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Archiving for Extinction

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ABSTRACT

Anjali Arondekar, Wendy H. K. Chun, Verne Harris, N. Katherine Hayles, Shannon Mattern, Saidiya Hartman, and Kate Eichhorn, among other scholars of the archives, have questioned the presumption of the archive as complete, whole, legitimate, authoritative, and ultimately in any way "total," by looking beyond the contents that the physical repository hosts and guards, as well as how, what, and who goes under-, mis- and altogether unrepresented. In their tradition, we find that the contemporary moment provides exemplars of where an archival (re)making is being uncritically taken up, increasingly envisioned, and subsequently reliant upon present-day technological capacities and the technological imaginaries of the future near and far. Under the guise of scientifically vetted global betterment, and drawing on a long legacy of publicly funded innovation that is then recaptured and taken up by private industry, Big Tech takes profit and credit for these particular future-oriented deployments, but takes on little to none of the social, political, and environmental responsibility. In this article we explore specifically what users can do when their abstracted data production or consumption is based not only on deeply flawed science and technology that is pervasive, powerful, and compelling, but also invariably presented as the only solution to climate catastrophe and the end of human existence. The three archival projects explored in this article—ordered by scale—are Alphabet's "The Selfish Ledger," Big Tech's "Genomics in the Cloud," and Arch Mission's launch of a "Solar, Earth, Lunar, and Mars Library." By exploring the sociotechnological imaginaries of Big Tech, we reposition the archive in terms of its legitimation and framing of humanity's past, present, and future. We demonstrate that the ledger is a political frame, cloud-based genomics is a biological and terrestrial fix, and the space library is a speculative implementation of the total—and final—archive for extinction.

INTRODUCTION

In the last twenty years, interdisciplinary scholars have proposed an archival turn in decolonial scholarship, in which they collectively redefine the archive as being the "instrument[s] of prevailing relations of power";[1] an endeavor that "gets wilder and dirtier the deeper you go."[2] In and through these depths, the scholars we invoke show that while the fantasy of the total, totalizing archive may play out in many different ways, it remains a powerfully consistent one that obscures the way such archives function, and, ultimately, fail to deliver on the promise to preserve all, for all, under all

conditions. Typically (and problematically, from the perspective of critical archives scholars across many disciplines), these failures have not been seen by the mainstream as such, but rather as a natural order of things, as a preserving of that which is worthy of preservation, introducing logics of oppression and power to the institutions and practices of archives that those we cite have been right to critique.

Rather than opening up opportunities to address inequities and reduce oppressive practices in the digital constitution of archives, this flawed archival ideal persists and is perhaps even further obscured. It is embedded in various Big Tech projects that might not seem, at a superficial level, archival at all, yet are very much imbued with similar total archival logics of their analog counterparts. Those we have chosen to treat as case studies in this essay range in complexity and ambition—ledgers of user data, genomic data, and data about humanity to be stored on the moon. Yet they are also united by a progression of the implementation of a particular archival colonial logic: that managing the world in all its complexity is both possible, and, further, is an understandable problem to be attended to with technological fixes. Each case also shares a fundamental adherence to a belief that humanity itself can be adequately represented and thus fully, wholly, and totally preserved in data.

Indeed, Anjali Arondekar, Wendy H. K. Chun, Verne Harris, N. Katherine Hayles, Shannon Mattern, Saidiya Hartman, and Kate Eichhorn, among others, have questioned the presumption of the archive as complete, whole, legitimate, authoritative, and "total," looking beyond the contents to the physical repository that hosts and confines, and they have also considered how, what, and who goes under-, mis- and altogether unrepresented in and by them. Instead, they view the archive as a dynamic, malleable, potentially and historically violent, frequently misleading, and certainly power-laden site of inquiry. Such framings have, in turn, demonstrated the shortcomings and pitfalls of a belief in the potential for completeness of *any* archive. These observations have evolved discursively and materially among these archival scholars into both a critique of the very ideal and possibility of a "total" repository—an archive of everything and everything archived—and a questioning of how the (necessarily incomplete) archive, its records, and its silences have been deployed and to what end. In their tradition, we find that the current moment provides exemplars showing where an archival (re)making is being uncritically taken up, increasingly envisioned, and reliant upon present-day technological capacities and technological imaginaries of the future near and far.

