Beyond its historical depth and political ramifications, Eurasia is a metaphorical and geopoetic space of never-ending transformations and mutations; stories, figures, and ideas find their ways through time-spaces and recast familiar narratives in a new light. This essay will focus on Eurasia as a cosmotechnical, more than a technopolitical, space—cosmotechnical in the sense of "the unification between the cosmic order and the moral order through technical activities" in order to overcome the conceptual dualism of technics and nature.[3] This reading of Eurasia surfaces a wealth of navigation systems and networks, as well as the social and communication technologies behind them. Inspired by premodern cosmologies of Eurasia, how can we rethink the fundamental ethics of network technology today? How can we think and feel with the deep time of the earth's elements and movements through technology?

Eurasian Information Highway: beyond spatialized notion of networks

Korean media artist Nam June Paik (1932–2006) and German artist Joseph Beuys (1921–1986) were not only friends, but their works both feature evocations of Eurasia. Beuys believed that his life was saved in 1944, while serving in the German army during World War II, by Tatars—a vague term used to describe the various once-nomadic peoples of Turco-Mongol origins in Eurasia—when he was buried in snow after a plane crash on the Crimean Front. With a dose of fantasy, at a time when cultural appropriation had not been problematized, Beuys attempted to redeem the Self by reaching out to the Other.

Almost concurrently with Beuys, Paik made a number of works on Eurasia. While advocating the use of new technology, he celebrated prehistoric culture. He used the expression "negative sci-fi," suggesting future-making through the past. He also said, "I like thinking about [the] old past before the discovery of private property." For Paik, video at the time was common property beyond the capitalist art market, while the Silk Road embodied the premodern Eurasian Information Highway through which ideas and goods flowed. Taken together, they provided a backdrop to imagine a trans-Eurasian non-capitalist market network, where videos could be disseminated using emerging technologies. Paik, too, might have embodied a double consciousness in what was emerging as a techno-Orientalism. However, both Paik and Beuys were earnest mavericks, and their practices point to an expanded notion of technology—as much a practical means to an end as a malleable sociocultural system.

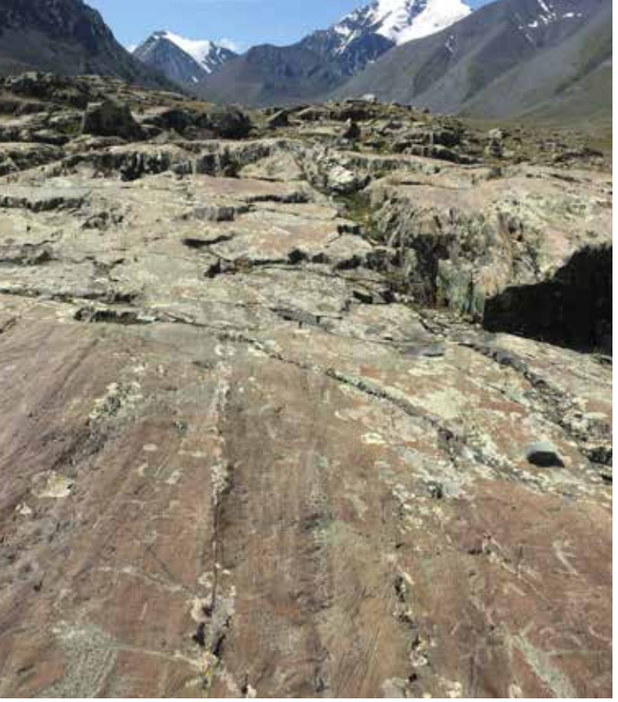
Following this invitation to dive into deep space-time, what follows is a collection of findings that point us to tangible and intangible Eurasian networks. We would like to push the imagination of networks beyond their common spatialized conceptions, succinctly summarized in Paul Baran's three diagrams—centralized, decentralized, and distributed—in the context of Cold War self-defense and resilience. The Eurasian networks are alive and imaginative; they extend in time as much as in space and consist of non-standardized agents. As such, they open unconventional pathways for us to reconsider our relation to technology.

Star Atlas and Petroglyphs: mutable maps

One way to dive into Eurasian deep technology is through atlases, such as the rich collections of medieval paper scraps from Dunhuang, Western China, which document divination guides, star atlases, and almanacs—practices of negotiation with divine and astral forces. Dating to before 700 CE, this skillfully drawn, four-meter-long star atlas is the world's oldest complete map of its kind. This and other ancient star atlases provide accurate depictions of the constellations, not just for calendar-making but, more importantly, for consultations of stately affairs. Court astronomers studiously observed celestial movements to draw moral interpretations and identify omens, such as signs of disaster or misconduct of the emperor, or signs of harmony in stately matters. These star atlases are scientific, in that they are based on repeated empirical observations. At the same time, they correspond to a supranatural realm in search of cosmological righteousness. As such, they serve as a perfect example of cosmotechnics.

Five thousand kilometers away, in the deserts of the Southern Levant, glyphs bearing the ancient Arabic alphabet of Safaitic script have been recently deciphered by linguistic historian Ahmad Al-Jallad. What were originally thought to be geographic place names turned out to be a set of Arabic zodiac coordinates, positions in the sky recorded on stones by the nomads as they moved through the basalt desert. Here, the star atlas was born of multiple movements: the collective movements of the nomads, the dancing movements of stars, and a third kind of movement, communicating between the previous two, conditioning the equilibrium of man to earth in relation to heaven. This third movement situates the traveler in a cosmos that moves with them, rather than rendering space static in an "immutable" map which the explorer can depart and return to freely.[4]

Many other kinds of traditional and informal maps represent this ethics of moving, whether in drawing the map of a territory in the sand, and then copying it onto paper before it is erased by the tide—as in the encounter between a Sakhalin islander and the French captain La Pérouse, in the allegorical retelling by Bruno Latour[5]—or in disseminating song lyrics



Petroglyphs in the Altai Mountains. Mi You.

through recitals. Remembering and erasing, mapping and unmapping are not mutually exclusive. In Nepal, the spiritual journeys of shamans, as they recalled after emerging from the trance, coincide with the ominous mountain landscape, which anthropologists can only "prove" through helicopter flights.[6] Landscape paintings that are used as a meditation guide by Taoist practitioners in China are conflated with the human body. All these maps here are mutable and serve as navigational tools for collective movement and minds to sail—a commons shared between mover and space, activated by movement and extending into both horizontal and vertical spaces.

What implications does this have for the modern technologized world, where every entity is mapped in the fullest detail and where individual choices are rendered into data packages to be harvested for behavioral patterns? These maps, as we have seen, are manifold, sporadic, and ephemeral.

Another example of cosmotechnical objects are the prehistoric petroglyphs found across Eurasia spanning the Bronze Age, the Iron Age, and the Turkic eras. They are sometimes re-engraved with new marks, forming an ancient palimpsest, wherein annotations may or may not share semantic systems. Without the formalized discipline of archeology and conceptualization of historical periods that we have today, Iron Age humans would nonetheless have viewed the human and animal figures of their Bronze Age predecessors. A set of self-motivated activities would unfold—copying, inventing new forms, and recording them in the rocks. The preexisting engravings condition in some way the world of those who come next. In this sense, the petroglyphs are like a distributed game without a game master.

This leads us to view networks in a different light: they exist in time as much as in space and can only be accessed from within, not represented from without. Are these not permutations of Nam June Paik's Eurasian Information Highway?

Udmurtian Family Tokens: social and natural commons

If these atlases capture a different relation to space and time, in which we humans are distributed in collective movement, then the same situated relation to space is reflected in the idea of ownership—or rather, the lack thereof—in various indigenous cultures. This leads us to social technologies and networks for distribution *in*, not *of*, space.

In Izhevsk, the capital city of Udmurtia—a twelve-hour ride on the slow train from the Ural Mountains—the regional museum exhibits the cultural artifacts of the Udmurts, a community of Finno-Ugric language speakers. Among them is a curious series of tokens, the Udmurtian family signs.

Family signs are related to property and possession: if someone finds a tree with wild bees in its hollow, they mark it with their family sign so that the tree becomes their property. The tokens are used for marking land and animals on traditional fabrics, carpets, and even gates. The origin of family signs goes back to the names of the mothers of the female prophets who protect a clan. They are also therefore amulets. As they are exchanged together with the objects, they also circulate histories, stories, and sensations.

Legends have it that in the past, all family signs were known by every Udmurt. As a result of punishment from the gods, people now only remember the sign of their own family. Ethnogenesis (the academic debate around reinventing traditions) aside, what was their society like when everyone knew every family token? Were exchanges then based on different principles; could they even be characterized as exchanges? The subjects engaging in exchange-like activities would have been very differently constituted.

After anthropological studies on the gift economy of traditional societies, the creation of "value" can be traced to the inalienable circulation of things among "dividuals" through money-mediated, alienated transactions among individualized agents.[7] The exchange of family tokens would likely have looked more like ritual than exchange, enabling the passing and assuming of various roles and functions in the community through performativity. The parties involved were dividuals, not mutually foreign individuals. The performative constitution of roles, rather than individual identities, is the key to building intricate ties that hold a community together over time. In this sense, the gift exchanged is not a medium of transaction but an index of sociality.

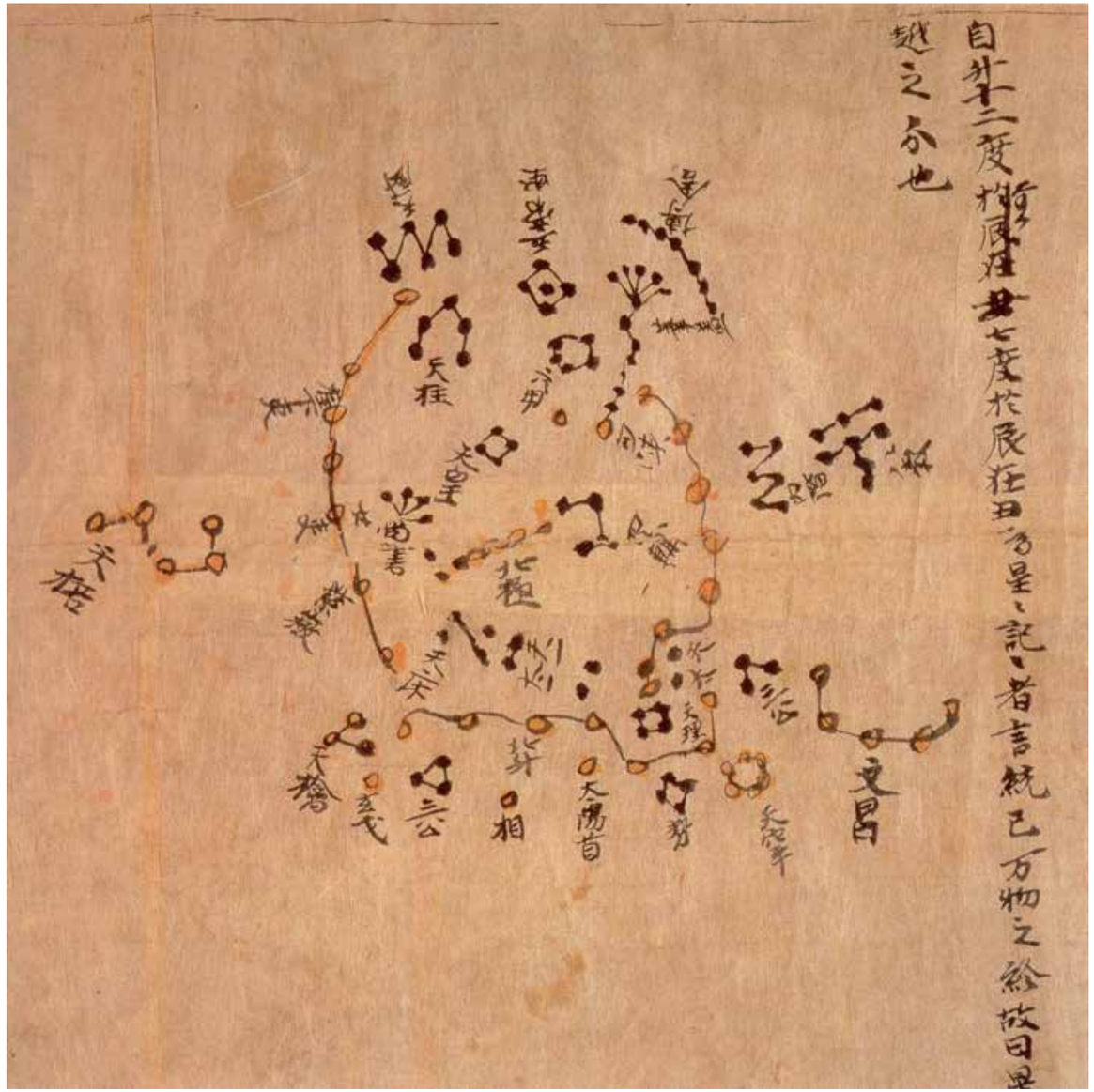
Again, this index is decentralized and, moreover, distributed: everyone engaging in community activities belongs to the same index, which arranges who gets what and how, based in part on which temporary roles they perform. One could call such a social form a "premodern blockchain," as the contemporary development of the blockchain maintains the veracity of a log of global transactions, not by creating a centralized auditing authority, but by distributing the log so that every participating node has a copy of the same ledger. The resilience of the social and information network in a small community inspires practitioners in the blockchain space today to push the social implication of blockchain, with initiatives that reconnect the on-chain with the off-chain.

Furthermore, the Udmurtian Family tokens can be carved onto trees, applying the designation of custodianship and the commons to natural resources. The commons here is twofold: it is both material—the abundance of trees in the Siberian taiga being commonly owned—and social, through the maintenance and transfer of knowledge, family histories, and stories. Both senses of the commons are based on care, which, in its broadest sense, is the practice of maintaining, continuing, or restoring the world.[8] If technics in modernity, as Federico Campagna traces, is the instrumentalization of everything on earth, with the ultimate goal of infinitely expanding the accumulated productive ability,[9] then reproduction and care offer a different lens on the transaction of energy. Care maintains and mediates the "social" and the "natural." Memories, experiences, and legends make up the social index, just as nature, with its own forms of memories, is attended to as part of the social index. Both "natural" and "social" are inseparable parts of the commons that we inherit, and they require our care to safeguard and mend.

Returning to Eurasian cosmotechnics, can modern technology take inspirations from family tokens as a social and natural index of commons and care—without being instrumentalized? Take, for example, the illegal logging of trees, which is conditioned by the

Udmurtian family tokens. Credit: Historic and Cultural Museum of the Udmurt Republic.

sweeping global capitalism that alienates people from their natural environment even in the most remote parts of the world. Recent efforts include incentivizing locals to preserve trees from illegal logging by



The Dunhuang star map of 700 AD, British Library Or. 8210/S.3326. Public domain.

rewarding them for keeping a digital photographic record of the local woods.[10] If such projects took in the community's history and relation to nature, they could lead to a relational network of nature and socialities, where both local knowhow regarding nature as well as the reconstruction of local social spheres would gain new valences. Once again, such a network morphs in time and space.

These Eurasian deep technologies capture many kinds of movements—some vertical, from the spiritual realm to the earth, and vice versa; some implosive, through transformations and metamorphoses of materials and socialities; and some across time, folding traditional practices into contemporary (and perhaps also futuristic) social forms. These diverse movements cannot be mapped or represented in either linear history or modern cartography: they are not spatialized, immutable, or recordable as absolute coordinates. Rather, they sow the seeds of a supernetwork, constantly mutating with social, natural, and imaginative intelligence. What happens if we filter our world of technology through these movements? What if our technology could aid these kinds of transformations? These Eurasian stories are told as a way of making sense within the flow, and together form an ethics of moving through, and living in common with, the world and its cosmotechnical objects.

June, 2021

1 See, for example, Owen Lattimore's *Inner Asian Frontiers of China*, Thomas Barfield's *The Perilous Frontier* and James C. Scott's *Against the Grain*.
2 See, for example, Chris Hann, "A Concept of Eurasia", in *Current Anthropology* Vol. 57 No. 1, 2016.
3 See Yuk Hui's essay "Cosmotechnics as Cosmopolitics" in this volume.
4 Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society: Studies in the Sociology of Culture Past and Present* 6 (1986): 1–40.
5 Ibid.
6 See Michael Oppitz, Mobile Myths exhibition, Kolumba Museum, Cologne, June 21 to December 3, 2018.
7 Arjan Appadurai, "The Wealth of Dividuals," in *Derivatives and the Wealth of Societies*, eds. Benjamin Lee and Randy Martin (Chicago and London: University of Chicago Press, 2016), 17–36.
8 Joan C. Tronto, "An Ethic of Care," *Generations: Journal of the American Society on Aging* 22, no. 3 (1998): 15–20.
9 Federico Campagna, *Technic and Magic: The Reconstruction of Reality* (London: Bloomsbury, 2018), 25.
10 The Forest Watcher app launched by the Global Forest Watch project allows users to monitor and alert illegal logging by uploading pictures from the field. Tom Duncan, from the sustainability and Fintech space, has proposed the scheme of actively rewarding the upkeep of forest.

NASA

BIT

GOLDEN RECORD

Los niveles de la comunicación según Bateson-Ruesch

CONFERENCIAS MACY

HOPE

WELCOME

WORLD FEDERATION FOR MENTAL HEALTH

WFMH

CIBERNETICA

KYBERNETES

WIENER

KUNST I KAMP

KUNST

B.F. Skinner "Burrhus the Bouncer", 1947

The Pigeon-Guided Missile

ESTADO ACTUAL

ESTADO DESEADO, OBJETIVOS

DIFERENCIAS

REDUCIR DIFERENCIAS

INSTRUMENTACIÓN

SOLAR APEX

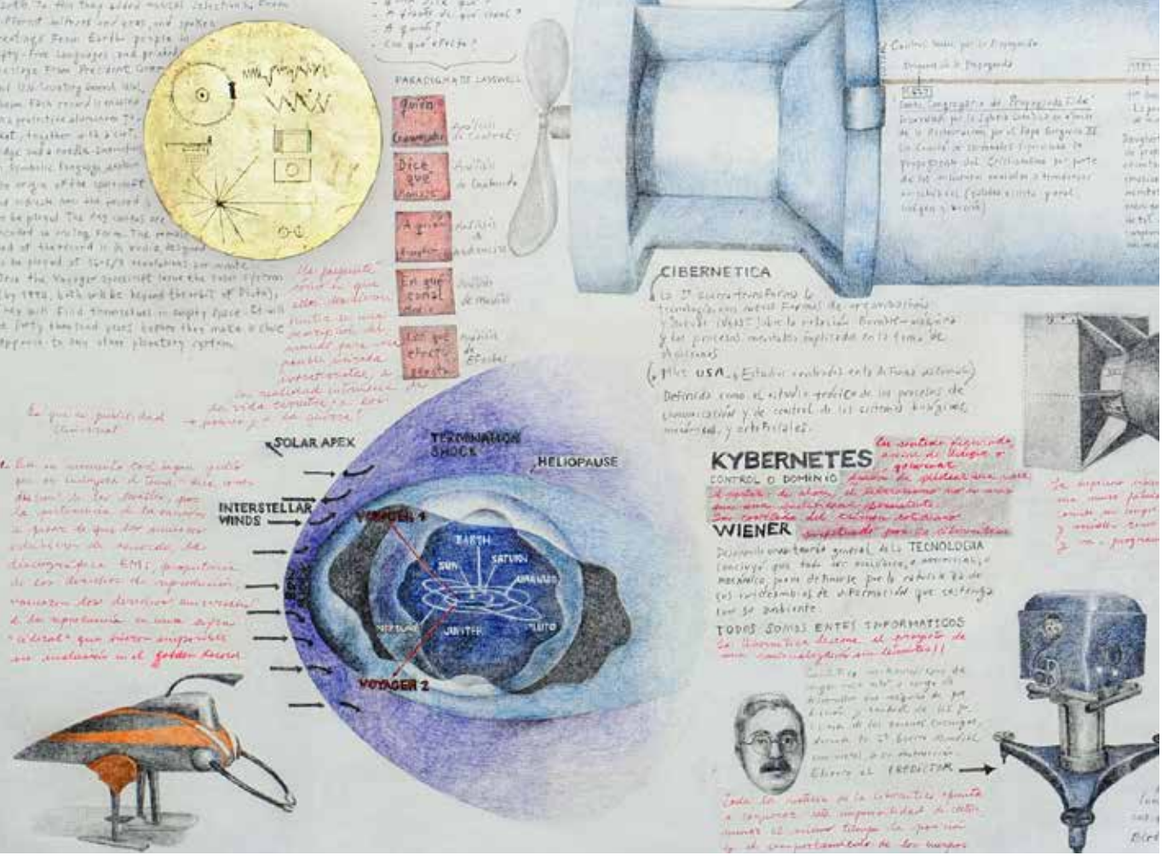
INTERSTELLAR WINDS

HELIOPAUSE

VOYAGER 1

VOYAGER 2

SACRA CONGREGATIO DE PROPAGANDA FIDE



NASA

ADRIANA BUSTOS

NASA reflects on cybernetics as systems of social control, and propaganda as a form of public opinion. In this large-scale drawing, Bustos proposes a personal drift through ideas, sentences and images, reminiscent of colonial explorers' notebooks.

Taxonomy, classification, codification, and systematization are key concepts for understanding the construction of Illustration and Modernity, and everything else that resulted from them. The development of this project is triggered by the Golden Record and the Macy Conferences. Held between 1943 and 1956 in the United States, these conferences gave rize to "Cybernetics" as a paradigmatic discipline in the process of developing modern communication sciences.

The Golden Record was a NASA project that consisted of a gold record with information in the form of images, sounds and music that would describe Earths' civilization to other possible extraterrestrial civilizations. *NASA* distinguishes between the Golden Record and political propaganda by providing detailed notes and images that create non-linear links between cybernetics as a form of social control, the effects of the Macy Conferences on the construction of current systems of control and circulation of information in Latin America, censorship, the introjection of information, and the history of propaganda and its different models. Featured is a drawing of the sophisticated operations room, the Opsroom of Project Cybersyn. This was an advanced cybernetic project undertaken in Chile from 1971 to 1973 during the presidency of Salvador Allende. It was aimed at constructing a distributed decision support system to aid in the management of the national economy.

Adriana Bustos. *NASA*, 2016.
Graphite, crayon and gold on canvas.
105 x 181 cm.

Witnessing with Earth Observation Technologies

CRISTINA COCHIOR

In this essay, Cristina Cochior expands on the three Vertical Atlas world.orbit workshops, which explored the artistic, theoretical and philosophical possibilities for a non-exploitative use of remote-sensing software to witness Earth in all its complexity.

As remote sensors spin around Earth on satellites, enveloping it in membranes of data, they participate in imaginaries that describe and mobilize the world in particular ways. The distant aesthetics that satellites generate evoke a fascination with the possibility of expanding human perception through remote mechanic and programmatic sensing machines. Remote sensing is the generation of data by satellites, that either actively transmit and receive electromagnetic radiation, or passively capture the signals of optical and thermal sensors.

The data layers that are created by satellites frame digital everyday life; we are attuned to the logics that they produce. They indicate the state of the weather, provide geolocation information, and also inform policies for the environmental protection and management of various natural resources. However, the same software that is used to monitor environmental change on a planetary scale is also used to determine possible new areas to exploit economically. Through their rendition into data, environments appear as programmable, extractable, a continuation of the colonial project.[1]

Starting from the premize that the ways in which remote-sensing software enable us to witness Earth are affected by root assumptions in the data's makeup, thus leaving out important frictions in the process of its generation, how is it possible to repurpose this technology to relate to the world in more affirmative and generative ways? What awareness or data treatments would be needed for that?

Data Worlds

Satellite data imagery quite literally creates specific visions of the world by presenting Earth as a single entity. Simultaneously, all the infrastructural elements that participate in this disembodied space view propel processes of world making.