These imaginaries, as N. Katherine Hayles has explained, are predicated upon and consist mainly of an expectation of infinite expansion and/or infinite compression, certainly two—but not the only—limitations on aspirational archival completeness. "Storage space" and "space of storage" are inversely related in order for the greatest amount of data (measured in digits or bits) to be preserved onto the smallest surface. The surfaces themselves have changed over the years in terms of capacity and material makeup, following technological innovation in industrial engineering, materials science, and related fields, but they share certain characteristics, serving both as the storage vessel for the information to be archived and frequently as objects of awe and wonder themselves. The capacity for memory is measured through storage potential. Yet the very conflation of memory and storage increasingly undermines archival promise: "Although artificial memory has historically combined the transitory with the permanent, the passing with the stable," Wendy H. K. Chun writes, "digital media complicates this relationship by making the permanent into an enduring ephemeral, creating unforeseen degenerative links between humans and machines."[3] In other words, "the machines" invoked here have been at the center of reimagining the archive as

potentially total: a technological catch-all for data where data is itself a catch-all for human knowledge.

Critical scholars of archival theory and practice have also contributed to the key view that the objective at the root of a positivist approach to the archive—that of a total or complete record—is not only pragmatic folly but theoretically incommensurate with the archive itself, leading archival scholar Verne Harris to propose replacing the idea of the (total) archive with the concept of the "archival sliver" as a more accurate rendering of archives' true capabilities.[4] In other words, incompleteness is a primary and necessary feature and function of any archive. Queer, feminist, and decolonial approaches have long challenged the view that the archive is neutral, official, and complete in what it captures. And these interventions have been paramount in acknowledging the limitations of thinking of the archive as "total." However, despite attempts to topple the power implicit in the archive by foregrounding its conceptual limitations, little can be done to entirely disconnect the total archive from recovery of its problematic past.[5]

According to Anjali Arondekar, the critiques emerging in framing the archive as object of inquiry—a critical archival turn—still "cohere around a temporally ordered seduction of access, which stretches from the evidentiary promise of the past into the narrative possibilities of the future."[6] Arondekar asks that we consider more precisely how we confound our understanding of *how* and *why* we do archival work. This question—of motives and technical ability—has taken on a decidedly different tone in our current wired global economy, at a time of mass social, political, and environmental unrest. Most importantly, however, today's challenge to the total archive asks us to consider how the future rather than the past is to be recovered for an archive increasingly imagined as a project where the past of humanity has been annihilated. In other words, the reimagined archive today is not about preservation for later access in similar conditions; it is preservation in preparation for the extinction of humankind.[7] In this sense, the projects we discuss in this chapter share much with other such nihilistic-disguised-as-hopeful endeavors as space exploration with the ends of colonization and other projects predicated on the belief that the end of humanity, and/or Planet Earth as we now know them, is nigh. Archiving for extinction therefore means preparing for a future where records hold essential information about the end of humanity, where files will be read differently and will have been preserved for a non-specific, non-terrestrial, environment.

Large data sets are mined for patterns and lead to predictions that reinforce a positivist worldview, where a single reality exists and can be measured, if not controlled, given the proper tools. In an era of big data that is aggregated and deployed at unprecedented scales, and with Big Tech oligopolies that control its infrastructure—like Alibaba, Amazon, Apple, Baidu, Meta, Alphabet, Microsoft, etc.—the total archive remains a supreme technology in the twenty-first-century imperial state and persists as a repository of codified beliefs that reimagine the human in largely binary and codable terms.[8]