In his article *Three Aspects of Data Worlds*, Jonathan Gray points towards the world-making capacities of data. Through the idea of "data worlds" it is acknowledged that the capacities of Earth observation and other data go beyond representation. These "shape the way we see and think about things, serve as a common point of connection across situations, and help to conventionalize ways of organizing the world."[2]

Gray defines data worlds through three main aspects. The first is that data is capable of speech acts, referring to the capacity of data worlds to "make things up." Their enunciative power comprizes both the things that are being said as well as "the background on which things become sayable."[3] Furthermore, data worlds are organized by and in turn organize the meaning-making acts of various collectives. Thirdly, Gray addresses transnational aspects of data worlds—made possible through data infrastructures that allow for international coordination.

Gray calls for a redistribution of data worlds that takes into consideration for whom and by whom data is being created, and which concerns it is mapping out.

Current Status of Earth Observation Technologies

Earth observation (EO) data is part of a larger data economy that has been undergoing overwhelming

Image by Radiant Earth Foundation. It was shown by Andrei Bocin-Dumitriu during his workshop as part of one of the world.orbit sessions.

change since Sputnik was launched into orbit in 1957. Technological advances, open data policies, reduced launch costs, and the rize of data-processing cloud infrastructures have lowered the participation barrier for actors that previously did not have access to the space sector. This in turn has given rize to diverse applications around both commercial and citizen-led engagement with remote-sensing data.

Based on the number of spacecraft applications that have been filed with the Federal Communications Commission (FCC), the International Telecommunication Union (ITU), and in some cases from announcements in mainstream media in 2020, a projected 107,000 satellites could be in orbit by 2029 (AGI Ansys 2020)[4], launched by both state actors and commercial enterprises.

Due to the rapid increase in resolution of newer technologies, older, lower-resolution satellite data has become available for greatly reduced and often zero costs, while higher-resolution data is highly sought after in a very competitive and rapidly growing market. And many more possibilities for non-experts to engage with the data have been opened up with cloud-computing platforms such as Google Earth Engine (GEE), enabling computational operations like data management, storage and access to happen on the server side, rather than the user side. Government-sponsored initiatives are part this effort too: the European Space Agency (ESA) launched the Copernicus project, for example. While it is clear that this will not immediately revolutionize the way satellite data is used, new users can bring new critical perspectives to remote-sensing practice.

Witnessing Data

Earth observation data is used as a technology for witnessing the state of Earth: it produces information that shapes various decision-making processes. The data serves as evidence for scientific, regulatory and commercial purposes, including resource mapping, glocalization, or the monitoring of ecosystems.

Artist Susan Schuppli calls this form of witnessing *material*. Material witnessing is "a Möbius-like concept that continually twists between divulging evidence of the event and exposing the event of evidence."[5] Through this term, she points towards the ways in which matter and evidence coalesce into "a particular kind of political project: one that discloses different orders of knowledge and regimes of perceptibility that enable materials to become evidential and bear witness."[6] For Schuppli, the ways in which computational data encode layers of information about material phenomena are similar to the ways in which nonhuman entities such as rocks, or oil spills in the ocean, are a

recording of an object's interactions with the world.

The generated data layers should not be considered merely representational, nor are they purely indexical to their object of observation. Instead, they produce an excess of information through the added data layers—in themselves inexhaustible objects in the world—which, combined with various nonhuman and machinic assemblages can provide different interpretations of the situatedness of the recording (or self-recording) object. Decoupling data from a representational function opens the possibility to more directly engage with its world-making capacities.

Innocent Observers

Witnessing is no innocent act, as media historian Lisa Gitelman states. She traces parallels between the figure of the "innocent observer" as it was enabled by the advent of photography and as it is currently enabled by the misleading, but prevalent oxymoron "raw data."[7] Appearing to be unencumbered by human agency, photography was also presumed to be an instance of mechanical objectivity when it first appeared. Because of this perceived quality, photography started to become a *de facto* tool of observation. Photography is nowadays understood as a deeply rhetorical practice which generates its own subjectivities.

The historical perception of photography as a medium of truth is not dissimilar to how satellite data is currently regarded. Lisa Gitelman argues that, just like photography, "data too need to be understood as framed and framing."[8] Satellite data are not merely faithful recordings, but are generated by particular understandings of ecology, mathematics, physics, chemistry and engineering, as well as the political and sociological commitments of its makers.

Furthermore, satellite imagery does not use cameras as a capturing technology to create images of Earth. Instead, the data collected is processed and analyzed by algorithms that decode it and thereby render it intelligible to humans. In certain cases where machine-learning algorithms are used, processes that cannot be directly witnessed by humans occur. Satellite imagery for this reason is often claimed as a technology that is less susceptible to human biases. But behind this data lies a gamut of decisions determining how a question is translated into measurements forming the data-collecting processes. Certain possible meanings are preselected that crop out other possible framings.

Tega Brain. *Deep Swamp*, 2018.

Once data is captured, it still undergoes multiple steps of transformation, from the binary information to pixel values, to being composited from different sources into one image, to having gaps removed and conflicts resolved, to being saved as a file, then uploaded to be matched with other data. At every step, the contingency of the computational translation acts affects the outcome in ways that may be imperceptible to human vision, even if they are presented as having a direct connection to it.

Oceans in Transformation

The work of spatial research organization Territorial Agency addresses these processes and offers an interesting alternative approach. The process of merging data into one coherent narrative is challenged in their work *Oceans in Transformation*, which takes the ocean as its primary focus and works from the premize that it has been irredeemably transformed by anthropogenic infrastructures.

Oceans in Transformation creates dynamic images by bringing multiple datasets together. The aesthetic appeal of the dynamic images serves a rhetorical function: to gather viewers around them and direct their attention to meta-narratives that are not directly depicted.

Chiesa di San Lorenzo. *Territorial Agency: Oceans in Transformation at Ocean Space*, 2020. Photo by Enrico Fiorese.

Through the overlap of multiple ocean datasets, patterns become visible which are not captured in the data, but instead emerge from the gaps between different qualities and perspectives that play out within it, potentially in conflict with each other. Rather than working on a unifying narrative of the ocean, the project is built around these incongruences. Multiple narratives and conflicting perspectives are presented simultaneously, thus countering the allure of apparent neutrality, refusing reconciliation.

Oceans in Transformation challenges the claim that increasing Earth-mapping efforts would produce a more precise understanding of the world. What emerges from these different juxtaposed ways of perceiving the ocean through data, is that the ocean itself cannot actually be seen: there is no singular agent that is the ocean. Every perspective reveals another one. The possibility arizes that the ocean does not want to be seen, a visibility which in this case would translate into more opportunities for extraction. This is in direct opposition to the mantra that is often heard in machine-learning communities whereby "more data is better data."

Deep Swamp

Tega Brain's work, *Deep Swamp*, focuses on a different dimension of data worlds and critically addresses the possibilities and limits of machine-learning models in dealing with the ongoing climate crisis. She questions the perception of the environment as a knowable and

controllable system that is open to intervention. *Deep Swamp* is a triptych of terraria with semi-inundated environments. Three differently trained artificial intelligence agents were each assigned with caring for one of the terraria in the gallery environment. They base their rehabilitational interventions on different notions of what an optimal landscape is after being trained using different selections of images from Flickr and Google Art Project. One was trained to recognize what a "natural wetland" looks like, one was trained to recognize "landscape art," and the last one was trained to recognize best settings to attract gallery visitors' attention. Based on the images and the classification model they are given, the algorithms learn to identify patterns that will then be used to make decisions. The spectrum of possible action is constrained by the datasets: the algorithm only changes the room acclimatization to imitate the wetland categories it has identified in the Flickr photographs, but not to prevent the plants from dying, for example.

The attempt to reduce human involvement in the process makes the particular human biases involved at different stages in the model's training glaringly obvious: starting from the geographical demographics of the platforms' user bases, to the cultural understanding behind the search terms, to the historical preferences in canonized Western art.

Tega Brain, Julian Oliver & Bengt Sjölén, Asunder, 2019.

Asunder

In *Asunder,* which Tega Brain developed with Julian Oliver and Bengt Sjölen, an algorithm trained on Landsat 8 pictures generates fictional landscapes using Google Brain's inpainting technique. The algorithm reconstructs missing parts of an image in such a way that its intervention is unrecognizable. The project combines a conventional Earth model with an atmospheric model, an ocean circulation model and a land-use model to simulate Landsat 8 tiles. *Asunder* starts with a Landsat8 tile of a particular region, uses a GAN algorithm to create multiple geo-engineering proposals, applies one, and then proceeds to interpret the (fictional) development of the tile by looking at the land-use parameters that are input to a climate model. This leads to realistically visualized absurd and desperate scenarios for geo-engineering. Both *Asunder* and *Deep Swamp* respond to the growing interest in AI in relation to current environmental crises, yet they criticize the techno-solutionist approach that is frequently encountered in geo-engineering.

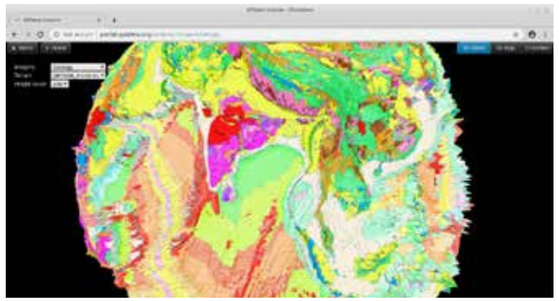
The approaches by Tega Brain and Territorial Agency both address strategies to escape the infrastructural subconscious, either by speculating on AI agency or by refusing to normalize data and entertain its discursive capacities. Both move beyond representational expectations of data and develop critical applications that open up possibilities for alternative data practices.

Data Infrastructures

The works mentioned above also point towards the mechanisms that are set in motion in order to create the data. From the sensors themselves, to the satellites, the servers needed to run the algorithms that decode the data, and the companies providing the services: each of these elements organizes certain relations between technologies, people and things, and perform a particular worldview in doing so.

Seda Gürses and Roel Dobbe use the term "computational infrastructures" to describe the breadth of factors involved in creating and maintaining such infrastructures.[9] Computational infrastructures come "not only with [their] own tools, values and environmental implications, but also with an expansive political economy, propelled by an immense amount of global capital investment."[10]

Earth-sensing software relies on computational infrastructures to gather, analyze, render, and make available data assessed on metrics of optimization and efficiency subservient to venture capital. This in turn is dependent on extractive geo-engineering practices harming Earth. Forefronting the axes of power that make the generation of data possible is a necessary step in the efforts to reconfigure software technoculture otherwise, without being assimilated into it.



GPlates web portal: geology view. Earthbyte Group and Scripps Institution of Oceanography. From the article We Have Always Been Geohackers by Femke Snelting, Helen Pritchard and Jara Rocha.

Depths and Densities

The Underground Division collective, comprized of Femke Snelting, Helen Pritchard and Jara Rocha, propose a form of thinking-with software that may address this point of tension. Thinking-with software for them relies on "engagement with technological objects that is potentially porous to nontechnical contributions; that is: to those by queers, women, people of color, non-adult and other less-entitled contributors."[11]

The Underground Division devized the *Depths and Densities* workshop in which participants were thinking-with GPlates, a free software program and web portal for tectonic plate modelling. They developed "resistant vocabularies, creative misuses and/or plausible f(r)ictions" which would unsettle the extractivist bias present in the software through the figures of disobedient bug reporting and disobedient action research.[12] These methods of doing research attempt to interrupt and transgress the projected production cycle of theory and practice by engaging with reconfigurations of publishing as an epistemic format.

In this case, the group engages with practices of bug reporting as a mode of affirmatively critiquing software "in order to technically equip ourselves with partial and localized repair possibilities, while resisting the production of ever-new and naïve reparative fantasies."[13]

The work of trans*feminist, queer, anti-racist collectives such as The Underground Division critically considers not only the subjectivities produced through "innocent" mechanical observers, but also who has the response-ability in witnessing these acts.

Cosmograms as Infrastructures of Thinking

Engaging with the poetics and politics of infrastructures points towards similar affective strategies, such as those of cosmograms introduced by Lukáš Likavčan in his book, *An Introduction to Comparative Planetology*. Cosmograms, he explains, are "diagrams of intrinsic

logic of our universe," which "present different images that [show] implicit traces of different relations which might be repeatedly applied through different registers of reality."[14] They are abstract mappings of metaphysical, political and material relations between things that display ontological beliefs about how the universe is organized. [15]

He provides five figures as examples of cosmograms: the Planetary, the Globe, the Terrestrial, Earth-without-us, and Spectral Earth. Currently, commercial mainstream technology, including satellite data infrastructure, operates on the vision of the Globe, where Earth is a passive, domesticated container of goods that can be neatly divided and turned to profit. These perceptions can be observed in the design of the technologies we use, which equally depends on a vision of Earth as an object that can be neatly sliced into data. In the *Depths and Densities* workshop, participants flagged the extraction-infused vocabulary of the GPlates software manifested by example in the "grabbing" gesture, which arguably brings up histories of land-grabbing.

Cosmograms could be understood as another form of thinking-with the data worlds generated by computational infrastructures. Thinking-with other cosmograms than that of the Globe as a type of toolmaking for imagination suggests a conceptual direction that is both critical and generative.

Closing Remarks

Being able to observe what is happening around the world, whether it is crop monitoring, forestry planning, illegal logging, pipeline monitoring, oil spills detection, iceberg monitoring, or handling disasters, makes remote sensing a key technology in addressing the present climate urgencies.

The different artistic and theoretical practices that have been mentioned establish possible tactics for highlighting the complexity, uncertainty and ambiguity in Earth observation (EO) software. Their interventions and engagements with the data worlds produced by such technologies generate a shift in attention from matters of fact to matters of concern, thus allowing for the response-ability of a broader group of people outside the scientific experts and commercial planners currently dominating the field, including those who are subjected to the forms of violence spurred by the currently dominant cosmogram.

And while attempting to repurpose the Globe-imbued logics of EO software for scalable political action without perpetuating its cosmogrammatic insinuations, there is an urgent need to create moments of witnessing the techno-social practices that govern everyday life and to gesture towards anti-colonial, non-extractive forms of relating to Earth which attest to its complex, unknowable assemblage. And for that there is generative potential in the transformative acts of disobedient thinking-with witnessing technologies, the refusal to normalize data processes, the experimentation with non-violent data worlds, or the work through alternative cosmograms.

April, 2021

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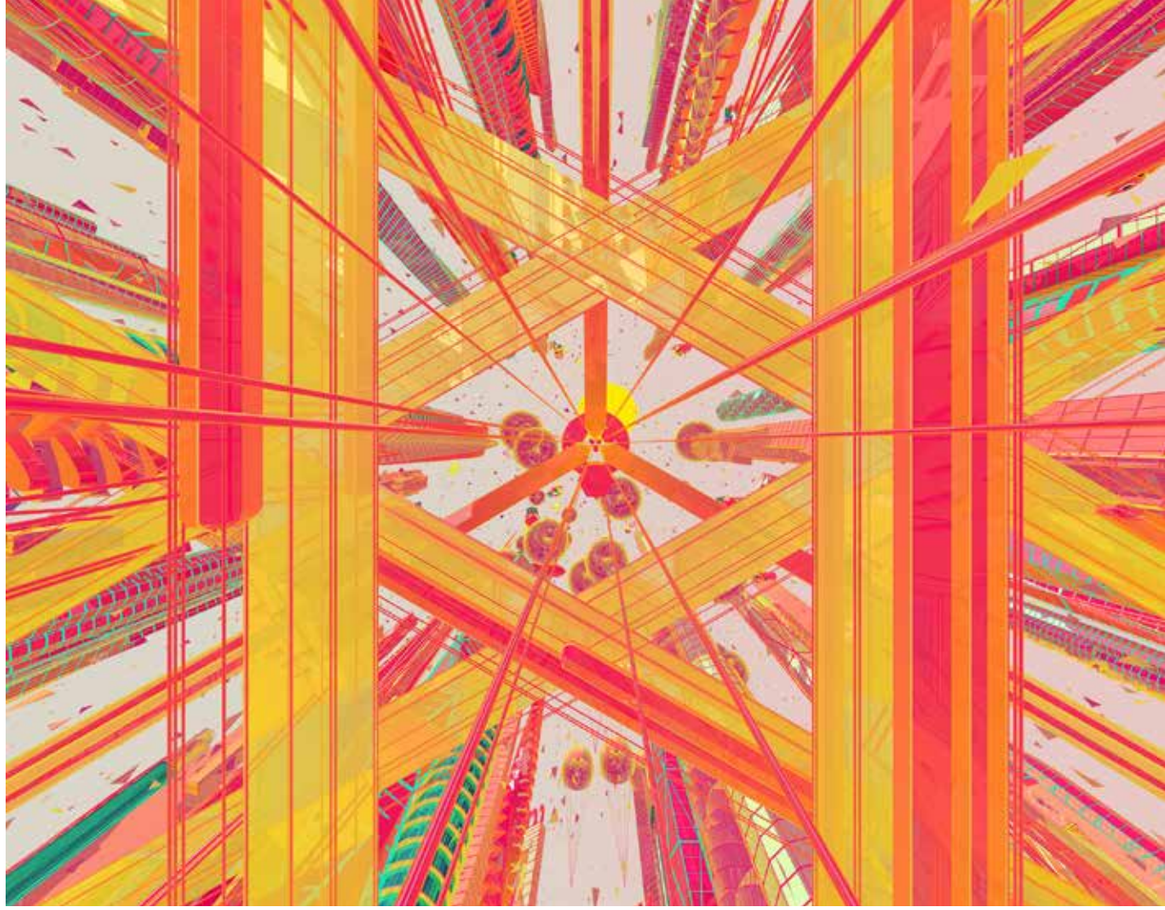


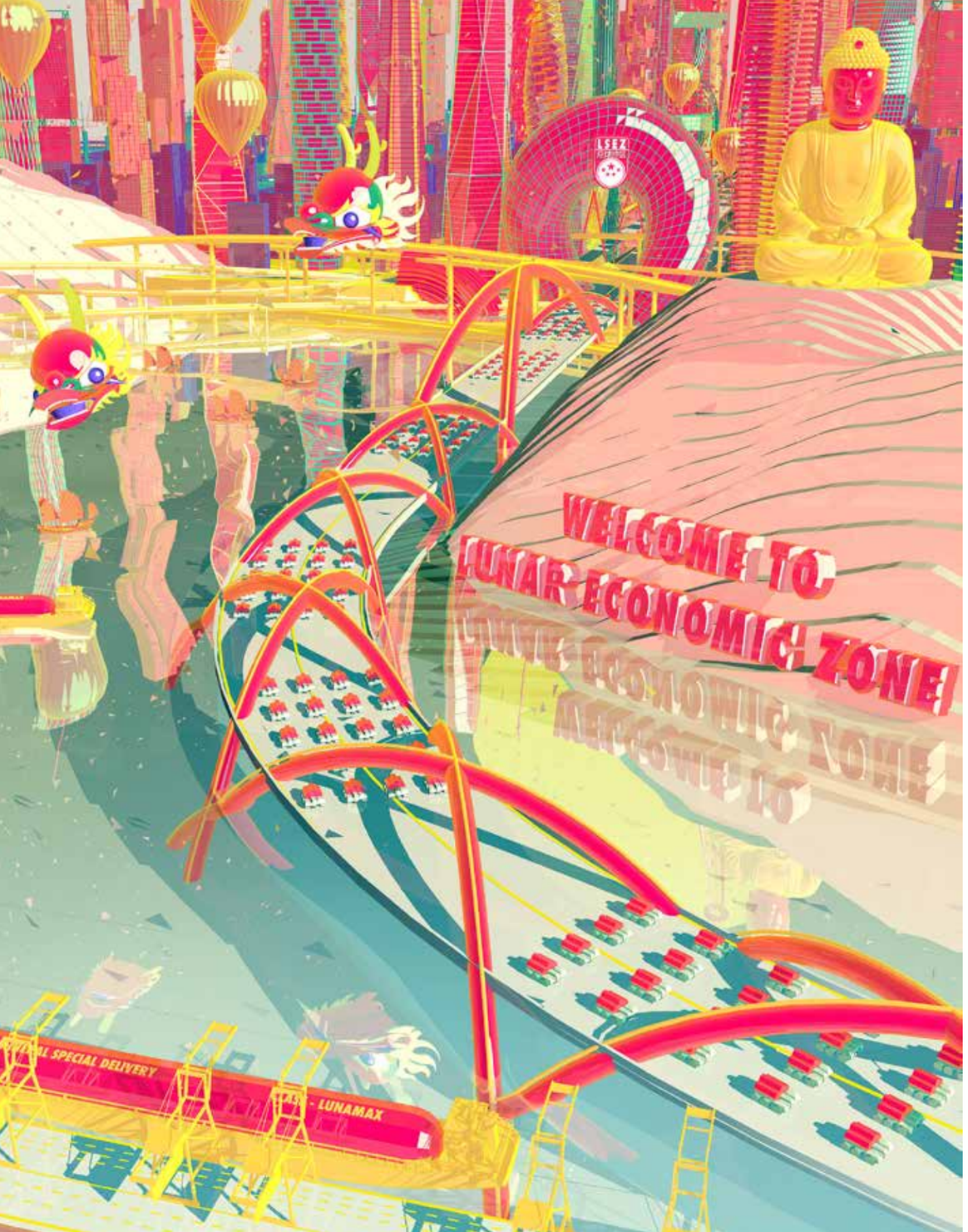
Lunar Economic Zone

ZHAN WANG

Lunar Economic Zone is a fictional place in the future where the urban landscape of the Chinese city of Shenzhen meets the moon: a fantastical creation in fluorescent pink, orange and yellow. On 15 August 2028, a festive parade will be held here to celebrate the arrival of moon minerals on Earth: the "Mid-August Day Lunar Mineral Parade." An endless space lift takes the parade visitor to the main mineral port, the beating heart of the technological space city. The scene is at once familiar and alienating: a satirical exaggeration of the modern Chinese city. Impressive agglomerations of skyscrapers, bridges and roads are framed by dragons, Buddhas and hot-air balloons. Tradition is also given a place in this city of the future, albeit distorted, discolored and different. The natural landscape has been replaced by a fabricated environment. This fictional digital reality is built with and uses moon minerals. It is a far cry from today's reality: as the largest producer of rare earth minerals, China dominates this market. *Lunar Economic Zone* gently confronts the viewer with the consequences of increasing Chinese expansionism by extending it to a still relatively undiscovered technopolitical zone: the moon. *Lunar Economic Zone* weighs the propaganda of a technotopical future against our fears and desires. Who has control over earthly minerals? Will the moon be colonized if earthly resources run out? Who can stop this global depletion?

Zhan Wang. *Lunar Economic Zone*, 2019.


CLASS - LUNAMAX



Deep Politics

LUKÁŠ LIKAVČAN

I.

Verticality has acquired a bad reputation. It is seen as an unwelcome symbol of oppression, domination, or control, with connotations of hierarchy or even coercion. However, I would argue that the very idea of verticality requires more critical appreciation than it usually receives. I am not referring to the commonplace declaration that a middle way is needed between horizontality and verticality, or that a combination of both principles is necessary in political organization and social vision. Instead, I want to make verticality relevant in the register of politics-to-come that is slowly being articulated in the Earth layer as an intersection between geophysics, geochemistry, geoeconomics, and geotechnology. This politics-to-come stems from a less geopolitical and more geological notion of verticality—the vertical axis of historical layers rather than that of the hierarchy of power. By uncovering this register, we may even come to realize that "politics" is a helplessly imprecize designation of what is going on. For the time being, however, I use the word "politics" in a vague and somehow equivocal manner to denote wildly different registers of normativity, which will be distinguished over the course of my argument. While I depart from the field of *political* ecology, my contention is that the very term "political ecology" simultaneously leads to my conclusion and prevents us from reaching it.

> "[O]f all sciences of inert matter thermodynamics is the nearest to man's skin—literally, not figuratively."
>
> **Nicholas Georgescu-Roegen**, *The Entropy Law and Economic Process* (1971)

II.

Living in the highly transient geopolitical space of Eastern Europe, I have an intuitive sympathy for the intellectuals whose key scientific contributions can help us understand the unravelling ecological emergency of the twenty-first century. The most prominent among them is the Romanian economist Nicholas Georgescu-Roegen who, in his groundbreaking book *The Entropy Law and Economic Process* (1971), developed the foundations of contemporary ecological economics—a discipline that brings economic phenomena down to earth by treating them as material and energetic flows in the socioeconomic metabolism. His intuitions align very well with the idea of the Earth layer as a site of planetary metabolisms, with the idea of the Stack itself as an amalgamation of apparatuses with particular appetites and digestive properties. At the same time, Georgescu-Roegen tackles the metaphysical idealism at the roots of modern economics, an idealism so extreme that even Hegel would be an appropriate pharmaceutical, at the proper dose. This idealism, which assumes that economic processes are reversible, conflicts with the findings of *thermodynamics*, the branch of physics that studies heat exchange. Together, the two fundamental laws of thermodynamics—that the total energy of the universe remains constant, and that the entropy of the universe always increases—mean that any energy transformation contains an irrevocable qualitative change of available energy (which can be transformed into mechanical work) into unusable waste energy. Entropy is an index of this change: the more unusable energy exists in a system, the higher its entropy. All processes that involve thermodynamics are thus irrevocable, and while we may observe many local "islands" of stable, low entropy (such as our solar system, including the Earth and its biota), the flow of energy in the *entire* universe has only one direction.

III.

What are the economic implications of thermodynamics for the Earth layer? According to Georgescu-Roegen, thermodynamics brings to economics an element of *historicity* that can be best expressed by modelling economy as a process. The economic process consists of *funds*—land, capital, and labor power—and *flows*, which can be divided into *input* flows (natural resources, such as rare earths or solar energy; materials transformed in production processes, such as glass or metal; flows maintaining capital, such as spare parts of machines) and *output* flows (commodities, taken as products of an economic process, and waste). It is precisely the non-identity of input and output flows that makes the model truly thermodynamic, since it both includes the moment of qualitative change in the process *and* accounts for waste as one output flow in the form of latent energy or dissipated matter. In contemporary ecological economics, this "flow-fund model" has evolved into a vision of the economic process as an *artificial metabolism*. Mario Giampietro, Kozo Mayumi, and Alevgül H. Sorman, the authors of *The Metabolic Pattern of Societies* (2012), demonstrate that—just as an organism takes in food from its environment, decomposes it into basic energy carriers and nutrients (*anabolism*), turns them into new biochemical compounds (*catabolism*), and maintains an equivalent output of waste and residual heat—the economy can be understood as a giant metabolism of sorts. The crucial implication is that metabolism is possible insofar as there is an environment that provides sunlight, water, and nutrient sources and guarantees optimal temperatures and other climate conditions. On the side of the metabolic process, the imperative is thus to produce or reproduce the environmental conditions that allow for its continuation. In the case of the artificial economic metabolism of the Stack, the question is, then, how should these environmental conditions be produced or reproduced?

IV.

How to navigate through the potential answers to this question? Seen from the vantage point of philosophy, the metabolic paradigm suggests that *thermodynamics has normative implications*. It is a consequence of the irrevocability of material and energetic transformations in economic processes, since it poses constraints on how the viable environment of the artificial metabolism can be produced or reproduced. In other words, the figure of the *limit* diagrams a space of possible futures of the artificial metabolism of the Stack. This aligns with my observations that:

> If chemistry is political, politics is also chemical; or in other words, politics always involves the operation and manipulation of chemical compounds and processes … politics as we know it is contested by the fluid, dynamic and precarious realities of politics-to-come, where every action can be read as a chemical process in the planetary ecosystem, since it is linked—directly or indirectly—to carbon emissions, metabolism of methane and nitrogen, acidification of the oceans, and so on.[1]

These processes include forest fires with massive impacts on the global climate, the geopolitics of oil, or the EU's approach to the eventuality of a no-deal Brexit as a major natural disaster. In this essay, I would like to elaborate on this line of thought with the claim that, given the normative importance of thermodynamics, planetary metabolisms (the procedural substrate of the Earth layer) constitute a landscape of *deep politics*.

V.

In debates about normativity, invoking scientific knowledge of nature is always tricky. One tendency is to hastily presume the latent normativity of the natural world through analogies to the more familiar political and ethical normativity of the social realm—transferring motifs between Malthusianism and Darwinism in the nineteenth century, or anthropomorphizing beehives or anthills as urban designs of sorts. Another tendency is to identify primordial templates of political and ethical normativity in nature, seeking thus an ultimate authority for certain laws, customs, actions, or decisions—Rousseau's noble savages, Schmitt's *justissima tellus*, Kropotkin taking cues for anarchist politics from the cooperative behavior of other animals, as well as attempts to naturalize strategies of heteronormativity, patriarchy and white supremacy). Neither direction is tenable for deep politics, which claims instead that there are degrees of normativity in the natural world, but not of the same provenance as political and ethical normativity, although both politics and ethics genealogically emerge from this latent space. Normativity in ethics, for example, denotes standards of individual behavior in morally relevant situations; when we invoke values such as equity or justice, we cross the boundary of ethics towards politics, where we deal with the public negotiation of values, either in discursive fields (diplomatic negotiations, public debate, protest marches) or nondiscursive fields (blockades, street fights). Just as we can clearly distinguish ethical and political normativity, I argue that we can also recognize *ecological normativity*, which is distinct from other domains in the sense that it cannot be negotiated in the same manner as political normativity, nor strongly associated with ethical judgments about what is good and bad.

VI.

Ecological normativity explains what deep politics is and how it relates to political ecology: it is not an extension of politics as we know it, politics as the public negotiation of values, to the sphere of ecology, but a deduction of a hidden layer of politics-to-come from ecology, with its own laws, struggles, and actors. The imperative of ecological normativity, then, is clearly *not* to "follow nature," but to pursue species-specific normative projects (in ethical and political domains, for example) without running into sharp conflict with the older layers of normativity. Returning to the concept of verticality at the beginning of this essay, the "deep" in "deep politics" indicates that the realm of normativity is modelled on geology as a layered topology, where each new layer extends and even overcomes older layers. Older layers are conditioned by newer layers, which thus remain constrained (but not fully determined) by older layers (for example, the thermodynamic boundaries imposed on artificial metabolism). That gives the agents in the most recent layers a maneuvering space that is surprizingly generous, even allowing for interventions at the planetary scale usually referred to as "geoengineering." The ecological normativity of deep politics implies that the political situation of climate crisis that we are witnessing is a struggle over the chemical composition of the atmosphere, not over the discursive composition of the noosphere.[2]

It also instructs us to judge technology—understood as *exosomatic instruments*, following mathematician Alfred Lotka—not through alignments between the essence of technology and the environment in which it is deployed, but through strategies for production and reproduction of the viable environmental conditions of the *artificial* metabolism already taking place. As Georgescu-Roegen wrote, "Man's existence is now irrevocably tied to the use of exosomatic instruments and hence to the use of natural resources just as it is tied to the use of his lungs and of air in breathing…"[3]

VII.

The last remark should be read as an unexpected twist to Georgescu-Roegen's vision of the economic process, underscored by the advent of planetary-scale computation. Given that the historical unfolding of the artificial metabolism is also irrevocably oriented in only one direction, what originally started as an innocent evolution of exosomatic instruments has now matured in the Earth layer of the Stack, to the extent that "instrumentality" is no longer a proper term to define what contemporary exosomatic apparatuses are doing. Perhaps "exosomatic" is not even the right word anymore, as it becomes increasingly difficult to recognize planetary-scale computation as a prosthetic extension of human organs. Consequently, the Stack gradually approximates the regime of ecological normativity, which is precisely *not* the same thing as naturalization of computation in political terms. We are no longer in a situation where a question of technology could be phrased in terms of ethical-political normativity. What started in basal ecological normativity has revolved, in the manner of a Möbius strip, back to the point of its departure, back to ecological normativity—this time embodied in what authors such as Jennifer Gabrys have called "the becoming environmental of computation."[4] Whatever the future ethical and political programming of the Stack (which is not in itself a thing to be programd, but first and foremost a structured model of the historical conditioning of the involuntary cosmopolity), it will be bound by the emergent, yet irrevocable, presence of planetary scalings and computational processes. And hence, whatever interventions we take against the runaway climate catastrophe, it will be impossible to avoid addressing the vision of both *geo* and *engineering* upon which they will rely.

April, 2021

1 Lukáš Likavčan, *Introduction to Comparative Planetology* (Moscow: Strelka Press, 2019), 8.
2 In the Eastern-European intellectual tradition, the term "noosphere" first appears in writings of Vladimir I. Vernadsky, who used it to describe a generalized sphere of human intellect or discursitivity, forming a new layer of the planetary system. See Eglė Rindzevičiūtė, "Soviet Policy Sciences and Earth System Governmentality," *Modern Intellectual History* 17, no. 1 (2020): 179-208.
3 Nicholas Georgescu-Roegen, The Entropy Law and the Economic Process (Cambridge: Harvard University Press, 1971), 21.
4 Jennifer Gabrys, "The Becoming Environmental of Computation: From Citizen Sensing to Planetary Computerization," *Tecnoscienza* 8, no. 1 (2017): 5–21.

Approximation (eyes of the world)

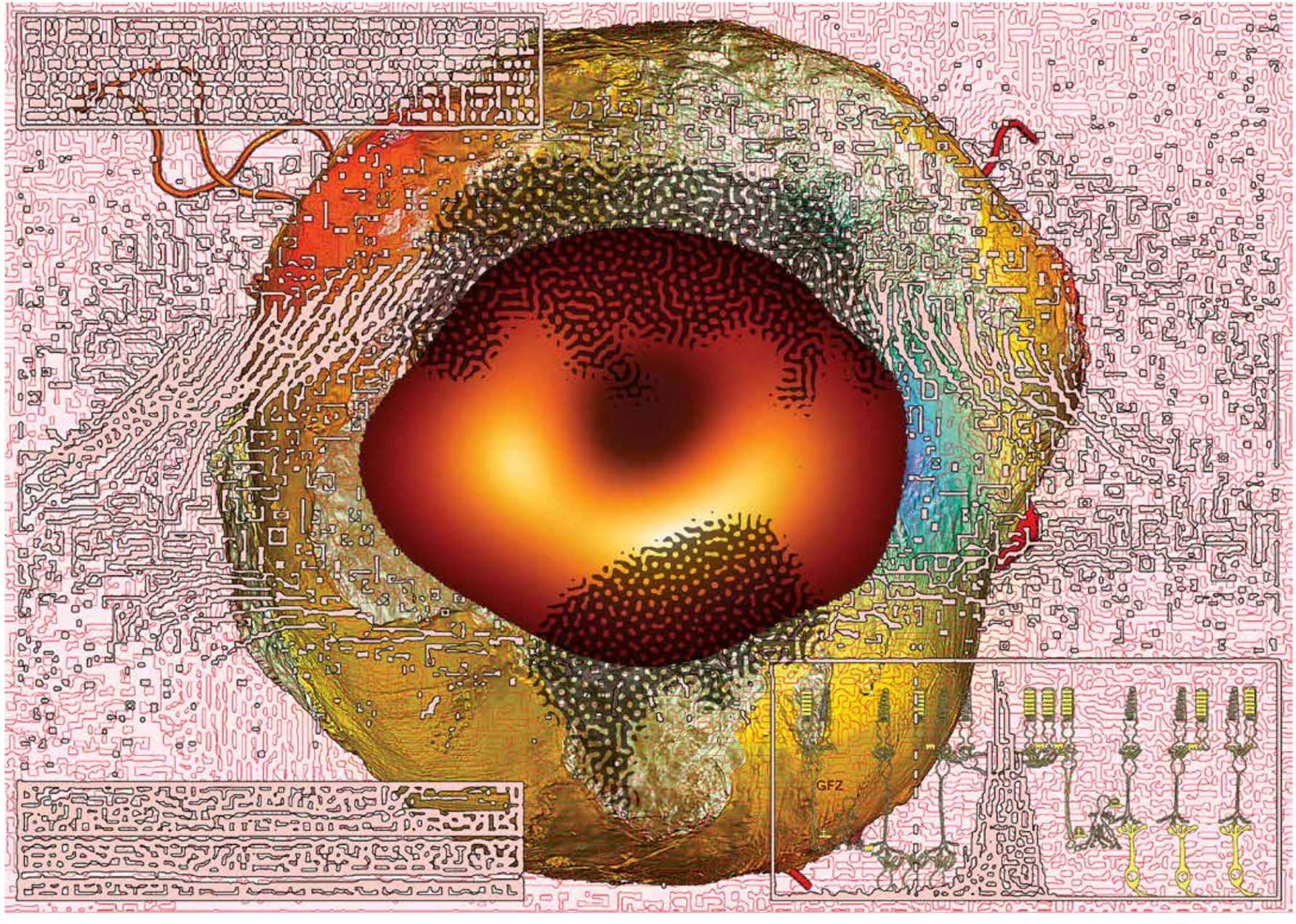
KATJA NOVITSKOVA

How do we represent technological narratives? Katja Novitskova delves into our relationship with technology, and the stories we tell with and about it. *Approximation (eyes of the world)* unifies technology, science, culture and biology, which together broaden our view of the cosmos. *Approximation (eyes of the world)* is a visual representation of the way in which algorithms process the world. The software that Novitskova used for this is based on the work of the mathematician Alan Turing, who in the previous century tried to use mathematical formulas to fathom biological patterns. Novitskova's work draws on similar research, which she explicitly extends to culture and aesthetics, in addition to mathematics, technology and biology. *Approximation (eyes of the world)* is a compilation of various photos that Novitskova then processes individually with a software program. A news photograph of a black hole is combined with images of an iris scan, used for personal identification, and two rhinoceroses captured by a drone with an infrared camera. Each image has a technological and cultural reference on both the maximum and minimum scales. They go beyond the boundaries of the body and the universe. From the iris to the black hole: inside and outside do not exist in this visualized reality. What connects the various images is that they have all been read by a machine, and then translated into images that the human eye can see. Novitskova then combines all the images in an aesthetic representation that merges technology, biology, science and culture.

Katja Novitskova. *Approximation (eyes of the world)*, 2021.

KATJA NOVITSKOVA

APPROXIMATION (EYES OF THE WORLD)



Matter, Spirit, AI

JORDI VALLVERDÚ

Can Artificial Intelligence (AI) be understood as a universal success of human intelligence, or does it show differences in its design based on location? Is its design polarized on Western and Asian areas?

Shared Lineage

If we backtrack to the foundational philosophies behind AI, there is no such a thing as an AI and robotics paradigm specific to Western or East Asian research.

The cognitive sciences, a multidisciplinary research field encompassing AI, psychology, neuroscience, philosophy and linguistics, employs three main theoretical approaches. Firstly, the cognitivist computational-symbolic approach, which analyzes the mind in terms of computations and information processing according to identifiable logical rules. Secondly, the connectionist-dynamic line of reasoning, which analyzes the mind as a network that produces regular and definable behavioral dynamics. It models mental or behavioral phenomena as the emergent processes of interconnected networks of simple units. Lastly, the embodied-enactive approach, which interprets cognition as emerging from the activity of embodied agents, for in order to function in the world, we must be embodied within it.

According to Pickering (1997), the interest in reducing mental life to computational procedures led experts to move from cognitivism to connectionism, opening the door to a fruitful interaction with Buddhism. Connectionism shares common ground with Buddhism in that it considers behavior as resulting from connections and relationships, rather than being caused by a biological processor that acts like a CPU. Buddhism, like connectionism, does not perceive any central self that controls the actions of the body, only the interaction of *khandas* or aggregates. In the (third) school of enaction, autopoietic automata offer a framework for investigating computational and complexity issues in the evolutionary self-reproducing processes. In this way, the Cartesian body-soul dualism is remediated.

In short, from the perspective of sciences of the mind from the second half of the twentieth century until today, there is a shared lineage between East Asia and Euro-America with regards to the creation and simulation of artificial intelligence.

At the engineering and programming level, too, scientists in both parts of the world follow a functionalist approach to AI and robotics, embracing the universal might of these technologies. Yet there are differences, on geopolitical and economic grounds as well as in the domain of social reception.

Geopolitical Race

There is a true race for AI leadership in all areas of the world, with three main actors: China, the EU, and USA. But the truth is that semiconductors are entirely produced in Asia, and according to the World Intellectual Property Organization, leading tech companies in South Korea and Japan (in that order) have the highest number of AI patent filings.

Analysis shows that AI and current techniques (machine learning, deep learning, NLP) are being implemented in a similar way by the TOP 5 worldwide companies, four based in the US (Amazon Web Services, Google Cloud Platform, IBM Cloud, Microsoft Azure) and one in China (Alibaba Cloud, although its founder Jack Ma defined it as "Alibaba intelligence").[1]

Social Reception

The multidimensional implications of the design of AI systems inevitably touch upon questions relating to notions of identity, self, autonomy, morality or spirituality,[2] to name but a few, that are all quite sensitive to cultural nuances.

How engineers, designers and audiences approach these questions is deeply influenced by the cultural framework within which they work. Cultural heritages, specifically those related to the religious or spiritual understanding of reality, shape how AI experts conceive and develop some of their AI systems.

Despite these points of convergence between East Asia and the West in the philosophy of mind, we can still identify two broad cultural traditions in popular science and popular culture. On the one hand, there is the shared characteristic of Western dualist metaphysics, shaped by ancient Greek thinkers, Christian beliefs and scholarship, and the rationalistic techno-scientific worldview that began to emerge during the so-called Enlightenment. On the other hand, there is the consistent element of ideas found in monist traditions from China (Confucianism, Taoism), Korea and Japan (Buddhism, Shintoism).

An important aspect of the Western tradition is the understanding of reality through the dual aspects of matter and spirit, which maps again onto the dualities of body and mind, earth and heaven, temporal and eternal, approximate and perfect, sinful and virtuous, object and subject, nature and human, et cetera. The Asian monist traditions tend to dilute the notion of the uniqueness of human subjectivity, as well as defend the continuity between humans and other entities. (This is understood as "animism" or even "pantheism" in European philosophical traditions and is basically considered heretical in the Christian mindset.) In short, monists maintain that all reality shares the same nature, while dualists differentiate between two fundamental aspects of reality.

This distinction is even greater in relation to AI implemented in robotics, which is surprizing, because in terms of the technologies applied there is no real difference to speak of.

So, despite AI and robotics researchers around the world using similar parameters, models, and tools in their work, they differ significantly in their *perception* of such machines or so-called intelligent systems. (Recent empirical studies have shown that these differences manifest themselves even on the level of the cognitive processing mechanisms involved.[3])

In Japan, Buddhist engineers like Masahiro Mori even defend the divine nature of robots.[4,5] His philo-

Connectionism shares common ground with Buddhism in that it considers behavior as resulting from connections and relationships, rather than being caused by a biological processor that acts like a CPU.

sophical analysis goes beyond the basic identification of human and divine natures, and also considers the notion of free will. Mori affirms that a robot follows the rules programd by a human, and therefore can act as if it is free, although it isn't. On the other hand, when a human acts, "every movement of my hands or feet, every blink of my eyelids, is the result of the Buddha's will. There is no way in which a human being's body or mind can separate itself even momentarily from the Buddha's laws." To express it differently, in the words of Yuian Iwasawa: "every single hair contains the Buddha nature."[6] Therefore, because Buddha directs the actions of humans and robots, there is no real difference between human and robotic nature and actions: everything is imbued with the Buddha nature.

Most studies in China, South Korea and Japan reveal that Confucianism, Daoism, and Buddhism shape particular attitudes towards robotics that not only tend to be much more friendly than the mistrust that is much more ubiquitous in the West: they also include spiritual dimensions.

This also allows robots to fulfil very different roles in society in China, Korea or Japan when compared to Western countries. In the Asian sphere, robots often perform religious duties in important shrines or temples. In March 2019 a new robot was stationed at Kodaiji Temple (Kyoto, Japan). Mindar, as it is called, is a robotic Buddhist priest modelled after Kannon Bodhisattva, the Buddhist Goddess of Mercy. This $1 million robot was created by Hiroshi Ishiguro Laboratories at Osaka University, famous worldwide for its perfect humanoid robots called Geminoids. Its main duties are to preach as well as transmit Buddhist ideas to new generations or audiences. Pepper robots (designed by SoftBank Robotics) have been used at different Buddhist rites in Japan, and in China, Xian'er, a robotic monk, performs Buddhist priestly duties at Lonquan Monastery.

In Western countries, although one of the first automata was Juanelo Turriano's famous monk, circa 1565, only one experimental Protestant priest-robot has been identified: BlessU2.[7] Western religions show significantly less interest in incorporating robots into their cults.

In 2011, as part of the (wonderful) JSPS fellowship I obtained at Nishidalab at Kyoto University, I studied Human-Robot Interactions (HRI). I conducted research into the extent to which the assumptions humans have about the skills robots possess affects their interaction with them. Also, I was interested in what differences could be observed between two groups of subjects. One group consisted of Koreans, Japanese, and Chinese, while the second group consisted of Europeans, North Americans and Canadians.

After performing multiple one-on-one sessions in which a human interacted with a robot, two patterns were identifiable.[8] First of all, and not surprizingly, it was clear that the more human or advanced one considers a robot, the more one treats it as a human. Secondly—and this was a surprize for me—there were strong differences in behavior between the Asian and the Western groups. In a nutshell: Asians treated the robot with respect and considered it to be almost human while Westerners touched the robot without reserve, observed it very closely, and in general interacted with it without politeness. They treated it as a machine, not as a sentient being.

At emotional, affective and sexual levels, there are again profound differences between cultural attitudes towards robots. When AI, robots and humans are considered to share the same existential level, this apparently opens up the possibility that a robot may have an identity. In 2009, 27-year-old Nene Anegasaki from Tokyo married the computer avatar of a character in a Nintendo DS game. In 2018, 35-year-old Akihiko Kondo married the cyber celebrity hologram Hatsune Miku, projected by a Gatebox machine.

The attitude toward robotics and AI in Japan, South Korea and China also normalizes the existence of artificial friendships. In Japan the cultural code of *otakuism* emerged, in which traits that are desirable in humans are recognized in sex robots.[9] Although initial innovations were developed in Europe and the US, the production of sex robots is experiencing a boom, especially in China.

Relating to robots as sentient beings capable of friendship and love has become part of certain East Asian cultures, but is not only reserved for humanoid robots. Owners of AIBO (the Sony robot cat or dog) not only overestimated the real skills of their pets,[10, 11] but also considered them as a part of their family and even buried them in sacred places. For example, in 2018 the Kofuku-ji Buddhist temple in Isumi, Japan, conducted solemn funeral rites for 114 AIBO.

Furthermore, the famous Moral Machine experiment by MIT revealed a strong divergence between different cultural clusters in the perception of the possible morality of AI.

AI is the core of the new economy, the new politics and the new scientific knowledge, and is therefore the most fundamental tool for any contemporary society.

Different cultural embedding of AI and robotics also opens up different scenarios for the participation of AI in government and legal processes. The implementation of AI in Chinese society leads to unprecedented precision in the scrutiny of citizens' behavior (which is not necessarily perceived as unethical), where the role of AI in policing, in legal decision-making, or in liberal democracies is met with a lot of suspicion.[12] And although a shared universal AI legislation with transversal values could theoretically be achieved,[13] every nation also wishes to maintain control over its own resources, and AI is among the most valuable of these. We cannot say that these strongly distributed population responses are biases. They represent the real understanding of such populations about the core values of reality.[14, 15] In this sense, when we talk about human perception of robotics, there isn't a single objective reality. Different human populations react differently to the same inputs.

This is surely the most important lesson from all studies on HRI and social robotics: we will have a rich set of robotic devices adapted to the characteristics of local populations that will affect how robots behave in terms of bodily movements, speech design, embedded moral codes, and ways of establishing a successful interaction with humans at a cognitive level.

I would argue that we must look at such variations as the success and essence of humanity: the co-existence of multiple ways of dealing with reality. This is one of the finest qualities of human populations: despite sharing the same bodily starting point, humans design different heuristics, languages, strategies, traditions, spiritual, aesthetical and ethical perspectives. And this will be preserved with the new companions of humans in the close future: robots like us, different but also similar.