Such projects are born of both aspiration and desperation; likewise, they perform hope and optimism while remaining rooted in nihilism. Significantly, the projects are anchored by a belief that all human knowledge can, indeed, be *known*, that it can then be aggregated, stored and, perhaps most aspirationally of all, will be retrievable—*and understandable*—at some future date and time. Yet the impetus for these projects, not always overt but certainly latent, shares much in common with the rationales and anxieties propelling moves to colonize outer space and other planets: a

fundamental belief in the end of Earth—or, perhaps more specifically, the end of Earth under current, contemporary conditions—and a reshaping of human society in the narrow vision of the preservers and escapees. In this way, these projects are driven by a futuristic fatalism that has at its core the premise that Earth and its societies are unlikely to persevere.

The three archival projects that are explored in this essay—ordered according to scale—are Alphabet's "The Selfish Ledger," Big Tech's "Genomics in the Cloud," and Arch Mission's launch of a "Solar, Earth, Lunar, and Mars Library." By exploring the sociotechnological imaginaries of Big Tech, we reposition the archive in terms of its legitimation and framing of humanity's past, present, and future.[9] We demonstrate that the ledger is a political frame, cloud-based genomics is a technological and terrestrial fix, and the space library is a speculative implementation of the total—*and final*—archive. These are only three cases among thousands that we could present as a rebuttal to the total archive, but we hope that they will serve as a starting point for future critiques of Big Tech's distortion of archival values and humanity itself.

Ledger

The concept of the "Selfish Ledger" first appeared to mainstream audiences when online tech news outlet *The Verge* leaked a video about it, along with an accompanying article, in May 2018. At the current pace of technology, 2018 may already seem distant, but looking back in condensed time also serves to remind us that we saw much of what is happening today coming; we were warned. In this way, the ledger (any ledger) serves as a political frame. In the video, a narrator demonstrates in proof-of-concept fashion, how Google (owned by Alphabet) might aim for a total archive of data on and from its users in order to eventually "reshape society."[10] In an in-depth analysis, Erna Fisher (2020) writes, "the video offers a new grand-narrative which links media, knowledge, and the self"[11] and points out that the "'desired result' is no longer determined by the human subject but rather by the ledger."[12] The political framing for this project is that more complete data invariably yields a knowable and objective truth. In simple terms, this singular truth can therefore be reasonably controlled only by those who own, aggregate, store, and control the data.

At the time of the article's publication in *The Verge*, the nine-minute video was already two years old but had not reached a large audience, mainly because it had not been intended for one; it had been conceptualized and created by Nick Foster, the head of Google's research and development division X (known as its "Moonshot Factory"),[13] whose activities are usually considered semi-secret, or at the least, significantly less public-facing than most of Google/Alphabet's best-known products and initiatives. The "Selfish Ledger" concept at the core of the video itself draws from another theory, that of "Lamarckian epigenetics," and proposes gathering and organizing user data based on user "actions, decisions, preferences, movement, and relationships,"[14] in line with its interpretation of Lamarckism.

While epigenetics is the study of all of the information in cells that is not directly encoded in DNA but still influences gene expression, Lamarckism itself is a mostly defunct and debunked evolutionary theory that focused on so-called acquired characteristics—such as behavior and experiences—transmitted from parent to child.[15] In this way the "Selfish Ledger" is presented as having a primarily social interventionist application and is imagined to be intergenerational ad infinitum in its function. Like genetic information, the architecture of the "Selfish Ledger" calls for user information to be passed down into the future—yet, in this case, regardless of the information's actual utility or the rigor of the theories underpinning such transmission. Key to Foster's vision of

the Ledger is that it draws on huge amounts of user data in order to redefine personal self-improvement ideals. But ultimately, the goal of data aggregation is beyond the individual and goes instead to social manipulation and to controlling human behavior on a much larger scale.