December, 2020

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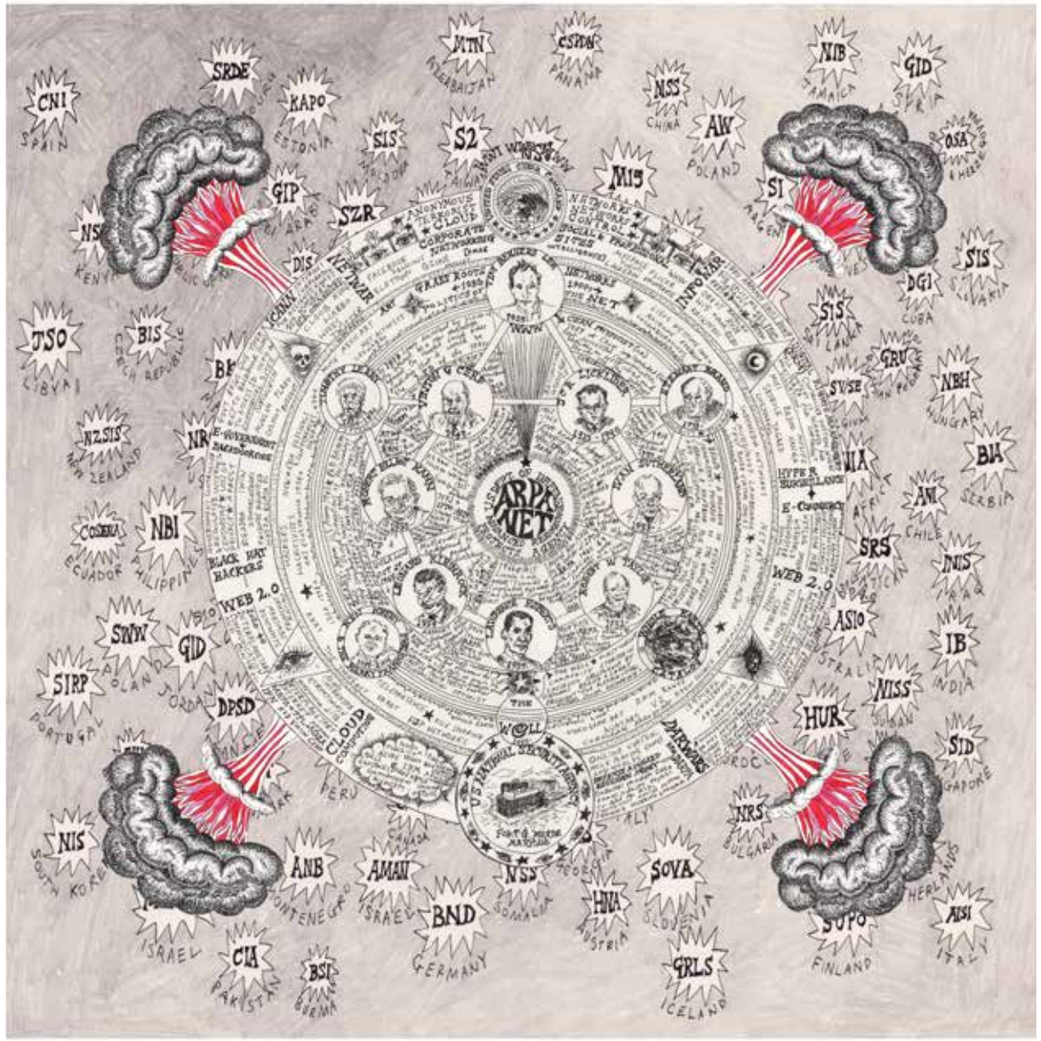
HEXEN 2.0

SUZANNE TREISTER

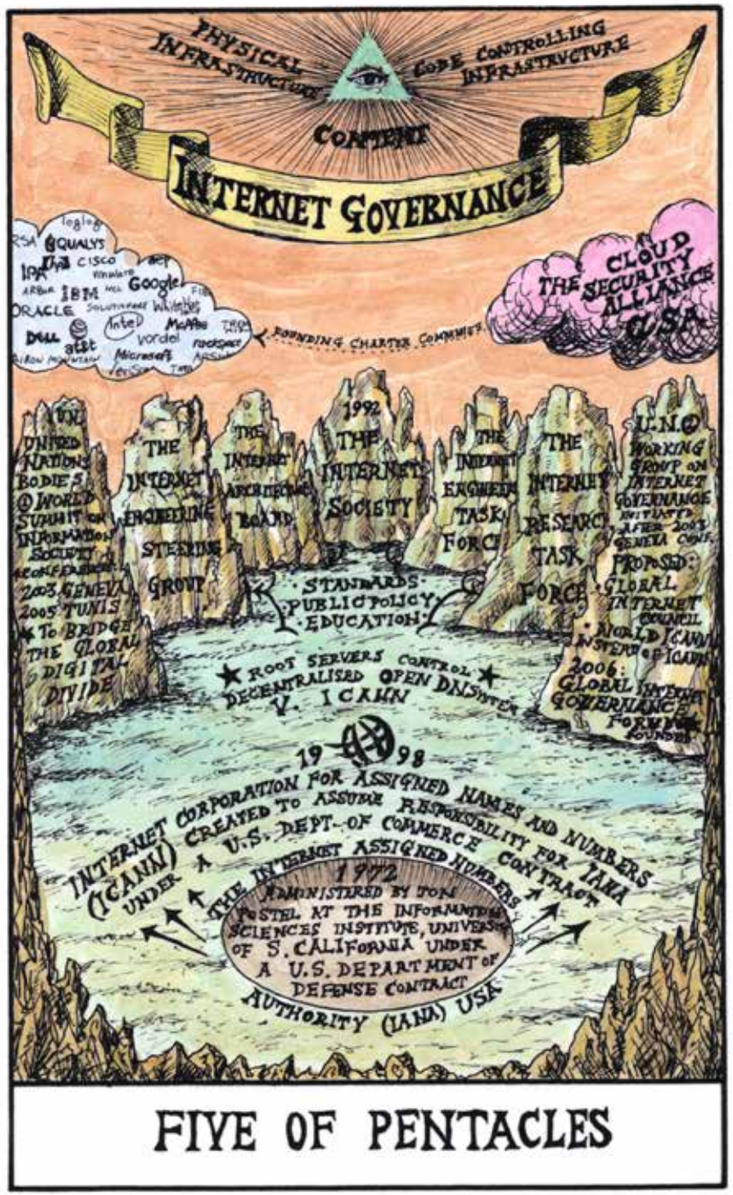
Suzanne Treister's tarot card game is a cosmological, mystical reading of the Internet. The hand-drawn and inscribed cards represent major figures in the history of the Internet as a space for ambiguity, occultism and mysticism—from cybernetics to psychedelics, and from mathematician Nortbert Wiener and psychologist and psychedelics expert Timothy Leary to cultural anthropologists Gregory Bateson and Margaret Mead. These figures are the archetypes of the history of the Internet, and are depicted by Treister as personified timeless patterns. Through the tarot cards they tell the story behind the development of communication media, the Internet and Web 2.0 with a different vocabulary. Treister highlights the social, scientific and psychological, rather than the technological patterns of this troubled history. *HEXEN 2.0* shows what consequences these new systems have had on the social manipulation of the masses, which ultimately took shape as today's surveillance society. The choice of tarot cards plays a crucial role in this: it links the history of the Internet to more esoteric phenomena and developments in the collective unconscious. *HEXEN 2.0* opens up a more esoteric world in which other rules apply and thus poses the question of whether the past, the present and the future cannot be interpreted and designed differently. From what intentions and ideologies did the Internet emerge, and what is left of them today? Can the Internet—a system in which the market dominates—be a space for the occult, the mystical and the personal? *HEXEN 2.0* also portrays the development of the Internet as an esoteric and mystical history.

HEXEN 2.0: From ARPANET to DARWARS via the Internet



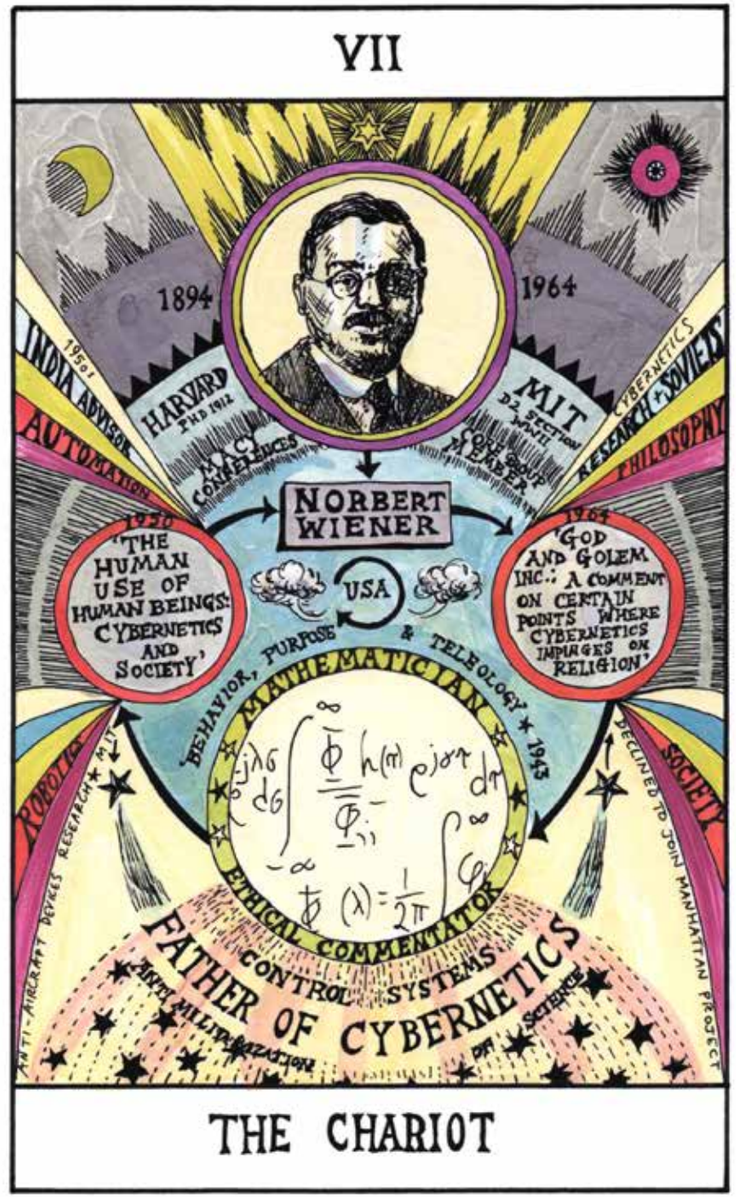
Suzanne Treister. *HEXEN 2.0 /Historical Diagrams / From ARPANET to DARWARS via the Internet*. 2009–2011. Courtesy the artist, Annely Juda Fine Art, London and P.P.O.W. Gallery, New York

Suzanne Treister. ***HEXEN 2.0/Tarot/Five of Pentacles–Internet Governance.*** **2009–2011. Archival giclée print with watercolor on Hahnemuhle Bamboo paper. 29.7 x 21 cm. Courtesy the artist, Annely Juda Fine Art, London and P.P.O.W. Gallery, New York.**



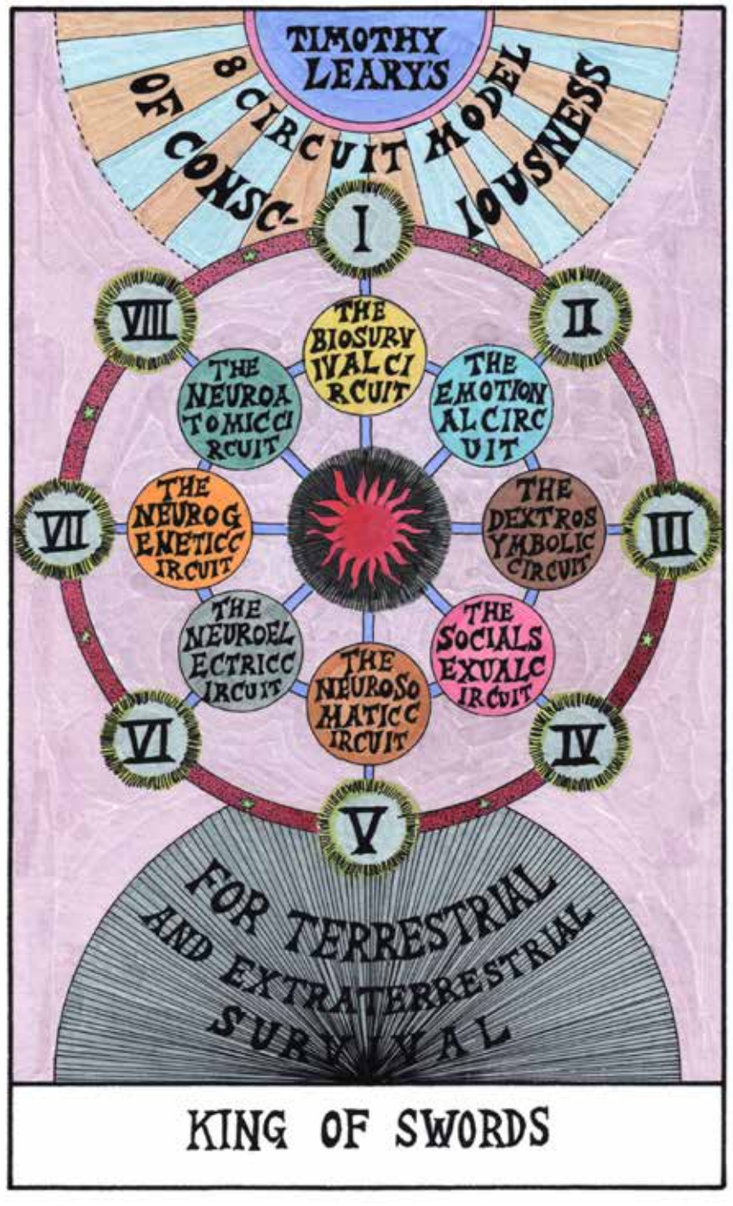
FIVE OF PENTACLES

Suzanne Treister. ***HEXEN 2.0 /Tarot/VII The Chariot–Norbert Wiener.*** **2009–2011. Archival giclée print with watercolor on Hahnemuhle Bamboo paper. 29.7 x 21 cm. Courtesy the artist, Annely Juda Fine Art, London and P.P.O.W. Gallery, New York.**



THE CHARIOT

Suzanne Treister. ***HEXEN 2.0/Tarot/King of Swords - 8-Circuit Model of Consciousness***. 2009–2011. Archival giclée print with watercolor on Hahnemuhle Bamboo paper. 29.7 x 21 cm. Courtesy the artist, Annely Juda Fine Art, London and P.P.O.W. Gallery, New York.



Suzanne Treister. ***HEXEN 2.0/Tarot/VI The Lovers–Margaret Mead and Gregory Bateson***. 2009–2011. Archival giclée print with watercolor on Hahnemuhle Bamboo paper. 29.7 x 21 cm. Courtesy the artist, Annely Juda Fine Art, London and P.P.O.W. Gallery, New York.

CLOUD
CORPORATE NETWORKING
SOCIAL & PROFESSIONAL SITES
CONTROL
NETWAR
INFOWAR
ICANN INTERNET CORPORATION FOR ASSIGNED NAMES AND NUMBERS
FACEBOOK
DELICIOUS
ELFTOWN
QZONE
CLOOB
XING
HABBO
HYVES
TWITTER
WIKIPEDIA
MYSPACE
FLICKR
LINKEDIN
VKONTAKTE
ORKUT
HI5
KAIXIN001
BEBO
RYZE
1990 ARPANET SHUTS DOWN
GRASS ROOTS
POLITICS OF
NETWORKS
THE NET
ART
ASCII ART
NET ACTIVISTS
TIM BERNERS LEE
1955-
WWW
CERN PHYSICIST (UK)
TIMOTHY LEARY
1920-1996
PSYCHOLOGIST
VINTON G CERF
1943-
J C R LICKLIDER
1915-1990
STEWART BRAND
1938-
BIOLOGIST
STANFORD
ROBERT ELLIOT KAHN
1938-
IVAN SUTHERLAND
1938-
TCP & IP
LEONARD KLEINROCK
1934
ROBERT W TAYLOR
1932-
LAWRENCE ROBERTS
1937-
KEN KESEY & THE MERRY PRANKSTERS
1935-2001
WHOLE EARTH CATALOG
U.S. DEPT. OF DEFENSE
ARPA NET
ADVANCED RESEARCH PROJECTS AGENCY
E-GOVERNMENT
BACKDOORCODE
BLACK HAT HACKERS
HACKERS
HACKTIVISTS
NEW MEDIA FESTIVALS
WEB 2.0
5.0
2020 4.0
INTERPLANETARY COMMUNICATION AND CONTROL
THE THING.NET
TELEPRESENCE
VR ART
P2P NETWORKS
FILE SHARING
WHOLE EARTH
CLOUD COMPUTING
THE WELL
1985-
NATIONAL SECURITY AGENCY
DARWARS
DARPA
DEFENSE ADVANCED RESEARCH AGENCY
ONLINE VIRTUAL ROLE PLAYING GAMES AND WORLDS
AVATARS
VIDEOGAME ART
CORPORATE PARODY ART
OPEN SOURCE MOVEMENT
DIGITAL RIGHTS MANAGEMENT
HYPER SURVEILLANCE
E-COMMERCE
NET ART
TACTICAL MEDIA
INDYMEDIA NETWORKS
NSA
SIS
DGI
CUBA
SLOVAKIA
SRI LANKA
GRU
RUSSIAN FEDERATION
SV/SE
NBH
HUNGARY
BIA
SERBIA
ANI
CHILE
SRS
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IRAQ
ASIO
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KENYA
TSO
LIBYA
BIS
CZECH REPUBLIC
NZSIS
NEW ZEALAND
COSENA
ECUADOR
NBI
PHILIPPINES
SWW
POLAND
GID
JORDAN
SIRP
PORTUGAL
DPSD

Lubricate Coil Engine

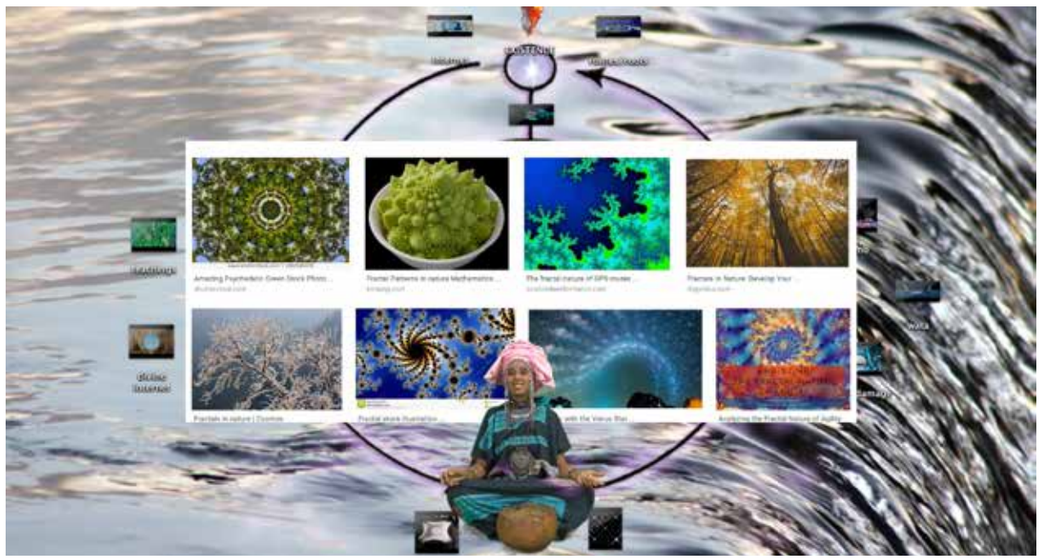
TABITA REZAIRE

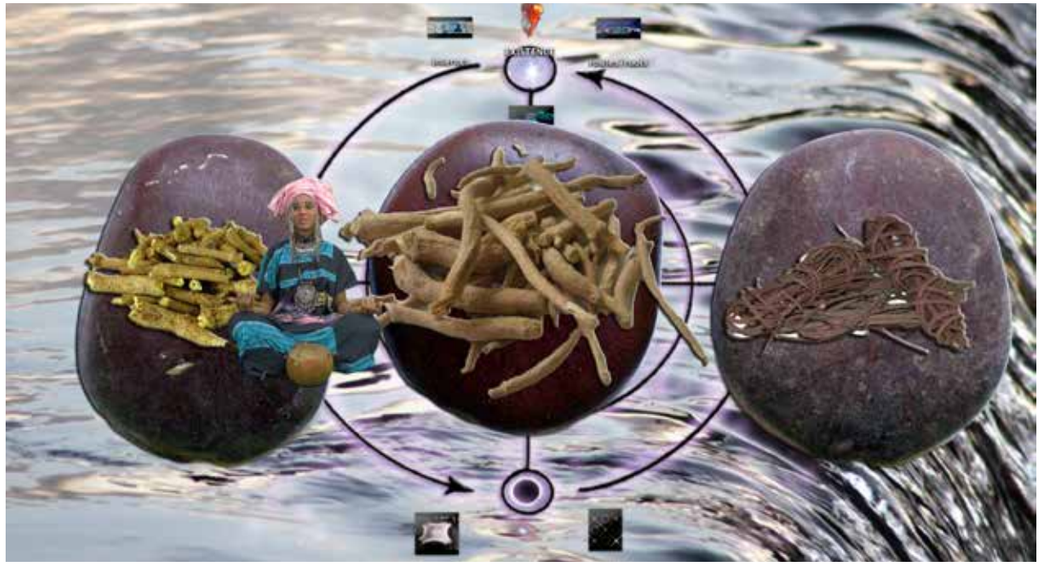
Tabita Rezaire challenges the legacy of colonization and patriarchy through healing, activism, art and film. Digital, embodied and ancestral memories are sites of struggle, and her body of work addresses the matrix of coloniality and the body. Through screen interfaces, performances and collective offerings, she reminds us to access our inner data centers and bypass hegemonic Western, heteropatriarchal information worlds. In *Lubricate Coil Engine*, Rezaire presents a supplication for our times with the intention of restoring our ability to connect to each other in the age of constant screen-based scrolling, colonization and dissociation.

Inspired by quantum and cosmic mechanics, Tabita's work is rooted in time-spaces where technology and spirituality intersect as fertile ground to nourish visions of connection and emancipation. The video features the Bakongo cosmogram, which supports viewers traveling around the four moments of the sun and implies a revival of spiritual information technologies to supplement our anxiety-riddled Internet diet. The cosmogram features a horizontal line that divides the mountain of the living world from its mirrored counterpart in the kingdom of the dead. The bottom half of the Bakongo cosmogram refers to the world of the dead as complete within itself and to the wholeness that comes to a person who understands the ways and powers of both worlds. In *Lubricate Coil Engine*, water, the womb, dream plants and sound are perceived as connective interfaces against the manufactured amnesia on the four points of the cross of the cosmogram. Organic, technological and spiritual realms harmonize in a kind of ceremonial meditation on information technologies.

As Rezaire takes us through the sun's journey, we are guided through a cycle of life, from birth to death and rebirth, and at each stage she shares technological tales and practices. *Lubricate Coil Engine* invokes spiritual channels as communication networks that can be used to rediscover the meaning and potential of technology by reappraizing it from a cosmological and ancestral viewpoint.

Tabita Rezaire. *Lubricate Coil Engine - Decolonial Supplication, Collective Healing Offering*, 2017. Video stills. 60-90 min.





Cosmo-technics as Cosmopolitics

YUK HUI

The end of unilateral globalization and the arrival of the Anthropocene force us to talk about cosmopolitics. These two factors correlate with one another and correspond to two different senses of the word "cosmopolitics": cosmopolitics as a commercial regime, and cosmopolitics as a politics of nature.

First, we are witnessing the end of unilateral globalization. Until now, so-called globalization has been a largely one-sided process, entailing the universalization of particular epistemologies and the elevation, through techno-economic means, of a regional worldview to a putatively global metaphysics. We know that this unilateral globalization has reached its end because of how the 9/11 attacks were misread as an attack on the Occident by an Other. In fact, 9/11 was an "autoimmune" event, internal to the Atlantic bloc, wherein its own anti-communist cells, lingering after the Cold War, turned against their hosts.[1] Still, the spectacular image of the event provided a kind of Rorschach test, onto which the representatives of unilateral globalization could project their growing insecurities about being stranded between the old configuration and the new—exemplifying what Hegel called "the unhappy consciousness."[2] This is clear in an article entitled "The Straussian Moment" by one of the leading financiers of American neoreaction, Peter Thiel: the modern West has lost faith in itself. In the Enlightenment and post-Enlightenment period, this loss of faith liberated enormous commercial and creative forces. At the same time, this loss has rendered the West vulnerable. Is there a way to fortify the modern West without destroying it altogether, a way of not throwing the baby out with the bathwater?[3]

Thiel's unhappy consciousness recalls a past age of commercial glory renounced by the end of unilateral globalization, and aspires to a transhumanist futurism based on technological acceleration on all cosmic scales. This leads to a redefinition of the sovereign nation-state as a result of global technological competition (as the Russian president Vladimir Putin recently claimed, "whoever leads in AI will rule the world"). It is necessary to start imagining a new politics which is no longer a continuation of this same sort of geopolitics with a slightly different power configuration, that is, with the role of the leading power now played by China or Russia instead of the US. We need a new language of cosmopolitics to elaborate this new world order that goes beyond a single hegemon.

Second, the human species on earth is confronting the crisis of the Anthropocene. The earth *and*

The main hall of the Chinese Science and Technology Museum, Beijing, August 2010.

the cosmos have been transformed into a gigantic technological system, the culmination of the epistemological and methodological rupture which we call modernity. The loss of the cosmos is the end of metaphysics in the sense that we no longer perceive anything behind or beyond the perfection of science and technology.[4] When historians like Rémi Brague and Alexandre Koyré write about end of the cosmos in seventeen- and eighteenth-century Europe,[5] this should be read in our present Anthropocene context as an invitation to develop a *cosmo-politics*, not only in the sense of cosmopolitanism but also in the sense of a politics of the cosmos.[6] In response to this invitation, I would like to suggest that in order to develop such a cosmopolitics it is necessary to elucidate the question of cosmotechnics. I have been developing this concept of cosmotechnics in order to reopen the question of technology by undoing certain translations that were driven by the search for equivalence during modernization. This problematization can be presented in terms of a Kantian antinomy:

Thesis: Technology is an anthropological universal, understood as an exteriorization of memory and the liberation of organs, as some anthropologists and philosophers of technology have formulated it;

Antithesis: Technology is not anthropologically universal; it is enabled and constrained by particular cosmologies, which go beyond mere functionality or utility. Therefore, there is no one single technology, but rather multiple cosmotechnics.

In order to elaborate the relation between cosmotechnics and cosmopolitics, I will divide this article into three parts. First, I will demonstrate how the Kantian concept of cosmopolitics is rooted in Kant's concept of nature. In the second part, I situate the "multi-naturalism" proposed by

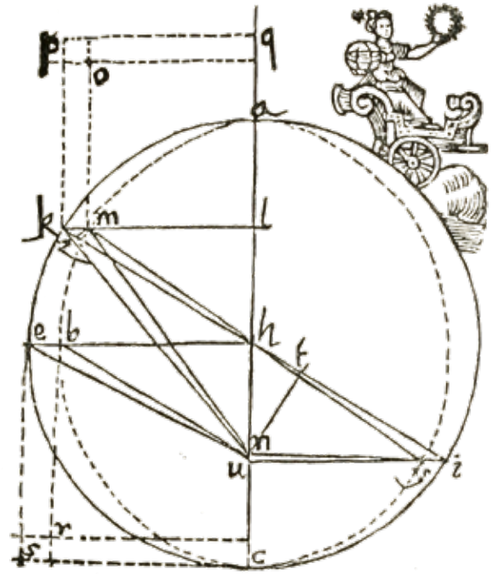


Diagram used by Johannes Kepler to establish his laws of planetary motion. Photo: Wikimedia Commons.

the "ontological turn" in anthropology as a different cosmopolitics, one which, in contrast to Kant's pursuit of the universal, suggests a certain relativism as the condition of possibility for coexistence. In the third part, I will try to show why it is necessary to move from cosmology to cosmotechnics as a politics to come.

1. Cosmopolitanism: Between Nature and Technology

The main difficulty of all cosmopolitics is the reconciliation between the universal and the particular. The universal tends to contemplate the particulars from above, as in the way that Kant regarded the French Revolution, like a spectator considering a violent piece of theater from the mezzanine. Universality is the view of a spectator, never that of an actor. Kant writes, in his "Idea for a Universal History with a Cosmopolitan Aim":

> There is no other way out for the philosopher—who, regarding human beings and their play in the large, cannot at all presuppose any rational aim of theirs—than to try whether he can discover an aim of nature in this nonsensical course of things human; from which aim a history in accordance with a determinate plan of nature might nevertheless be possible even of creatures who do not behave in accordance with their own plan … [Nature] did produce a Kepler, who subjected the eccentric paths of the planets in an unexpected way to determinate laws, and a Newton, who explained these laws from a universal natural cause.[7]

Throughout his political writings, Kant maintains that this relation between nature and cosmopolitics is necessary.[8] If Kant sees the republican constitution and perpetual peace as political forms that may be able to bring forward a universal history of the human species, it is because he understands that such progress is also a progress of reason, the telos of nature. This progress toward an end goal—namely, universal history and a "perfect state constitution"—is the "completion of a hidden plan of nature" (*Vollziehung eines verborgenen Plans der Natur*). What does it mean for nature to have a hidden plan? And why is the realization of cosmopolitics the teleology of nature?

Authors such as Hannah Arendt and Eckart Förster, among others, suggest that Kant's political philosophy centers on his concept of nature.[9] Arendt proposes a juxtaposition concerning Kant's perpetual peace: on the one hand, *Besuchsrecht*, the right to visit foreign countries and the right to hospitality; and on the other, nature, "the great artist, as the eventual 'guarantee of perpetual peace.'"[10] If after the 1789 revolution Kant is even more consistent in his affirmation of cosmopolitics as the teleology of nature, it is because he has developed the concept of self-organization, which plays a central role in the second book of his *Critique of Judgment*, and which affirms the two important categories of relation, namely community (*Gemeinschaft*) and reciprocity (*Wechselwirkung*).

Consider Kant's example of the tree from 64 of the *Critique of Judgment*. First, the tree reproduces itself according to its genus, meaning that it reproduces another tree. Second, the tree produces itself as an individual; it absorbs energy from the environment and turns it into nutrients that sustain its life. Third, different parts of the tree establish reciprocal relations with one another and thus constitute the whole; as Kant writes, the "preservation of one part is reciprocally dependent on the preservation of the other parts."[11] In such a totality, a part is always constrained by the whole, and this is true of Kant's understanding of cosmopolitical wholeness as well: "All states … are in danger of acting injuriously upon one another."[12] Nature is not something that can be judged from a particular point of view, just as the French Revolution cannot be judged according to its actors. Rather, nature can only be comprehended as a complex whole, and the human species, as one part of it, will ultimately progress towards a universal history that coincides with the teleology of nature.[13]

Here we only want to show that as Kant develops his thinking towards universalism, his conceptualization of the relation between cosmopolitics and the purposiveness of nature is situated within a peculiar moment in history: the simultaneous enchantment and disenchantment of nature. On the one hand, Kant recognizes the importance of the concept of the organic for philosophy; discoveries in the natural sciences allowed him to connect the cosmos to the moral, as indicated by his famous analogy near the end of *Critique of Practical Reason*: "Two things fill the mind with ever new and increasing wonder and awe, the more often and constantly reflection concerns itself with them: the starry heavens above me and the moral law within me."[14] Howard Caygill makes an even stronger claim, arguing that this analogy points to a "Kantian physiology of the soul and the cosmos" that unites the "within me" (freedom) and the "above me."[15] On the other hand, as we saw in Kant's citation of Kepler and Newton in "Idea for a Universal History with a Cosmopolitan Aim," the affirmation of "universal history" and advancements in science and technology led in the eighteenth century to what Rémi Brague calls the "death of the cosmos":

> The new astronomy, following Copernicus and his successors, had consequences for the modern view of the world … Ancient and medieval thinkers presented a synchronic schema of the structure of the physical world, which erased the traces of its own genesis; the Moderns, on the other hand, remembered the past and in addition provided a diachronic view of astronomy—as if the evolution of ideas about the cosmos was even more important than the truth about it … Can we still speak of cosmology? It seems that the West ceased to have a cosmology with the end of the world of Aristotle and Ptolemy, an end due to Copernicus, Galileo, and Newton. The "world" then no longer formed a whole.[16]

New discoveries in the natural sciences thanks to the invention of the telescope and the microscope exposed human beings to magnitudes they could not previously comprehend, leading us to a new relation with the "entire span of nature" (*in dem ganzen Umfang der Natur*).[17] The Kantian scholar Diane Morgan suggests that through the "worlds beyond worlds" revealed by technology, nature ceases to be anthropomorphic, for the relation between humans and nature is thus reversed, with humans now standing before the "unsurveyable magnitude" (*Unabsehlich-Groß*) of the universe.[18] However, as we indicated above, there is a double moment that deserves our attention: both the enchantment *and* disenchantment of nature via the natural sciences, leading to a total secularization of the cosmos.

In addition to the revelation of nature and its teleology through technical instruments, technology also plays a decisive role in Kant's political philosophy, when he asserts that communication is the condition of the realization of the organicist whole. Arendt made explicit the role of the *sensus communis* in Kant's philosophy, as both the question of community and consensus.[19] But such a *sensus communis* is achieved only through particular technologies, and it is on this ground that we should problematize any naive discourse on the common as something already given or preceding technology. The age of Enlightenment, as noted by Arendt (as well as Bernard Stiegler), is the age of "the public use of one's reason," and this exercize of reason is expressed in the freedom of speaking and publishing, which necessarily involves the technology of printing. On an international level, in "Toward Perpetual Peace: A Philosophical Sketch" Kant writes that "it was trade that first brought them into peaceful relations with one another and thereby into relationships

Gisela Motta and Leandro Lima, *Xaipiri*, 2012.

based on mutual consent, community, and peaceful interactions even with remote peoples," later adding, "it is the spirit of trade, which cannot coexist with war, which will, sooner or later, take hold of every people."[20]

2. "Ontological Turn" as Cosmopolitics

This reiteration of Kantian cosmopolitanism is an attempt to demonstrate the role of nature in Kant's political philosophy. Kant somehow assumes *one single nature*, which reason compels us to recognize as rational; the rationality corresponds to the organicist teleological universality ostensibly realized in the constitution of both morality and the state. This enchantment of nature is accompanied by a disenchantment of nature, driven by the mechanization enforced by the Industrial Revolution. Brague's "death of the cosmos" brought about by European modernity and its globalization of modern technology necessarily forms one of the conditions for us to reflect on cosmopolitics today, insofar as it illustrates the inefficacy of a biological metaphor for cosmopolitanism. If we start with Kant rather than with more recent discussions on cosmopolitanism—such as Martha Nussbaum's rootless cosmopolitanism, Habermas's constitutional patriotism, or Anthony Appiah's cosmopolitan patriotism[21]—it is because we want to reconsider cosmopolitanism by examining its relation to nature and technology. In fact, Appiah's rooted cosmopolitanism is relevant to our discussion below. He holds the view that cosmopolitanism denies the importance of affiliations and particular loyalties; this means that it is necessary to consider cosmopolitics from the point of view of locality. This crucial point is the reason I would like to engage with the idea of "multi-naturalism" recently proposed by anthropologists associated with attempts to present a new way of thinking cosmopolitanism.

The "ontological turn" in anthropology is a movement associated with anthropologists such as Philippe Descola, Eduardo Viveiros de Castro, Bruno Latour, and Tim Ingold, and earlier, Roy Wagner and Marilyn Strathern, among others.[22] This ontological turn is an explicit response to the crisis of modernity that expresses itself largely in terms of ecological crisis, which is now closely associated with the Anthropocene. The ontological-turn movement is an effort to take seriously different ontologies in different cultures (we have to bear in mind that knowing there are different ontologies and taking them seriously are two different things). Descola has convincingly outlined four major ontologies, namely naturalism, animism, totemism, and analogism.[23] The modern is characterized by what he calls "naturalism," meaning an opposition between culture and nature, and the former's mastery over the latter. Descola suggests that we must go beyond such an opposition and recognize that nature is no longer opposed or inferior to culture. Rather, in the different ontologies, we can see the different roles that nature plays; for example, in animism the role of nature is based on the continuity of spirituality, despite the discontinuity of physicality.

In *Beyond Culture and Nature*, Descola has proposed an ontological pluralism that is irreducible to social constructivism. He suggests that recognizing these ontological differences can serve as an antidote to the dominance of naturalism since the advent of European modernity. But does this focus on nature (or the cosmos, we might say) in the interest of opposing European naturalism actually revive the enchantment of nature, this time in the name of indigenous knowledge? This seems to be a hidden problem with the ontological-turn movement: many anthropologists associated with the ontological turn have focused on the question of nature and the politics of the nonhuman (largely animals, plants, minerals, spirits, and the dead). This is evident when we recall that Descola proposes to call his discipline an "anthropology of nature." Furthermore, this tendency also suggests that the question of technics is not sufficiently addressed in the ontological-turn movement. For example, Descola talks often of practice, which may indicate his (laudable) desire to avoid an opposition between nature

and technics; but by doing so, he also obscures the question of technology. Descola shows that analogism, rather than naturalism, was a significant presence in Europe during the Renaissance; if this is the case, the "turn" that took place during European modernity seems to have resulted in a completely different ontology and epistemology. If naturalism has succeeded in dominating modern thought, it is because such a peculiar cosmological imagination is compatible with its *techno-logical* development: nature should be mastered for the good of man, and it *can* indeed be mastered according to the laws of nature. Or put another way: nature is regarded as the source of contingency due to its "weakness of concept," and therefore it has to be overcome by logic.

These oppositions between nature and technics, mythology and reason, give rize to various illusions that belong to one of two extremes. On the one hand, there are rationalists or "progressivists" who hysterically struggle to maintain their monotheism after having murdered god, wishfully believing that the world process will stamp out differences and diversities and lead to a "theodicy." On the other hand, there are left intellectuals who feel the need to extol indigenous ontology or biology as a way out of modernity. A French revolutionary thinker recently described this situation thus:

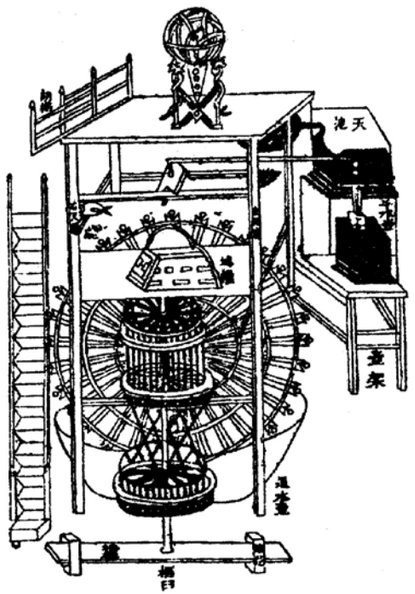
> A funny thing to see these days is how all these absurd modern leftists, all unable to *see* anything, all lost in themselves, all feeling so bad, all desperately trying to exist and to find their existence in the eyes of the Other—how all these people are jumping on the "savage," the "indigenous," the "traditional" in order to escape and not face themselves. I am not speaking of being critical towards one's "whiteness," towards one's "modernism." I am talking of the ability to peer inside [*transpercer*] oneself.

My refusal of the above two extremes does not come out of any postcolonial "political correctness," but rather out of an attempt to go beyond postcolonialism's critique. (Indeed, I have elsewhere reproached postcolonialism for its failure to tackle the question of technology.[24]) I hold the thesis that an ontological pluralism can only be realized by reflecting on the question of technology and a politics of technology. Kant was aware of the importance of technology in his comment on trading as communication; however, he didn't pay much attention to the *technological difference* that finally led to planetary modernization, and now planetary computation, since what was at stake for him was the question of the whole that absorbs all differences. Kant criticized the impolite guests, the greedy colonizers who brought with them "oppression of the native inhabitants, the incitement of the different states involved to expansive wars, famine, unrest, faithlessness, and the whole litany of evils that weigh upon the human species."[25] Commenting on the defense strategies of China and Japan, Kant said that both countries have wisely, limited such interaction. Whereas the former has allowed contact with, but not entrance to its territories, the latter has allowed this contact to only one European people, the Dutch, yet while doing so it excludes them, as if they were prisoners, from associating with the native inhabitants.[26]

When Kant wrote this in 1795, it was too early for him to anticipate the modernization and colonization that would take place in Japan and China. If this phase of globalization was able to take place, it was because of the technological advancement of the West, which allowed it to defeat the Japanese, the Chinese, and other Asian civilizations. Nature, the guarantee of perpetual peace, didn't really lead us to perpetual peace but rather to wars and more wars. To appeal for a cosmopolitanism today, I think we must reread Kant's cosmopolitanism according to the process of modernization and revisit the question of nature and technology anew. The arrival of modern technology in non-European countries in recent centuries has created a transformation unthinkable to European observers. The restoration of "indigenous natures" itself has to first be questioned, not because it doesn't exist but because it is situated in a new epoch and is transformed to the extent that there is hardly any way to go back and restore it.[27]

Let's review what has been said above regarding the ontological turn. Central to the anthropologists' concept of "nature" and "ontology" is cosmology,

since such "nature" is defined according to different "ecologies of relations" in which we observe different constellations of relations, e.g., the parental relation between females and vegetables, or brotherhood between hunters and animals. These multi-ontologies are expressed as multi-natures; for example, Descola's four above-named ontologies correspond to different cosmological views. I believe that it is very difficult, if not impossible, to overcome modernity without directly confronting the question of technology, which has become increasingly urgent after the end of unilateral globalization. Therefore, it is necessary to reformulate the question of cosmopolitics in relation to cosmotechnics.



A diagram of Su Song's (1020–1101) clock tower. The original design included an armillary sphere, a waterwheel, an escapement mechanism, and a chain drive. Photo: Wikimedia Commons.

3. Cosmotechnics as Cosmopolitics

I propose to go beyond the notion of cosmology; instead, it would be more productive to address what I call cosmotechnics. Let me give you a preliminary definition of cosmotechnics: it is the unification of the cosmos and the moral through technical activities, whether craft-making or art-making. There hasn't been one or two technics, but many cosmotechnics. What kind of morality, which and whose cosmos, and how to unite them vary from one culture to another according to different dynamics. I am convinced that in order to confront the crisis that is before us—namely, the Anthropocene, or the intrusion of Gaia (Latour and Stengers), or the "entropocene" (Stiegler), all presented as the inevitable future of humanity—it is necessary to reopen the question of technology, in order to envisage the bifurcation of technological futures by conceiving different cosmotechnics. I tried to demonstrate such a possibility in my recent book *The Question Concerning Technology in China: An Essay in Cosmotechnics*. As one can gather from the title, it is an attempt to respond to Heidegger's famous 1949 lecture "The Question Concerning Technology." I propose that in order to rethink the project of overcoming modernity, we must undo and redo the translations of *technē*, *physis*, and *metaphysika* (not as merely independent concepts but also concepts within systems); only by recognizing this difference can we arrive at the possibility of a common task of philosophy.

Why, then, do I think it's necessary to turn to cosmotechnics? For a long time now we have operated with a very narrow—in fact, far too narrow—concept of technics. By following Heidegger's essay, we can distinguish two notions of technics. First, we have the Greek notion of *technē*, which Heidegger develops through his reading of the ancient Greeks, notably the Pre-Socratics—more precisely, the three "inceptual" (*anfängliche*) thinkers, Parmenides, Heraclitus, and Anaximander.[28] In the 1949 lecture, Heidegger proposes to distinguish the essence of Greek *technē* from modern technology (*moderne Technik*).

If the essence of *technē* is *poiesis*, or bringing forth (*Hervorbringen*), then modern technology, a product of European modernity, no longer possesses the same essence as *technē* but is rather an "enframing" (*Gestell*) apparatus, in the sense that all beings become standing reserves (*Bestand*) for it. Heidegger doesn't totalize these two essences of technics, but nor does he give space to other technics, as if there is only a single homogenous *Machenschaft* after the Greek *technē*, one that is calculable, international, even planetary. It is astonishing that in Heidegger's so-called *Black Notebooks* (*Schwarze Hefte*)—of which four volumes have been published so far—we find this note: "If communism in China should come to rule, one can assume that only in this way will China become 'free' for technology. What is this process?"[29] Heidegger hints at two things here: first, that technology is international (not universal); and second, that the Chinese were completely unable to resist technology after communism seized power in the country. This verdict anticipates technological globalization as a form of neocolonization that imposes its rationality through instrumentality, like what we observe in transhumanist, neoreactionary politics.

My effort to go beyond Heidegger's discourse on technology is largely based on two motivations: 1) a desire to respond to the ontological turn in anthropology, which aims to tackle the problem of modernity by proposing an ontological pluralism; and 2) a desire to update the insufficient discourse on technology that is largely associated with Heidegger's critique of technology. I have proposed that we reopen the question of technics, to show that one must consider technics as a variety of cosmotechnics instead of either *technē* or modern technology. In my book, I used China as a testing ground for my thesis and tried to reconstruct a lineage of technological thought in China. However, this task is not limited to China, since the central idea is that every non-European culture must systematize its own cosmotechnics and the history of such a cosmotechnics. Chinese cosmotechnical thought consists of a long history of intellectual discourse on the unity and relation between Qi and Dao. The unification of Qi and Dao is also the unification of the moral and the cosmic, since Chinese metaphysics is fundamentally a moral cosmology or a moral metaphysics, as the New Confucian philosopher Mou Zongsan has demonstrated. Mou suggests that if in Kant we find a metaphysics of the moral, it is at most a metaphysical exploration of the moral but not a moral metaphysics, since a moral metaphysics can only start with the moral. Mou's demarcation between Chinese and Western philosophy situates his conviction that Chinese philosophy recognizes and cultivates the intellectual intuition that Kant associated with knowing the noumenon, even as Kant dismissed the possibility that human beings could possess such an intuition. For Mou, the moral arizes out of the experience of the infinity of the cosmos, which necessitates infinitization as the condition of possibility for Dasein's finitude.[30]

Dao is not a thing. It is not a concept. It is not the *différance*. In the *Cixi* of *YiZhuan* (易傳·繫辭), Dao is simply said to be "above forms," while Qi is what is "below forms."[31] We should notice here that *xin er shang xue* (the study of what is above forms) is the word used to translate "metaphysics" (one of the equivalences that must be undone). Qi is something that takes space, as we can see from the character and also read in an etymological dictionary—it has four mouths or containers and in the middle there is a dog guarding the utensils. There are multiple meanings of Qi in different doctrines; for example, in classic Confucianism there is Li Qi (禮器), in which Qi is crucial for Li (a rite), which is not merely a ceremony but rather a search for unification between the heavens and the human. For our purposes, it will suffice to simply say that Dao belongs to the noumenon according to the Kantian distinction, while Qi belongs to the phenomenon. But it is possible to infinitize Qi so as to infinitize the self and enter into the noumenon—this is the question of art.

In order to better understand what I mean by this, we can refer here to the story of the butcher Pao Ding, as told in the *Zhuangzi*. However, we will have to remind ourselves that this is only an example from antiquity, and a much larger historical view is necessary to comprehend it.