Further, the neo-Lamarckian theory permeating the project suggests a socialization rationale that pathologizes certain segments of society, with obvious attendant racist, classist, ableist and other eugenic overtones—again, the premise is that the behavior of one's progenitors will absolutely influence one's own decision-making around behaviors *at a cellular level*, which is where the Ledger would come in. Not incidentally, one can detect a resurgence of Lamarckism—or an interpretation thereof—littering some of the internet's more worrisome quarters, alongside discussion of red pilling and MRA (men's rights activism).[16]

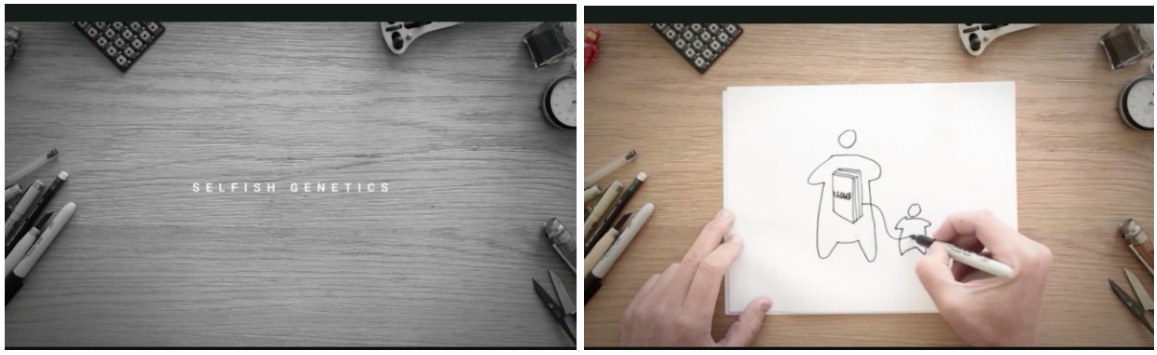


Figure 1. From Google's "X" labs' video on its "Selfish Ledger" thought experiment, showing the empty desk of a designer, at left, surrounded by the tools of creative invention. At right, the "ledger" is depicted as a person who carries the personalized "Ledger" tome inside, and then passes it to a descendent.

Richard Dawkins' 1976 book, *The Selfish Gene*, is the obvious inspiration for the Ledger project's name, but also for other conceptual elements of the proposed project. In his book, Dawkins argued that genes were not at the service of the human, but rather held their own kind of agenda, fighting for their own survival; this is what made the genes, and not humans per se, selfish. In essence, the "Selfish Ledger" project proposes an agenda for human behavior that, similarly, transcends the individual.

After the widespread release of the concept video, Google responded by positioning it as little more than poetic license—a "thought experiment" intended only to be provocative to creative teams working internally at Google. It further reassured the public that the short film did not relate to any products currently in development. The video, however, is almost nine minutes long and certainly seems to relate to other aspects of Alphabet/Google's data-gathering activities and to be seamlessly integrated into numerous other kinds of "ledger" production created through tracking, surveillance, and aggregation of user behavior and activity. While Foster describes the genetic element of his project as purely metaphorical, the video overwhelmingly calls upon both (colonial, settler) scientific and technological concepts to legitimate the project's premise and, to a certain extent, describe how it might work.

Perhaps unsurprisingly, total access to all human data (with human as stand-in for "Google user") at all times is a key component to the function of the "Selfish Ledger." As *The Verge* points out, this latter component is never questioned in terms of privacy or surveillance, and total reliance for individual behavior being transferred to interactions with an app as dictated by Google are, likewise, of seemingly no concern.[17] How might the effect of such reliance upon "ledgers" increase the data storage footprint, the demand (and thus justification) for massive proprietary data centers and their deleterious environmental impact, the resource-intensive reliance upon devices and digital information structures, and, last but not least, the introduction of a pervasive mode of flowchart logic and binary decision-making into everything from the most mundane to the most complex activities of everyday life?

It was these unanswered but latent questions that made the video disquieting for many: the notion that personal agency over decision-making might be wrested from an individual in these ways effectively reduces such activity to a false sense of personalization that belies, supersedes, and denies the existence, impact, and importance of social and cultural orientations, politics, and ideologies to people's modes of living. Under the "Selfish Ledger," these modes would now be atomized and rendered virtually meaningless, with the focus instead redirected to the moment-by-moment activity of selecting an organic banana, for example, over one conventionally grown.