Pao Ding is excellent at butchering cows. He claims that the key to being a good butcher doesn't lie in mastering certain skills, but rather in comprehending the Dao. Replying to a question from Duke Wen Huei about the Dao of butchering cows, Pao Ding points out that having a good knife is not necessarily enough; it is more important to understand the Dao in the cow,

so that one does not use the blade to cut through the bones and tendons, but rather to pass alongside them in order to enter into the gaps between them. Here, the literal meaning of "Dao"—"way" or "path"—meshes with its metaphysical sense:

> What I love is Dao, which is much more splendid than my skill. When I first began to carve a bullock, I saw nothing but the whole bullock. Three years later, I no longer saw the bullock as a whole but in parts. Now I work on it by intuition and do not look at it with my eyes. My visual organs stop functioning while my intuition goes its own way. In accordance with the principle of heaven (nature), I cleave along the main seams and thrust the knife into the big cavities. Following the natural structure of the bullock, I never touch veins or tendons, much less the big bones![32]

Hence, Pao Ding concludes that a good butcher doesn't rely on the technical objects at his disposal, but rather on Dao, since Dao is more fundamental than Qi (the tool). Pao Ding adds that a good butcher has to change his knife once a year because he cuts through tendons, while a bad butcher has to change his knife every month because he cuts through bones. Pao Ding, on the other hand—an *excellent* butcher—has not changed his knife in nineteen years, and it looks as if it has just been sharpened with a whetstone. Whenever Pao Ding encounters any difficulty, he slows down the knife and gropes for the right place to move further.

Duke Wen Huei, who had posed the question, replies that "having heard from Pao Ding, now I know how to *live*"; and indeed, this story is included in a section titled "Master of Living." It is thus the question of "living," rather than that of technics, that is at the center of the story. If there is a concept of "technics" here, it is one that is detached from the technical object: although the technical object is not without importance, one cannot seek the perfection of technics through the perfection of a tool or a skill, since perfection can only be accomplished by Dao. Pao Ding's knife never cuts tendons or bones; instead, it seeks the void and enters it with ease. In so doing, the knife accomplishes the task of butchering the cow without endangering itself—i.e., without becoming blunt and needing to be replaced. It thus fully realizes itself as a knife.

What I have said above is not sufficient to be formulated into a program, since it is only an explanation for the motivation behind the much larger project that I tried to initiate in *The Question Concerning Technology in China*. Also, we must pay attention to the historical development of the relationship between Qi and Dao. Specifically, the search for unity between Qi and Dao has gone through different phases in Chinese history in response to historical crizes (the decline of the Zhou Dynasty, the proliferation of Buddhism, modernization, etc.); it was widely discussed after the Opium Wars of the mid-nineteenth century, but such a unification was not resolved due to a very limited understanding of technology at the time and an eagerness to look for equivalences between China and the West. I have attempted to reread the history of Chinese philosophy not only as intellectual history, but also through the lens of the Qi-Dao episteme, with the aim of reconstructing a tradition of technological thought in China. As I have emphasized elsewhere, this question is by no means only a Chinese affair.[33] Rather, every culture must reflect on the question of cosmotechnics for a new cosmopolitics to come, since I believe that to overcome modernity without falling back into war and fascism, it is necessary to reappropriate modern technology through the renewed framework of a cosmotechnics consisting of different epistemologies and epistemes. Therefore, my project is not one of substantializing tradition, as in the case of traditionalists like René Guénon or Aleksandr Dugin; it doesn't refuse modern technology, but rather looks into the possibility of different technological futures. The Anthropocene is the planetarization of standing reserves, and Heidegger's critique of technology is more significant today than ever before. The unilateral globalization that has come to an end is being succeeded by the competition of technological acceleration and the allures of war, technological singularity, and transhumanist (pipe) dreams. The Anthropocene is a global axis of time and synchronization that is sustained by this view of technological progress towards the singularity. To reopen the question of technology is to refuse this homogeneous technological future that is presented to us as the only option.

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November, 2017

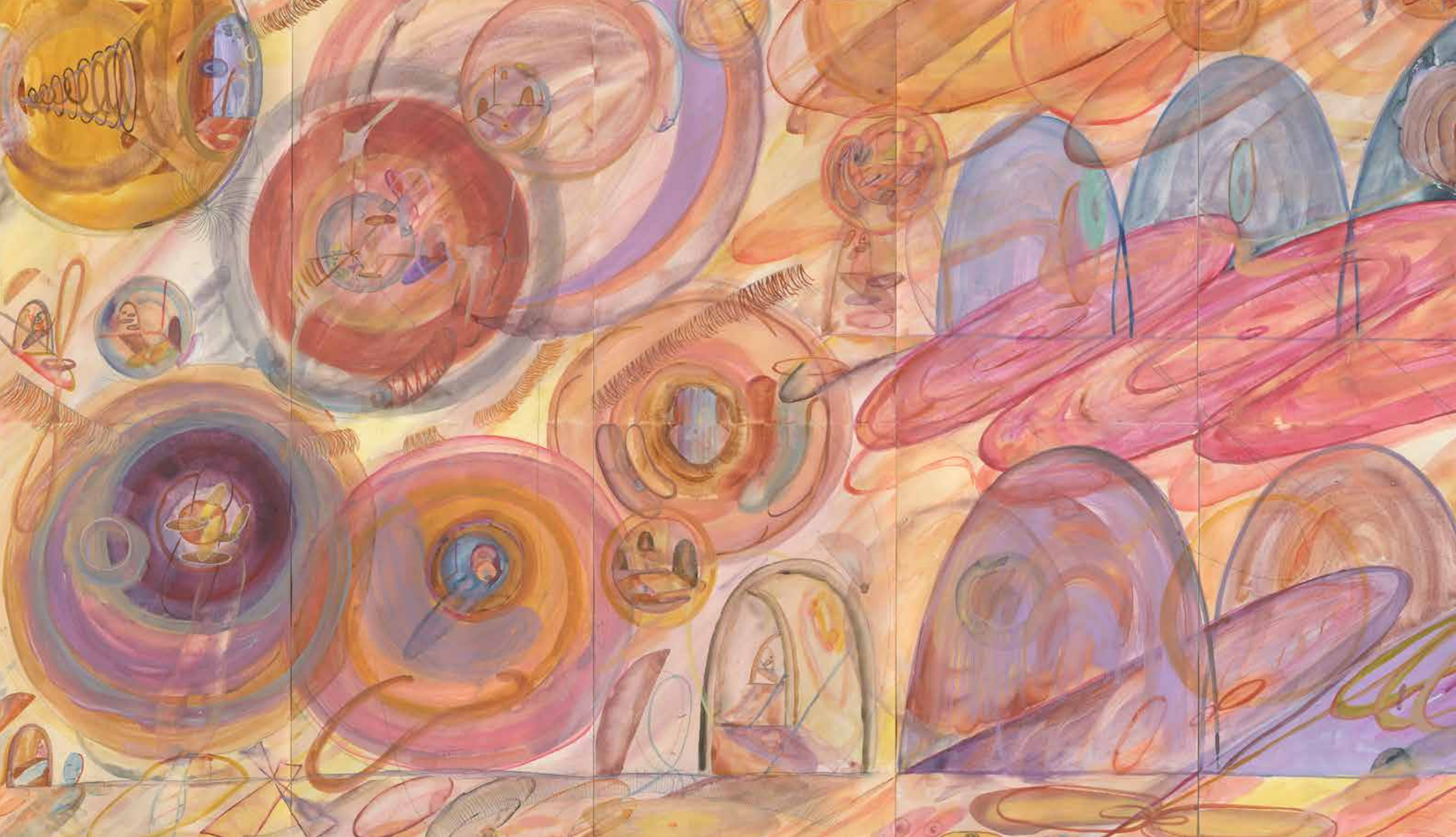
1 On the autoimmune character of the 9/11 attacks, see Giovanna Borradori, *Philosophy in a Time of Terror: Dialogs with Jürgen Habermas and Jacques Derrida* (Chicago: University of Chicago Press, 2004); and Chalmers Johnson, *Blowback: The Costs and Consequences of American Empire* (New York: Holt, 2004).
2 See Yuk Hui, "On the Unhappy Consciousness of Neoreactionaries," *e-flux journal* 81 (April 2017)
3 Peter Thiel, "The Straussian Moment," in *Studies in Violence, Mimesis, and Culture: Politics and Apocalypse*, ed. Robert Hamerton-Kelly (East Lansing: Michigan State University Press, 2007), 207. I also cited this passage in my "On the Unhappy Consciousness of Neoreactionaries."
4 See specifically Martin Heidegger, *Der Satz vom Grund* (Frankfurt am Main: Klostermann, 1997).
5 See Rémi Brague, *The Wisdom of the World: The Human Experience of the Universe in Western Thought* (Chicago: University of Chicago Press, 2003); and Alexandre Koyré, *From the Closed World to the Infinite Universe* (Baltimore: John Hopkins Press, 1957).
6 On this point, see the work of Isabelle Stengers, *Cosmopolitics I* and *II* (Minneapolis: University of Minnesota Press, 2010, 2011).
7 Immanuel Kant, "Idea for a Universal History with a Cosmopolitan Aim," in *Kant's Idea for a Universal History with a Cosmopolitan Aim: A Critical Guide*, eds. Amélie Oksenberg Rorty and James Schmidt (Cambridge: Cambridge University Press, 2009), 11. (AK 8: 18.)
8 See Kant's "Idea for a Universal History with a Cosmopolitan Aim" (1784) and "Toward Perpetual Peace: A Philosophical Sketch" (1795), and in between, "Critique of Judgment" (1790), a main resource for Kant's nonexistent political philosophy, according to Hannah Arendt. See her *Lectures on Kant's Political Philosophy* (Chicago: University of Chicago Press, 1992).
9 See Arendt, *Lectures on Kant's Political Philosophy*; and Eckart Förster, "The Hidden Plan of Nature," in *Kant's Idea for a Universal History with a Cosmopolitan Aim: A Critical Guide*, 187–99.
10 Arendt, *Lectures on Kant's Political Philosophy*, 25.
11 Immanuel Kant, *Critique of Judgment*, trans. James Creed Meredith, ed. Nicholas Walker (Oxford: Oxford University Press, 2007), §64, 199.
12 Cited by Arendt, *Lectures on Kant's Political Philosophy*, 53.
13 Concretely, Kant here is interested in the question of organization, which finds its highest potency in the organism. Kant's conception here has to be distinguished from Spinozism (pantheism), theism, and hylozoism, which Kant explicitly rejects in §72 of the *Critique of Judgment*.
14 Immanuel Kant, *Critique of Practical Reason*, trans. Lewis White Beck (New York: Macmillan, 1993), 169.
15 Howard Caygill, "Soul and Cosmos in Kant: A Commentary on 'Two Things Fill the Mind …,'" in *Cosmopolitics and the Emergence of a Future*, eds. Diane Morgan and Gary Banham (New York: Palgrave Macmillan, 2007), 213–34, 215. Caygill traces the relation between the cosmos and the moral in Kant's analogy (e.g., beauty as a symbol of the moral) to the influence of Brown and Haller's theory of irritability on Kant's *Opus Postumum*, affirming the organicist structure found in both.
16 Brague, *Wisdom of the World*, 188–89.
17 Immanuel Kant, *Universal Natural History and the Theory of the Heavens*, ed. and trans. S. Jaki (Edinburgh: Scottish Academic Press, 1981), 164. Cited by Diana Morgan, "Introduction: Parts and Wholes—Kant, Communications, Communities and Cosmopolitics," in *Cosmopolitics and the Emergence of a Future*, 8.
18 Kant, *Critique of Practical Reason*, 166. Cited by Morgan, "Introduction: Parts and Wholes," 8.
19 Arendt, *Lectures on Kant's Political Philosophy*, 70–72.
20 Immanuel Kant, *Toward Perpetual Peace and Other Writings on Politics, Peace, and History*, ed. Pauline Kleingeld, trans. David L. Colclasure (New Haven: Yale University Press, 2006), 88. (AK 8: 364.)
21 I will not be able to comment here on these different approaches to cosmopolitanism, but for a overview, see Angela Taraborrelli, *Contemporary Cosmopolitanism*, trans. Ian McGilvray (London: Bloomsbury, 2015).
22 For this intellectual trajectory, see Martin Holbraad and Morten Axel Pedersen, *The Ontological Turn An Anthropological Exposition* (Cambridge: Cambridge University Press, 2017).
23 Philippe Descola, *Beyond Nature and Culture* (Chicago: University of Chicago Press, 2003), 122.
24 Yuk Hui, *The Question Concerning Technology in China: An Essay in Cosmotechnics* (Falmouth: Urbanomic, 2016), 28.
25 Kant, *Toward Perpetual Peace*, 83. (AK 8: 359.)
26 Ibid.
27 On this question we will have to confront Viveiros de Castro elsewhere, since for him Amerindian perspectivism is anything but obsolete.
28 In order to better understand Heidegger's concept of *technē*, we should go back to his earlier writings. In the 1936 *Introduction to Metaphysics*, Heidegger attempts to reconcile Parmenides the philosopher of being with Heraclitus the philosopher of becoming through an interpretation of a verse from Sophocles's *Antigone*. The reflection centers on the description of human Dasein as *to deinataton*, the uncanniest of the uncanny (*das Unheimlichste des Unheimlichen*). According to Heidegger, "the uncanny" has two senses. In one sense, it refers to a violence (*Gewalttätigkeit*) associated with *technē*; here, *technē* is neither art nor technics in the modern sense, but knowing—a form of knowing that can set Being to work in beings. In a second sense, "the uncanny" refers to overwhelming (*Überwaltigend*) powers, such as those of the sea and the earth. This overwhelming is manifested in the word *dikē*, which is conventionally translated as "justice" (*Gerechtigkeit*), although Heidegger translates it as "fittingness" (*Fug*). For a detailed analysis, see Hui, *The Question Concerning Technology in China*, §8, 69–79.
29 Martin Heidegger, *Anmerkungen I-V* (*Schwarze Hefte* 1942–48), ed. Peter Trawny (Frankfurt am Main: Klostermann, 2015), 441. German original: "Wenn der Kommunismus in china an die Herrschaft kommen sollte, steht zu vermuten, daß erst auf diesem Wege china für die Technik »frei« wird. Was liegt in diesem Vorgang?"
30 Mou Zongsan, *Collected Works 21: Phenomenon and Thing-in-Itself* (現象與物自身) (Taipei: Student Books Co., 1975), 20–30.
31 "形而上者為之道，形而下者為之器"
32 *Zhuangzi* (bilingual edition) (Hunan: Hunan People's Publishing House, 2004), 44–5. Translation modified.
33 Yuk Hui, "For a Philosophy of Technology in China: Geert Lovink Interviews Yuk Hui," *Parrhesia* 27 (2017): 48–63.

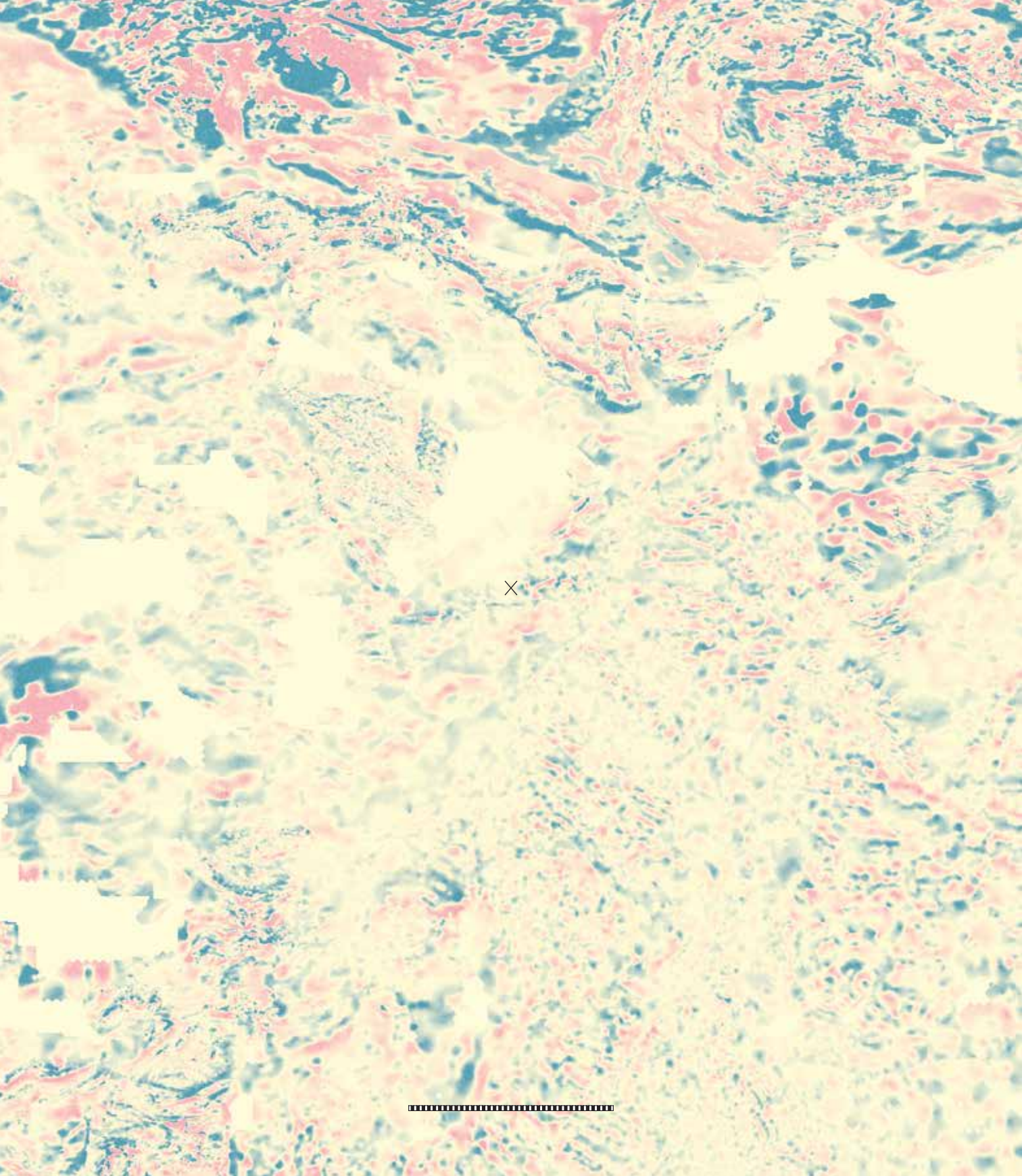
Eyeballs, Windows and Mussels

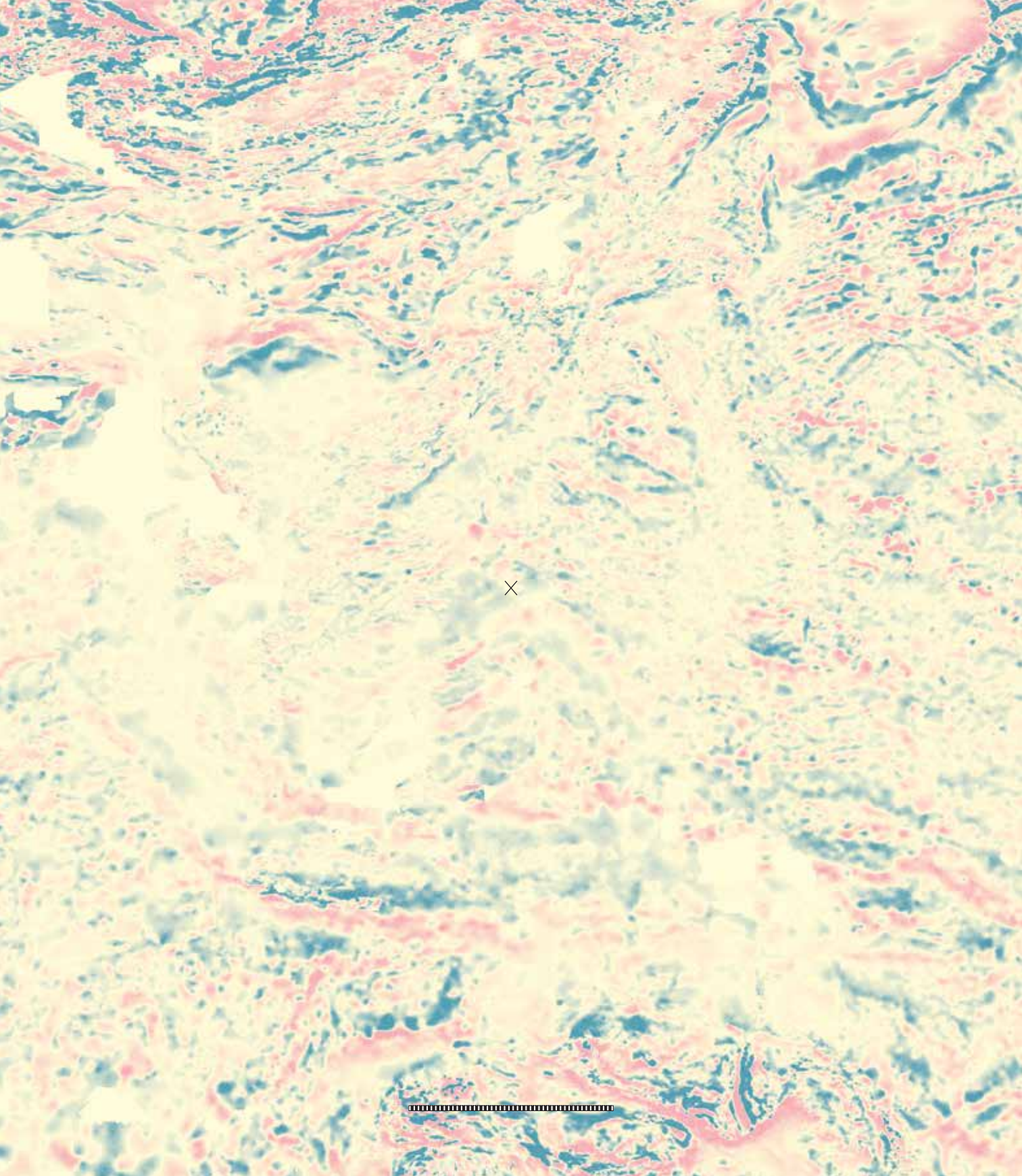
DAN ZHU

Is the orange-pink watercolor *Eyeballs, Windows and Mussels* an abstract monumental drawing, or the creation of a new world? *Eyeballs, Windows and Mussels* by Dan Zhu has no beginning and no end. The sizeable drawing eludes any sense of scale: everyday objects are magnified to cosmic proportions, while that same cosmos seems very accessible and mundane. *Eyeballs, windows and mussels* are clearly discernible in this celestial scene, but they also begin to merge into one another, converging in size and shape. There seems to be a passageway at the bottom of the drawing, close to the earthly horizon, that leads to yet another world, where other laws and dimensions apply. It is a holistic representation of our reality, enabled by technological inventions. Among others, the microscope and the telescope have made it possible to read the world in other ways and on other scales. Technology shapes our view of the world. With *Eyeballs, Windows and Mussels*, Zhu implicitly asks the question how cosmoslogy is embedded in daily life. How can imagination shape a liveable digital future?

Dan Zhu. *Eyeballs, Windows and Mussels*. 2020. Pencil, watercolor, gouache and acrylic on paper. 178.2 x126 cm.







Biographies

HANNAH ADLIDE

Hannah Adlide looks to expand outdated ideas of heritage and bring them into contemporary debates around culture, identity, and the climate, with a vision to better our collective futures. Her previous experience has spanned curatorial work, editing, and team management for creative projects. She received her B.A. in Culture, Criticism and Curation from Central Saint Martins, London, and her M.A. in Heritage and Memory Studies at the University of Amsterdam. She has worked with Digital Earth as an editor since 2020.

SOPHIA AL MARIA

Sophia Al Maria is a Qatari-American artist who lives in London. Though her work spans many disciplines including drawing, film and screenwriting for TV, it is united by a preoccupation with the power of storytelling and myth, and in particular with imagining revisionist histories and alternative futures.

HEBA Y. AMIN

Artist Heba Y. Amin engages with political themes and archival history by using mediums including film, photography, archival material, lecture, performance, and installation. Her artistic research takes a speculative, often satirical, approach to challenging narratives of conquest and control; Amin was one of the artists behind the noted 2015 subversive graffiti action on the set of the television series “Homeland.” Amin is a Professor of Digital and Time-Based Art at ABK-Stuttgart, the co-founder of the Black Athena Collective, curator of visual art for the Mizna journal, and currently sits on the editorial board of the Journal of Digital War. She was awarded the 2020 Sussmann Artist Award. She recently published *Heba Y. Amin: The General's Stork* edited by Anthony Downey (Sternberg Press, 2020).

LOTTE ARNDT

Lotte Arndt is a researcher, writer, and journalist living and working in Paris and Berlin. She is a PhD student at Humboldt University of Berlin and Paris Diderot University, researching African cultural magazines in Paris. She writes about literature, art and society in academic and journalistic contexts. Her main interest lies in the intersections of esthetics and politics. As a member of the Frankfurt Research Center for Postcolonial Studies, in 2011 she collaborated with Bétonsalon in Paris on a series of monthly conferences “Under the free sky of history.” Arndt works within multiple postcolonial conflicts, notably a project with the Berlin-based group Artefakte//anti-humboldt on restitution as a possible strategy for the contestation of colonial archives and of their contemporary repercussions, which leads her to question the collections of ethnographic museums.

BENJAMIN H. BRATTON

Benjamin Bratton is Professor of Visual Arts at University of California, San Diego and Visiting Professor at NYU Shanghai, SCI_Arc and the European Graduate School. He is the author of several books, including *The Stack: On Software and Sovereignty*, which established a political philosophy of planetary scale computation. He was formerly the director of The New Normal and The Terraforming think-tanks at Strelka Institute.

KÉVIN BRAY

Kévin Bray completed the postgraduate course at the Sandberg Instituut's Design Department in Amsterdam and the DSAA at ESAAB of Nevers, France. He is an alumni of the Rijksakademie van Beeldende Kunsten in Amsterdam. His work has been exhibited at Dordrecht Museum, FOAM Amsterdam, Showroom Mama, Rotterdam; Unfair, Amsterdam; K Museum of Contemporary Art, Seoul; De Appel, Amsterdam; OT301, Amsterdam; and De School, Amsterdam.

JAMES BRIDLE

James Bridle is a writer and artist working across technologies and disciplines. Their artworks have been commissioned by galleries and institutions and exhibited worldwide and on the internet. Their writing on literature, culture and networks has appeared in magazines and newspapers including *Wired, the Atlantic, the New Statesman, the Guardian,* and *the Observer.* They are the author of *New Dark Age* (Verso, 2018) and *Ways of Being* (Penguin, 2022), and they wrote and presented "New Ways of Seeing" for BBC Radio 4 in 2019.

INGRID BURRINGTON

Ingrid Burrington is the author of *Networks of New York: An Illustrated Field Guide to Urban Internet Infrastructure* (Melville House, 2016).

ADRIANA BUSTOS

Adriana Bustos was born in Argentina and graduated from Fine Arts and Psychology at the University of Córdoba. Her practice analyzes and reconfigures knowledge production systems, and in doing so creates alternative epistemologies, calling for more comprehensive and nuanced historical narratives. She has participated in a variety of biennials and international exhibitions such as, Dahka Art Summit 2020: Cosmopolis 2, Centre Pompidou (2019); Sharjah Biennal (2019); Bienal Sur Global, Argentina (2021); Site Santa Fé (USA); and Biennal of Montevideo 2014-2019. She has been awarded the Azquy First Prize in 2020, and First Prize Federico Klemm in 2016, as well as by Cultural Chandon in 2005, 2006 and 2009.

CATALOGTREE

Catalogtree is a multidisciplinary design studio based in Arnhem (NL). It was founded in 2001 by Daniel Gross and Joris Maltha who met at Werkplaats Typografie, Arnhem (NL). Nina Bender was part of studio from 2011 to 2021. The studio works continuously on commissioned and self initiated projects. Highly interested in self-organising systems they believe in 'Form Equals Behaviour'. Experimental tool-making, programming, typography and the visualisation of quantitative data are part of their daily routine.

BEN CERVENY

Ben Cerveny was one of the first users of the Web, and since the start of the digital era has amassed a vast wealth of knowledge and experience on computer-related issues, ranging from technical to conceptual. As information architect, he helped to make both Apple and Nike’s first websites and worked on various operating systems, programming with Pascal, Logo and HyperCard. As the digital became the context for many different processes, he started focusing on environments and cities and the rationalization of these processes. He has taught at CYARC, at UCLA, and USC at NYU, and various other schools, exploring the intersection between cultural production, society, and digital art.

GUO CHENG

Guo Cheng, born 1988 in Beijing, is an artist currently living and working in Shanghai. He received his bachelor's degree from Tongji University (2010) and his master's degree from the Royal College of Art (2012). His sculptures and installations focus on exploring the mutual impacts and influences between established/emerging technologies and individuals in the context of culture and social life. In recent years, his practice has dealt with themes such as the anthropocene and second nature, digitalized interobjectivity, and the ideologies behind various infrastructures. Cheng's works often use humorous yet subdued language to link grand issues with seemingly arbitrary objects, and to provide critical perspectives for discussion. Guo Cheng has worked as Executive Director at Chronus Art Center, Shanghai (2015-2017), the visiting researcher at Dept. Environment & Health, Vrije University, Amsterdam (2017) and has been teaching at College of Design and Innovation, Tongji University, Shanghai since 2013. He obtained Ars Electronica Honorary Mentions, Linz (2020); CAC:// DKU Research & Creation Fellowship, Shanghai (2020); STARTS Prize Nomination, Linz (2020); the Digital Earth fellowship (2018-2019); the Special Jury Prize of Huayu Youth Award, Sanya (2018); the Bio-Art & Design Award, The Hague (2017).

CHIMURENGA

Chimurenga is a pan-African platform of writing, art and politics founded by Ntone Edjabe in 2002. Drawing together myriad voices from across Africa and the diaspora, Chimurenga operates as an innovative platform for free ideas and political reflection about Africa by Africans. Outputs include *Chimurenga Magazine*; a quarterly broadsheet called *The Chronic*; the Chimurenga Library—an ongoing intervention that seeks to re-imagine the library; the *African Cities Reader*—a biennial publication of urban life, Africa-style; and the Pan African Space Station (PASS)—an online radio station and pop-up studio. These activities express the intensities of our world, capturing those forces and taking action. Unless we push form and content beyond what exists, we merely reproduce the original, colonized form. It requires new practices and methodologies that allow us to engage lines of flight, of fragility, precariousness, as well as joy, creativity, and beauty that defines contemporary African life. As Fela puts it: who no know go know.

CRISTINA COCHIOR

Cristina Cochior is a researcher and designer working in the Netherlands. With an interest in automation, situated software and peer to peer knowledge production, her practice largely consists of investigations into the intimate bureaucracy of knowledge organization systems and more recently,

collective and non-extractive digital infrastructures.

SOUNAK DAS

Sounak Das is a multimedia Artist based Dhaka, Bangladesh, his practice is predominantly comprized of photography, moving image, sound, and installation. He works to render ideas along the omnipresent lingering landscapes and aspects of urban scenario, with minimal representations of the convenient elements of time. His works embody community, cultural dilemma, spatial context, history, advancement of technology, and its Anthropocene. Experimenting within the parameters of physical reality, his expressions mostly focus on philosophy which questions the presence of reality.

DATA JUSTICE LAB

Data Justice Lab is a space for research and collaboration at Cardiff University's School of Journalism, Media and Culture (JOMEC). They seek to advance a research agenda that examines the intricate relationship between datafication and social justice, highlighting the politics and impacts of data-driven processes and big data. This research examines the implications of institutional and organizational uses of data, providing critical responses to potential data harms and misuses. Areas of research include, but are not limited to: data discrimination, digital labor, data ethics, algorithmic governance, social justice-informed design, uses of data by social justice groups, and data-related activism and advocacy.

LEONARDO DELLANOCE

Leonardo Dellanoce is a cultural entrepreneur working in and around art, technology and theory. He collaborates with artists, designers and thinkers in bringing to life a variety of projects including books, think-tanks, films, exhibitions and conferences. Among others, he co-founded Digital Earth, a research grant and support program for artists from Africa, Asia and South America; and he directed the interactive documentary Trust in the Blockchain Society.

PABLO DESOTO

Pablo DeSoto is an experimental architect and radical cartographer with years of experience in working with diverse communities across geographical and disciplinary borders. His research uses fieldwork and critical epistemologies to produce spatial knowledge and investigate the urgent political and environmental conditions of our time. A co-founder of hackitectura.net, he is the editor of three books and coauthor of the Critical Cartography of the Straits of Gibraltar. He has been awarded NTNU ARTEC AiR, LAB_Cyberspaces, UBA Elinor Ostrom, among others. He holds a Master's Degree in Architecture from the Royal Institute of Technology of Stockholm and a PhD in Communication & Culture from the Federal University of Rio de Janeiro.

ALEXIS DESTOOP

Alexis Destoop lives and works in Sydney, Australia and Brussels, Belgium. He has a background in photography and philosophy. His productions examine the experience of time, elements of storytelling, and procedures of identification and memory. Informed by the strategies of minimalism, his works are often seductive in appearance, functioning as lures that explore the deceptive nature of images. Destoop regularly works in collaboration with writers, performers and musicians. His latest project re-signifies Australia's desert landscape and its history through a science fiction narrative, resonating with colonial history and the omnipresent actuality of the mining industry, questioning the relationship between fiction and reality.

MARJOLIJN DIJKMAN

Marjolijn Dijkman lives and works in Brussels, Belgium and Saint-Mihiel, France. Her practice is research-based and multi-disciplinary, including film, photography, sculpture, and installation. Her works can be seen as a form of speculative-fiction, partly based on facts and research but often brought into the realm of the imagination. Her work is concerned with residues of enlightenment ideology, manifestations of collective memory, and blind spots of representation. The works propose alternate knowledge systems through their entanglement of different temporalities and geographies. Collaborations with other artists, thinkers, and experts are an important part of her life and practice as an artist and have been a key motivation to co-found Enough Room for Space in 2005. Marjolijn Dijkman's recent solo shows in 2021 include: Electrify Everything at NOME, Berlin; and Shifting Axis at Edith Russ Haus, Oldenburg, Germany.

DISNOVATION.ORG

Founded in 2012 by Nicolas Maigret and Maria Roszkowska, DISNOVATION.ORG is an art collective and international workgroup engaged in the intersection between contemporary arts, research, and hacking. Artist and philosopher Baruch Gottlieb joined the collective in 2018. Together, they develop situations of interference, discussion and speculation that question dominant techno-positivist ideologies in order to foster post-growth narratives. Their research is expressed through installations, performances, websites and events. They recently co-edited A Bestiary of the Anthropocene (Onomatopee 2021), an atlas of anthropic hybrid creatures, and *The Pirate Book* (Aksioma 2015), an anthology about media piracy.

MAARTEN VANDEN EYNDE

Maarten Vanden Eynde is an artist and co-founder of Enough Room for Space. He graduated in 2000 from the free media department at the Gerrit Rietveld Academie in Amsterdam (NL), participated in 2006 in the experimental MSA^ Mountain School of Arts in Los Angeles (US) and finished a postgraduate course in 2009 at HISK in Ghent (BE) where he is a regular guest tutor. His practice is embedded in long-term research projects that focus on numerous subjects of social and political relevance such as post-industrialism, capitalism and ecology. Currently he is investigating the influence of transatlantic trade of pivotal materials like rubber, oil, ivory, copper, cotton and uranium, on evolution and progress, the creation of nations and other global power structures. Since 2020 he is a PhD candidate at the UiB / University of Bergen in Norway.

CAO FEI

Beijing-based artist Cao Fei reflects on the rapid changes occurring in Chinese society today. She mixes social commentary, popular aesthetics, references to Surrealism, and documentary conventions in her films and installations. Cao Fei's first solo exhibition took place at MoMA PS1 (2016) and since then her work has been included in numerous international biennials and triennials. Her recent projects include a solo exhibition at the Serpentine Galleries, London (2020), a major retrospective at the UCCA Center for Contemporary Art, Beijing (2021), and solo exhibition at the National Museum of 21st Century.

SHUANG LU FROST

Shuang Lu Frost is an ethnographer of technology and innovation, she works as an Assistant Professor of Digital Innovation and Business Transformation at Aarhus University. She recently completed her PhD of Social Anthropology at Harvard University, with a secondary field in Science, Technology and Society (2020). She is currently working on her monograph *Moralizing Disruption: China's Ride-Hailing Revolution*, which explores the emergence, contestation, and moralization of ride-hailing platforms in contemporary China. During 20 months of ethnographic fieldwork spanning six years, she immersed herself in communities of computer engineers, corporate managers, on-demand drivers, hackers, and labor contractors, exploring how different groups of actors participate in and make sense of the changes brought on by ride-hailing platforms. Her recent publications include "Taxi Shanghai: Entrepreneurship and Semi-Colonialism" (*Business History*, 2021) and "Platforms as if People Mattered" (*Economic Anthropology*, 2020).

MAYA INDIRA GANESH

Maya Indira Ganesh is a tech and digital cultures theorist, researcher, and writer. She co-leads a new Masters program on AI, Ethics, and Society at the University of Cambridge, UK. Maya has a Drphil in Cultural Sciences from Leuphana University, Lüneburg, Germany. Her research examined the computational, social, and cultural conditions of media technologies re-shaping the 'ethical' and the place of the human in data-fied worlds of the driverless car. Maya is part of an advisory board on AI and the arts to the Junge Akademie at the Academy of the Arts, Berlin. She continues to be associated with gender justice and digital rights movements that she worked in prior to academic work. She is on the board of Arrow, a feminist reproductive health and rights policy organisation working in the Asia-Pacific region.

PÉLAGIE GBAGUIDI

Pélagie Gbaguidi is a self-proclaimed "contemporary Griot" living and working in Brussels. Her work is an anthology of the signs and traces of trauma. A readjustment of the imaginary arouses in the artist an urgency to give it form, writing to liberate images, drawing a corpus of contemporary forms. She has participated in numerous international exhibitions including, Stadtmuseum, Munich, Germany (2013), MMK Museum für Moderne Kunst, Frankfurt, Germany (2014), "Divine Comedy: Heaven, Hell, Purgatory Revisited by Contemporary African Artists" at the Smithsonian National Museum of African Art, Washington D.C., USA (2015), Documenta 14 in Athens and Kassel (2017), and *Multiple Transmissions: Art in the Afropolitan Age* at Wiels, Brussels (2019).

GCC GROUP

The artist collective GCC has been making arab contemporary art that addresses the contemporary culture of the Arab Gulf region. Consisting of a "delegation" of nine artists, the GCC makes reference to the English abbreviation of the Gulf Cooperation Council, an economic and political consortium of Arabian Gulf nations. Founded in the VIP lounge of Art Dubai in 2013, the GCC makes use of the ministerial language and celebratory rituals associated with the Gulf. The collective consists of Nanu Al-Hamad, Khalid al Gharaballi, Abdullah Al-Mutairi, Fatima Al Qadiri, Monira Al Qadiri, Aziz Al Qatami, Barrak Alzaid, Amal Khalaf.

GEOCINEMA

Geocinema (Asia Bazdyrieva, Solveig Qu Suess) is a collective that explores the possibilities of a "planetary" notion of cinema. Based in Berlin and Kyiv, their practice has been concerned with the understanding and sensing of the earth while being on the ground, enmeshed within vastly distributed processes of image and meaning making. Their work has been shown internationally, including their first solo show Making of Earths at Kunsthall Trondheim Norway (2020) and group shows such as Critical Zones at ZKM Karlsruhe (2020-21) and Re-thinking Collectivity at Guangzhou Image Triennale (2021). They have given lecture-performances at the Ashkal Alwan Beirut, ICA London, HKW Berlin, NYU Shanghai, Matadero Madrid and have taught at the Berlin University of the Arts, FAMU Prague, Central Saint Martins London among others. They were 2018–19 Digital Earth Fellows and have been nominated for the Schering Stiftung Award for Artistic Research (2020) and the Golden Key Kasseler Dokfest (2021).

JOHN GERRARD

John Gerrard was born in North Tipperary, Ireland. Gerrard received a BFA from The Ruskin School of Drawing and Fine Art, Oxford University. Best known for his sculptures and installations, Gerrard is widely regarded as a key figure in the development of simulation within contemporary art. His works typically take the form of digital simulations, displayed using real-time computer graphics.

OULIMATA GUEYE

Oulimata Gueye is a Senegalese and French art critic and curator studying the impact of digital technology on urban popular culture in Africa. Since 2010, Gueye has been conducting a research project known as Africa SF which explores digital culture, science, and the potential of fiction to develop critical analysis and alternative positions.

CAMILLE HENROT

The practice of French artist Camille Henrot moves seamlessly between film, painting, drawing, sculpture and installation. The artist references self-help, online second-hand marketplaces, cultural anthropology, literature, psychoanalysis, and social media to question what it means to be at once a private individual and a global subject. Henrot is interested in confronting emotional and political issues, and looking at how ideology, globalization, belief and new media are interacting to create an environment of structural anxiety. A 2013 fellowship at the Smithsonian Institute resulted in her film Grosse Fatigue, for which she was awarded the Silver Lion at the 55th Venice Biennale. Her acclaimed 2014 installation "The Pale Fox" at Chisenhale Gallery in London travelled to institutions including Kunsthal Charlottenburg, Copenhagen; Bétonsalon—Centre for art and research, Paris; and Westfälischer Kunstverein, Münster, Germany. In 2017, Henrot was given carte blanche at Palais de Tokyo in Paris, where she presented the major exhibition "Days Are Dogs."

FEMKE HERREGRAVEN

Femke Herregraven investigates which material base, geographies, and value systems are carved out by financial technologies and infrastructures. Her work focuses on the effects of abstract value systems on historiography and individual lives. This research is the basis for the conception of new characters, stories, objects, sculptures, sound, and mixed-media installations. Her current work focuses on the financialization of the future as a "catastrophe" and uses language, the voice, and the respiratory system to examine these monetized speculative catastrophes within our social, biological, and technological ecosystems. She is an alumnus of the Rijksakademie van beeldende kunsten in Amsterdam (2017—2018). In 2016, she collaborated with Dutch investigative journalists on the Panama Papers. In 2019, she was nominated for the Prix de Rome. She is currently a Creator Doctus (practice-based PhD) candidate at Sandberg Instituut (2020—2023).

YUK HUI

Yuk Hui wrote his doctoral thesis under the French philosopher Bernard Stiegler at Goldsmiths College in London and obtained his habilitation in philosophy from Leuphana University in Germany. Hui is author of several monographs that have been translated into a dozen languages, including *On the Existence of Digital Objects* (University of Minnesota Press, 2016), *The Question Concerning Technology in China:-An Essay in Cosmotechnics* (Urbanomic, 2016), *Recursivity and Contingency* (Rowman & Littlefield, 2019), and *Art and Cosmotechnics* (University of Minnesota Press, 2021). Since 2014, Hui has been the initiator and convenor of the Research Network for Philosophy and Technology and currently sits as a juror of the Berggruen Prize for Philosophy and Culture. He currently teaches at the City University of Hong Kong.

SANNEKE HUISMAN

Sanneke Huisman was trained as an art historian, and works as a freelance writer, curator and teacher with a focus on media art and digital art. She collaborated with Marga van Mechelen on compiling and editing a comprehensive

publication on the history of media art in the Netherlands, *A Critical History of Media Art in the Netherlands: Platforms, Policies, Technologies* (2019, Jap Sam Books). At LIMA, a platform for media art in Amsterdam, she is active as a programr and a project leader for various national and international exhibitions and projects, including the 2015 exhibition *Talking Back to the Media* (1985-2015), *Cultural Matter* (2017-2020), and *Mediakunst op Wikipedia* (Media Art on Wikipedia, 2021-2023). She writes about contemporary art for exhibition catalogues and magazines including Metropolis M and De Witte Raaf, and is a guest lecturer at various Dutch art academies and universities, including KABK, ArtEZ, Leiden University, Vrije Universiteit, and UvA.

VICTORIA IVANOVA

Victoria Ivanova is currently Research and Development Strategic Lead at the Serpentine Galleries, a contemporary arts organization in London. In 2010, while working in the human rights field, she co-founded a cultural platform in Donetsk, Ukraine. In 2014 she founded Real Flow, a research and development platform for socializing finance. Her practice is informed by systems analysis and approaching infrastructures as mechanisms for shaping socio-economic and political realities. Her current research interests include possibile technological infrastructures which prototype post-Westphalian citizenship models.

FIEKE JANSEN

Fieke Jansen is a PhD candidate at Cardiff University's School of Journalism, Media and Culture and the Data Justice Lab. She is interested in re-politicizing data and technology, by understanding its historical, social, cultural and political context in Europe. Her research focuses on the impact on targeted communites of implementing data-driven decision-making in European police forces. Prior to starting her PhD, Fieke worked as a practitioner exploring the intersection of human rights, the internet, and artificial intelligence.

VLADAN JOLER

Vladan Joler is a researcher and artist whose work blends data investigation, counter-cartography, investigative journalism, writing, data visualization, critical design and numerous other disciplines. He explores and visualises technical and social aspects of algorithmic transparency, digital labor exploitation, invisible infrastructures and other contemporary phenomena in the intersection of technology and society.

ISAAC KARIUKI

Isaac Kariuki is a visual artist and writer whose work centres on surveillance, borders, internet culture and the black market, as they relate to the Global South. His work takes the form of image, video, lectures, writing and performance. He has exhibited at the Tate Modern, Kadist (Paris) and the Kampala Art Biennale, as well as holding lectures at the Tate Britain among others.

AMAL KHALAF

Amal Khalaf is a curator and artist and currently Director of Programs at Cubitt and Civic Curator at the Serpentine Galleries where she has worked on the Edgware Road Project since its inception in 2009. Here and in other contexts she has developed residencies, exhibitions and collaborative research projects at the intersection of arts and social justice. With an interest in radical pedagogy, collectivity and community practice, she has developed a migrant justice program through Implicated Theatre (2011-2019) using Theatre of the Oppressed methodologies to create interventions, curricula and performances with ESOL teachers, hotel workers, domestic workers and migrant justice organizers. She is a founding member of artist collective GCC, a trustee for not/no.w.here and on the artistic committee for Arts Catalyst. In 2019 she curated Bahrain's pavilion for Venice and in 2016 she co-directed the 10th edition of the Global Art Forum, Art Dubai.

FRANCOIS KNOETZE

Francois Knoetze is a scavenger, sculptor, performer, and video artist with an interest in the connections between social histories and material culture. His roaming costumed performances and experimental videos pick at the socio-spatial force-fields that attempt to rigidly order the contaminated, folded, and entangled worlds of people and things. His videos create narrative portraits of the uncertainty in the nervous system of a global digital machine at the brink of collapse. Knoetze is a co-founder of the Lo-Def Film Factory. Based in South Africa, the collective's work involves archival research, dramaturgy and visual strategies associated with video art, collage, sculptural installation and Virtual Reality, to explore and create space for collaborative, experimental community storytelling.

SRINIVAS KODALI

Srinivas Kodali is a interdisciplinary researcher based in India, where he is part of several internet movements and communities. His work focuses on governance and the internet, advocating for data standards, open data and cyber security.

BOGNA KONIOR

Bogna Konior is Assistant Professor at the Interactive Media Arts department at NYU Shanghai, where she teaches classes on emerging technologies, philosophy, humanities and the arts. She also co-directs the university's Artificial Intelligence and Culture Research Centre. She is the co-editor of Machine Decision is not Final: China and the History and Future of AI (Urbanomic).

KLAAS KUITENBROUWER

Klaas Kuitenbrouwer is senior researcher in digital culture at Het Nieuwe Instituut in Rotterdam and teaches theory at the Gerrit Rietveld and other academies. Since the late 1990s, he has researched, curated, and lectured on the intersections of art, design, technology, and ecology. In the early 2000's he set up and curated the Mediamatic research workshops on the cultural significance of new digital technologies. He co-curated the Transnatural festivals (2010—2013) and worked in the field of cultural policy of digital culture at Virtueel Platform (2009—2013). Through his work he convergences different knowledge practices: technological, artistic, legal, organizational, scientific, and more-than-human. In recent years, he curated, among other programs, Garden of Machines (2015), Gardening Mars (2017), Bot Club and the Neuhaus Temporary Academy for more-than-human knowledge (2019). He co-edits the Vertical Atlas and in 2019 he initiated the Zoöp project.