But perhaps most worrisome of all is the fact that the alleged science behind the concept of completely relinquishing user data to have it fed back to users is hardly uncontroversial or incontrovertible itself. What do users do when their abstracted data production or consumption is based on deeply flawed science that barely masks its deeper engagement with troublesome ideology? In this case, the abstraction of "the ledger" concept itself may be providing cover for a more startling social engineering project masquerading as, at best, a public health experiment, but probably something more akin to consumerist movements into "self-care" and the appropriation of cultural practices for dubious and largely unproven health and wellness benefits. To be sure, even the examples given arc toward consumptive behavior. In short, in its most benign and banal application, one might expect to see the use of a "Selfish Ledger"-like product while shopping at Whole Foods, with all the aggregated, analyzed, and stored data deployed in the next iteration of individuated marketing and targeted advertising under the guise of scientifically vetted individual—and social—betterment. The archive, here, in this reimagining, is in service of global market flows, but it feels precise, targeted at the individual, and ultimately, unique and tailored for its user.

Cloud

By 2025, the worldwide genomics industry will have produced approximately forty exabytes of data to sequence between one hundred million and two billion human genomes globally.[18] As the human desire to digitally acquire, process, manipulate, and store genomic data increases exponentially, and as we witness the proliferation of businesses that have one or many of these uses of genetic data at their core, a bottleneck grows: the dedicated storage infrastructure required to sustain the demand does not currently exist. Big Tech, however, operates computational server farms across the globe that can be called into service to sequence, render, and analyze (big) data of all kinds, including data derived from human biology—as *bios*, as biopower.[19]