LUKÁŠ LIKAVČAN

Lukáš Likavčan is a philosopher focusing on technology, ecology and visual cultures. He is a Global Perspective on Society Postdoctoral Fellow at NYU Shanghai, and an author of *Introduction to Comparative Planetology* (Strelka Press, 2019).

ABU BAKARR MANSARAY

Abu Bakarr Mansaray is a devoted autodidact of visual arts, industrial design, engineering, mathematics, and physics who persistently studies these disparate knowledge systems to give order to the physical world. Growing up in Sierra Leone, he witnessed the country's most brutal period of civil war, which left fifty thousand dead and many more injured, raped, or mutilated and faced with impending economic, political, and social collapse. The artist narrowly escaped the 1999 Freetown massacre but has since returned to his country, fostering within his work a desire to alter the sinister political forces at play by revealing their concealed mechanisms and suggesting methods for disrupting their devious courses.

SVITLANA MATVIYENKO

Svitlana Matviyenko is an Assistant Professor of Critical Media Analysis at the SFU School of Communication. Her research and teaching focus on information and cyberwar, the political economy of information, media and environment, infrastructure studies, and science and technology studies. She writes about practices of resistance and mobilization, digital militarism, dis- and misinformation, internet history, cybernetics, psychoanalysis, posthumanism, Soviet and post-Soviet techno-politics, and nuclear cultures, such as the Chernobyl Zone of Exclusion. She is a co-editor of two collections, *The Imaginary App* (MIT Press, 2014) and *Lacan and the Posthuman* (Palgrave Macmillan, 2018). She is a co-author of *Cyberwar and Revolution: Digital Subterfuge in Global Capitalism* (Minnesota UP, 2019).

EMO DE MEDEIROS

Emo de Medeiros is a Beninese-French artist living and working in Cotonou, Benin and Paris, France. His work has been shown internationally at Centre Pompidou, and Palais de Tokyo, Paris, France; MARKK Hamburg, Germany; Videobrasil Contemporary Art Festival São Paulo, Brazil; LagosPhoto, Nigeria; as well as in the United Kingdom, Japan, China, and the biennales of Marrakech, Dakar and Casablanca. His practice hinges on a single concept he calls "contexture," a fusion of the digital and the material, of the tangible and the intangible, exploring hybridizations, interconnections and circulations of forms, technologies, traditions, myths and merchandises. He investigates the new perspectives and conversations happening in a novel space: the current context of the post-colonial, globalized and digitalized world of the early 21st century. Within his practice, Medeiros employs an array of media including drawing, sculpture, text, video, photography, assemblage, performance, electronic music, installations, painting and appliqué fabric.

METAHAVEN

The work of the Amsterdam-based artist collective Metahaven consists of filmmaking, writing, and design. Films by Metahaven include *Chaos Theory* (2021), *Hometown* (2018), *Eurasia (Questions on Happiness)* (2018), and *Information Skies* (2016). Metahaven has participated in group exhibitions at Artists Space, New York, the Museum of Modern Art Warsaw, the Gwangju Biennale, Gwangju, the Busan Biennale, Busan, the Sharjah Biennial, Sharjah, and M HKA, Antwerp, among others, andheld solo exhbitions exhibitions at MoMA PS1, New York, Yerba Buena Center for the Arts, San Francisco, Izolyatsia, Kyiv, ICA London, e-flux, New York, and State of Concept

Athens, among others. Their work is featured in collections of the Sharjah Art Foundation, the National Gallery of Victoria, and the Stedelijk Museum Amsterdam, among others. Recent publications include the book-length essay Digital Tarkovsky (2018), and *PSYOP: An Anthology* (2018), edited with Karen Archey.

PHILIPPA METCALFE

Philippa Metcalfe is a PhD candidate at the ERC funded DATAJUSTICE project, based at the Data Justice Lab at Cardiff University, UK. She has conducted empirical research in Greece and the UK, conceptualizing the datafied border and asylum regimes of Europe. Her primary focus is to (re) politicise data driven governance, by critically engaging with the ways which technological advances work to entrench historical bordering practices. Her work has been published in *First Monday* and *Geopolitics* peer-reviewed online journals.

DORINE MOKHA

Dorine Mokha (1989-2021, based in Lubumbashi, DRC): Dorine was a Congolese dancer, choreographer and author, artistic co-director of ART'gument Project in Lubumbashi and associated artist with Studios Kabako in Kisangani. Open to multidisciplinarity, he has participated in numerous workshops in theatrical improvization, film initiation, theatre writing, project writing and more recently in visual criticism and artistic production. He participated in international programs such as the Pan-African PAMOJA Residencies (2013-2015), the TURN Fund Meeting (2014), the Berlin Platform—Goethe Institute Coproduction Fund (2018); Avignon Festival, the Ruhrtriennale, the Theater der Welt or the Theaterformen. Scholar 2014-2015 of the Akademie Schloss Solitude, Laureate 2016 of the Triennial Dance Dance of Africa Dance of the French Institute, Jury 2017 of the Zurcher Kontal Bank Prize or Laureate 2019 of the Pro Helvetia Research Residence.

JEAN KATAMBAYI MUKENDI

Jean Katambayi Mukendi is a visual artist based in the Democratic Republic of Congo. His practice lies at the intersection of technology, mechanics, geometrics, and electricity. He fuses his training as an electrician with influences from his daily life within his works.

MUSASA

Edmond Musasa Leu N'seya is specialised in figurative painting, focussing on habits, rules and systems that are part of life in rural environments and ancient societies. He developed most of the visual language used in the National Museum of Lubumbashi explaining the origin and use of a variety of natural and industrial materials and processes. Musasa's work has been exhibited over the last 40 years in DR Congo in local exhibition in Lubumbashi, Likasi, Kolwezi and Kolwezi. Musasa and Maarten Vanden Eynde have been collaborating since 2015. Their collaborative works have been presented at Mu.Zee, Ostend, Belgium (2021); Jean-Cocteau Cultural Centre, Paris, France (2020); Tallinn Photomonth - Contemporary Art Biennial, Estonia (2019); 6th and 4th Lubumbashi Biennale, Lubumbashi, DRC (2019 and 2015); Contour Biennial #9, Mechelen, Belgium (2019); Cargo in Context, Amsterdam, The Netherlands (2019); Galerie Imane Farès, Paris, France (2019); Egmont Palace, Brussels, Belgium (2018); Belgian Art Prize, BOZAR, Brussels, BE (2017)

KATJA NOVITSKOVA

Katja Novitskova, born 1984 in Tallinn, Estonia, lives and works in Amsterdam. Novitskova's work tackles the complexity and failures of depicting the world through technologically driven narratives. Novitskova's work focuses on the mapping of biological territories that are no longer outside but rather "inside" biological bodies. By uniting art and science at the level of nature, Novitskova brings awareness to tools of mediation and representation used to depict these realms, such as microscopes or brain scans, and how they are able to merge datasets and biology. Novitskova has published three books, *If Only You Could See What I've Seen with Your Eyes* (Sternberg, 2018), *Dawn Mission* (Kunstverein, 2016), *Post Internet Survival Guide* (Revolver, 2010). She has had solo shows internationally at Kunstfort bij Vijfhuizen (2021); Whitechapel Gallery, London (2018) the Estonian Pavilion at the 57th Venice Biennale (2017), among others.

NANJALA NYABOLA

Nanjala Nyabola is a writer and researcher based in Nairobi, Kenya. She is the author of *Digital Democracy, Analogue Politics: How the Internet Era is Transforming Politics in Kenya* (Zed. 2018) and *Travelling While Black: Essays Inspired by a Life on the Move* (Hurst. 2020).

TREVOR PAGLEN

Trevor Paglen was born in 1974 at an Air Force base in Maryland, where his father worked as an ophthalmologist. He grew up on bases in the USA and Germany. A former prison-rights activist, Paglen's photographs often depict classified military activity. Previous series have featured a National Security Agency's eavesdropping complex,

an Israeli nuclear weapons facility, and a secret CIA prison. The images are always shot from public land, and consequentially are often blurred, sometimes indecipherable. This tendency is embraced by Paglen as an emphasis on the secretive nature of the establishments from which he is attempting to gather information.

ALICE PIVA

Alice Piva is an undergraduate architecture and urban design student and researcher at Federal University of Paraiba, Brazil. She works through more-than-human perspectives, interweaving digital, physical, and biological systems in data-driven cartographies, algorithms, and speculative designs, to which she applies post-anthropocentric and technopolitical discussions.

CHEN 'STANLEY' QIUFAN

Chen Qiufan (a.k.a. Stanley Chan) is an award-winning Chinese speculative fiction author, translator, creative producer, and curator. He is honorary president of the Chinese Science Fiction Writers Association, and has a seat on the Xprize Foundation Science Fiction Advisory Council. His works include the novel *Waste Tide* (Tor, 2019) and, co-authored with Kai-Fu Lee, the book *AI 2041: Ten Visions for Our Future* (Currency, 2021). He currently lives in Shanghai and is the founder of Thema Mundi Studio.

NII QUAYNOR

Dr. Nii Quaynor pioneered Internet development and expansion throughout Africa for nearly two decades, establishing some of Africa's first Internet connections and helping set up key organizations, including the African Network Operators Group. He also was the founding chairman of AfriNIC, the African Internet numbers registry.

ELIA REDIGER

Elia Rediger was born in 1985 in Kinshasa, Congo. As the son of Swiss development workers, he grew up in Basel after returning to Switzerland, where he performed as a child singer at the Basel Theater. After staying in Denver, USA and studying media art, he founded the music group The bianca Story with Fabian Chiquet in 2006, in which he was a lyricist, front man and singer and has released four albums.

TABITA REZAIRE

Tabita Rezaire is infinity longing to experience itself in human form. Her path as an artist, devotee, yogi, doula, and soon-to-be farmer is geared towards manifesting the divine in herself and beyond. As an eternal seeker, Tabita's yearning for connection finds expression in her cross-dimensional practices, which envision network sciences—organic, electronic and spiritual—as healing technologies to serve the shift towards heart-consciousness. Embracing digital, corporeal and ancestral memory, she digs into scientific imaginaries and mystical realms to tackle colonial wounds and energetic imbalances that affect the songs of our body-mind-spirits. Through screen interfaces and healing circles, her offerings aim to nurture our collective growth and expand our capacity for togetherness. Tabita is based near Cayenne in French Guyana, where she is currently studying Agriculture and birthing AMAKABA, her vision for collective healing in the Amazonian forest. Tabita is devoted to becoming a mother to the world.

LUCAS ROLIM

Lucas Rolim is an architect who graduated from the Federal University of Paraiba, in Brazil, his homeland. Focused on transdisciplinary relations between advanced computational design and social and environmental responsibility, he is especially interested in employing these techniques and methods in the Global South sociopolitical context. Currently, he is doing his Master of Science in Technische Universität Berlin, Germany, where he studies in the M-ARCH-Typology Program in which he focuses on the development of emerging building types and construction paradigms, in particular, circular and sustainable modes that attempt to address multiple stacks of planetary scale architecture.

RENÉE ROUKENS

Renée Roukens is an arts organizer and creative producer. She is COO at Strietman Espresso Machines. As an executive she builds institutional capacity, helping creative people share ideas and achieve their goals. She has developed exhibitions, residencies and discursive programs at Marres, House for Contemporary Culture, MU Hybrid Art House, Baltan Laboratories and Hivos. She is co-founder of Digital Earth, a fellowship for artists thinking through questions of digital futures.

BASSEM SAAD

Bassem Saad is an artist and writer born on September 11 and trained in architecture. His work explores objects and operations that distribute violence, pleasure, welfare, and waste. Through video, sculpture, and writing, he investigates and record strategies for maneuvering within and beyond governance systems. His writing appears in *Jadaliyya*, *Unbag*, and *The Funambulist*, and he is an editorial team member at Failed Architecture. He was a resident fellow at Eyebeam in New York and at Ashkal Alwan's Home Workspace Program in Beirut. He is currently a fellow at the Leslie Lohman Museum.

NANJIRA SAMBULI

Nanjira Sambuli is a researcher, policy analyst, and strategist working to understand the unfolding, gendered impacts of ICT adoption on governance, media, entrepreneurship, and culture. Nanjira is a Fellow in the Technology and International Affairs Program at The Carnegie Endowment for International Peace, and a Ford Global Fellow. She is also a co-chair of Transform Health, and board member at The New Humanitarian, Development Gateway, and Digital Impact Alliance. Nanjira advises the <A+> Alliance for Inclusive Algorithms, and the Carnegie Council's AI and Equality Initiative. She is also a Diplomacy Moderator at the Geneva Science and Diplomacy Anticipator (GESDA). Nanjira has served as a Commissioner on the Lancet & Financial Times Governing Health Futures 2030 Commission, as a panel member on the United Nations Secretary General's High-Level Panel on Digital Cooperation, and as a deputy on the United Nations Secretary General's High-Level Panel for Women's Economic Empowerment.

NZILANI SIMU

Nzilani Simu is a visual artist specializing in illustration, hand lettering, infographics, identity design and visual advocacy. She finds inspiration in the African landscape, its animals, plants, and flowers. She enjoys learning and conveying African stories in her art. Her hand-lettering practice engages with everything from music lyrics to inspirational quotes. Her art brand Kulula is an outlet for creative expression where she also sells art goods and holds occasional workshops. She is passionate about design for social impact, particularly when it comes to an African lens and projects focused on women's rights.

GEORGES SENGA

Georges Senga (1983, Lubumbashi, DRC) is a photographer. He develops his photographic work around history and the narratives revealed by "memory, identity and heritage," illuminating our actions and the present. Three of his projects explore memory, looking for the resonances that people, their facts and their objects leave behind, and the resilience of memory in his country, Congo. Georges Senga is part of the artistic dynamic of the city of Lubumbashi at the PICHA art centre in DR Congo and at the Photo Market and Phototools workshop in Johannesburg, South Africa. His work has been exhibited internationally in institutions; in 2021 he developed a project at the Villa Medici.

ANDREJ ŠKUFCA

Andrej Škufca's work presents itself as a network characterized by fiction, technological design, industrial fabrication processes and synthetic materials. His installations not only combine technological and fictional elements, but produce immersive and seemingly animated environments, in which human agents are no longer central. He has had solo shows in Aksioma, Ljubljana; The International Center of Graphic Arts, Ljubljana; Miroslav Kraljević Gallery, Zagreb; Karlin Studios, FUTURA, Prague; DUM Project Space Ljubljana. And participated in group shows in MAXXI - National Museum of XXI Century Arts, Rome; Ludwig Muzeum, Budapest; Museum of Contemporary Art Metelkova, Ljubljana; Gallery of Modern Art, Ljubljana. He is also an editor at Šum journal.

ARTHUR STEINER

Arthur Steiner is an art historian passionate about the role of arts, culture and digital tech in tackling 21st century challenges. He has led various innovative strategic programs for Hivos, working to develop the cultural sector and its social impact in over 25 countries. Through his work he has connected musicians in Zimbabwe, game designers in Egypt, VR storytellers in China and impact investors in the United Arab Emirates. He is co-founder of New Silk Roads and Digital Earth, a fellowship for artists to reimagine the dominant narrative of our digital futures. He has curated various art exhibitions and public programs around the world. Together with the Prince Claus Fund and the European Culture Foundation he initiated the publication *Forces of Art: Perspectives from a Changing World* (Valiz, 2020).

KSENIA TATARCHENKO

Ksenia Tatarchenko is an assistant professor of Science, Technology and Society at the Singapore Management University. She received her PhD from the History of Science Program, History Department, Princeton University (2013), and an MA in history from University Paris-Sorbonne (2006). Her dissertation "A House with the Window to the West: The Akademgorodok Computer Center, 1958-1993" was awarded the Charles Babbage Institute 2012-2013 Erwin & Adelle Tomash Fellowship. She has held positions as a lecturer at the Global Studies Institute, Geneva University, as a visiting Assistant Professor of History at NYU, Shanghai, and as a post-doctoral fellow at the Harriman Institute, Columbia University.

SUZANNE TREISTER

Suzanne Treister lives and works in London and the French Pyrenees. She has been a pioneer in the new media field since the early 1990s, working simultaneously across video, the internet, interactive technologies, photogra-

phy, drawing and watercolour. Treister has evolved a large number of projects, many spanning several years, which engage with eccentric narratives and unconventional bodies of research. In 1988 she was making work about video games, in 1992 virtual reality, in 1993 imaginary software and in 1995 she made her first web project and invented a time travelling avatar, Rosalind Brodsky, the subject of an interactive CD-ROM. An ongoing focus of her work is the relationship between new technologies, society, alternative belief systems and the potential futures of humanity.

UNKNOWN FIELDS

Unknown Fields (UK/AU) is a nomadic design research studio directed by Kate Davies and Liam Young. By venturing out on expeditions into the shadows cast by the contemporary city, they uncover the industrial ecologies and precarious wilderness its technology and culture set in motion. These distant landscapes—the iconic and the ignored, the excavated, irradiated, and the pristine—are embedded in global systems connected in surprizing and complicated ways to our everyday lives. Unknown Fields make provocative objects and films from this expedition work, exploring the dispersed narratives that coalesce to form a contemporary city. They chronicle their expeditions in a book series titled *Unknown Fields: Tales from the Dark Side of the City* (Architectural Association, 2016). Their projects have been collected by institutions internationally, and their work has been published extensively in *The Guardian*, *BBC*, *Wired*, *New Scientist* and many more.

JORDI VALLVERDÚ

Jordi Vallverdú, PhD, MSci, BMus, BPhil, is ICREA Acadèmia Tenure Professor at Universitat Autònoma de Barcelona (Catalonia), where he teaches Philosophy and History of Science and Computing. His research is dedicated to the epistemological, cognitive, ethical and educational aspects of Philosophy of Computing and Science and artificial intelligence. He leads his own MICINN funded research group on Innovation and Medicine, is research member of the Caixabank funded AppPhil project, as well as research member of TECNOCOG Philosophy, Technology and Cognition Research Group. He is also head of UAB team of the consortium that has obtained the CSI-COP H2020 EU project. He has been involved in the publication of nearly 20 books, as author or editor.

RICHARD VIJGEN

Richard Vijgen is an artist and designer whose work focuses on artistic data visualization. He creates multi-sensorial data experiences that visualize the invisible technological dimensions of reality. His work provides poetical interpretations of data and proposes a dialog between the human perspective and the disembodied world of digital networks, algorithms and wireless communication.

SARAH WAISWA

Sarah Waiswa is Ugandan-born, Kenya-based documentary and portrait photographer with an interest in exploring the New African Identity on the continent. Her work has been exhibited around the world, most recently at the National Gallery of Victoria in Australia. Her photographs have been published in *The Washington Post*, *Bloomberg*, and *The New York Times*, among other publications.

ZHAN WANG

Zhan Wang is a visual artist currently based in Berlin. Having been trained in architecture at the Architectural Association in London, Zhan's works focus on creating spatial consequences of technology and politics. In his work "Lunar Economic Zone," he uses visual references from Chinese propaganda posters from the 60s and 70s to create an animated "technotopia" driven by resource monopoly. The overly saturated visual language of the animation contrasts with the more complex reality of a development-driven economy. The "Lunar Economic Zone" has been shown in Tokyo, Singapore, Zurich etc. Zhan works with various media including animation, coding and VR.

KEDOLWA WAZIRI

Kedolwa Waziri is a writer, dreamer, and community organizer at Trans Queer Fund Kenya. She is a student of radical social movements, and her work lives at the intersection of social justice, art, and feminist politics. In her practice she is an emerging voice on the histories of marginalization, identity, and digital justice.

MI YOU

Mi You is an interim professor of Art and Economies at the University of Kassel/documenta Institut. Her long-term research and curatorial projects spin between the two extremes of the ancient and futuristic. She works with the cultural and economic idea of Silk Road as a figuration for nomadic imageries and old and new networks/technologies. She has curated programs at Asian Culture Center in Gwangju, South Korea, Ulaanbaatar International Media Art Festival, Mongolia (2016), and with Binna Choi, she is co-steering a research/curatorial project Unmapping Eurasia. At the same time, her interests in politics around technology and futures led her to work on "actionable speculations," articulated in the exhibition, workshops and sci-fi-a-thon "Sci-(no)-fiction" at the Academy of the Arts of the World, Cologne (2019), as well as in her function as chair of committee on Media Arts and Technology for the transnational political NGO Common Action Forum. She is one of the curators of the 13th Shanghai Biennale (2020-2021).

QIU ZHIJIE

Qiu Zhijie was born in 1969 in Zhangzhou, Fujian Province, China. As an artist, writer, curator, and teacher he has earned critical recognition worldwide for his concept and practice of "total art," which forges new cultural meaning from various philosophies and systems of thought from anytime, anywhere. Since 2016, Qiu has served as dean of the School of Experimental Art, Central Academy of Fine Arts, Beijing. He has co-curated several exhibitions of experimental art in China, including *Image and Phenomena: '96 Video Art Exhibition* (1996), and *Post-Sense Sensibility: Alien Bodies and Delusion* (1999). He was chief curator of the Shanghai Biennial (2012) and curator of the China Pavilion at the Venice Biennale (2017).

DAN ZHU

Dan Zhu is a visual artist born in 1985 in Jiangxi, China, currently living and working in The Hague. For Dan Zhu work with pencil and paint on paper or linen is the beauty of necessity, the wonder of medium, there since the explosion of space itself. Circle after circle, round after round, the hour glass is turning.

Colophon

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Vertical Atlas is the result of a four-year collaboration between Hivos and Het Nieuwe Instituut. It builds on the research by the Digital Earth fellows and the findings of six Vertical Atlas research labs by Het Nieuwe Instituut in Rotterdam as well as six Digital Earth workshops in Dakar, Beirut, Paris, Dubai, New Delhi and Moscow. The Vertical Atlas Research Labs were curated by Benjamin H. Bratton, Arthur Steiner, Leonardo Dellanoce and Klaas Kuitenbrouwer, supported by Anastasia Kubrak.

Island.eu
September 20-21, 2018
Speakers Benjamin H. Bratton, Victoria Ivanova and Marten Kaevats
Participants research lab Ben Cerveny, Pablo DeSoto, Benjamin H. Bratton, Jaap-Henk Hoepman, Victoria Ivanova, Fieke Jansen, Vladan Joler, Marten Kaevats, Alison Killing, Philippa Metcalfe and Marina Otero Verzier

Infocosm.ru
November 29 - December 1, 2018
Speakers Svitlana Matviyenko, Ksenia Tatarchenko, Ksenia Fedorova, Benjamin Peters
Participants research lab Denis Leontiev, Svitlana Matviyenko, Katja Novitskova, Jasmijn Visser Benjamin Peters, Valia Fetisov, Ksenia Fedorova, Ksenia Tatarchenko, Alexander van Wijnen, Femke Herregraven, Sanne Stevens, Tin Geber and Nikita Lin

Networks.africa
April 11-12, 2019
Speakers 'Gbenga Sesan, Nanjala Nyabola, Serubiri Moses, Tegan Bristow and Oulimata Gueye
Participants research lab Tegan Bristow, Oulimata Gueye, Halima Haruna, Serubiri Moses, Sylvia Musalagani, Nanjala Nyabola, 'Gbenga Sesan and Alexander van Wijnen

Futures.gcc
October 17-18, 2019
Speakers Marc Owen Jones and Amal Khalaf
Participants research lab Marc Owen Jones, Amal Khalaf, Iyad Alsaka

China.ai
December 5, 2019
Speakers Shuang Lu Frost and Chen Qiufan (aka Stanley Chen)
Participants research lab Yue Mao, Chen Qiufan, Yin Aiwen, Shuang Lu Frost, Jo Wei

World.orbit
October 30 - November 13, 2020
Speakers Tega Brain, Andrei Bocin-Dumitriu, John Palmesino and Lukáš Likavčan
Participants research lab Diego Dametto, Sarah Friend, Richard Vijgen, Carlos Nazareno, Corneel Cannaerts, Dominic Ligot, Valentin Vetisov, Yosra El Gazzar, Cheng Guo, Sergio Costa, Javier Argota Sanchez-Vaquerizo, Rodrigo Delso, Eva Ibanez, Sahir Patel, Monika Halkort, René Boer, Benjamin Asante, Sara Nachem, Cristina Cochior

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