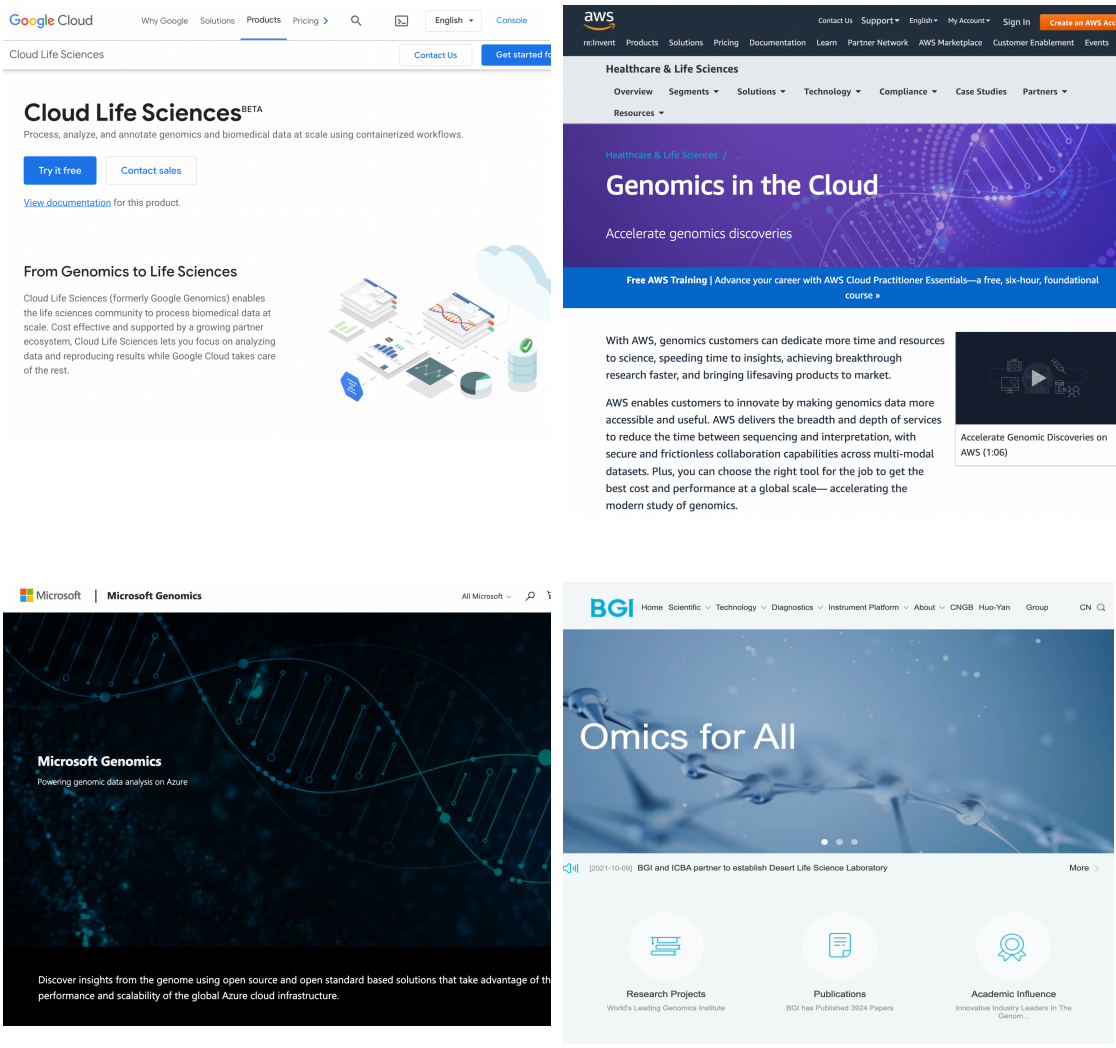


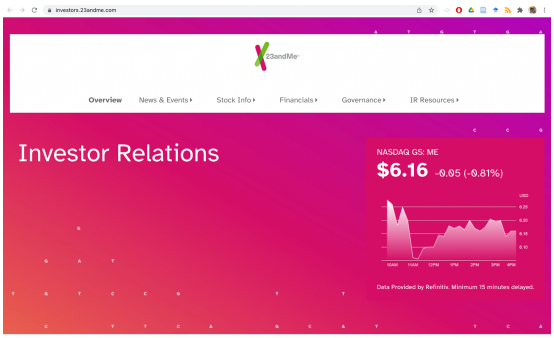
Figure 2. Google's Cloud Life Sciences (https://cloud.google.com/life-sciences), AWS's Genomics in the Cloud (https://aws.amazon.com/health/genomics), Microsoft Genomics (https://www.microsoft.com/en-us/genomics), and BGI (https://en.genomics.cn) are examples of Big Tech's role in supporting the genomic enterprise.

Big Tech companies also own massive data centers worldwide to digitally store, retrieve, and archive genomics research.[20] But the demand for faster processing and more readily available genomics data is high. The meeting place of infrastructural expansion is a key area of focus for understanding the increasingly complex partnership between Big Tech and genomics research, as well as its medical, political, and social deployments. It is also key for revisiting the question of genes *as archive*, a promise to map a human template that gained prominence and then momentum with the completion of the first iteration of the Human Genome Project (HGP) in 2003.[21] Almost twenty years later, in its thirty-eighth iteration, the HGP reveals little more to the general public about their bodily constitutions.[22] With the HGP, the genome was promised to be *the*

biological/technological solution to all of humanity's problems, and, in turn, to provide a terrestrial fix. Yet if such a terrestrial fix proves impossible, the project could instead help "fix" humans themselves, by enabling them to better adapt to changing planetary conditions.

Digital information storage is a complex constellation of numerous material systems, installations, and parts, which has also shaped how genetics and genomics research have developed. While much of this infrastructure is often posited as being immaterial and ethereal—described as "cloud" storage, the process of uploading referred to as sending data "to the cloud." But in reality these installations are, contrary to marketing language, decidedly earthbound, taking up a massive physical footprint, requiring the construction or retrofitting of specialized industrial spaces on massive land parcels, and drawing vast amounts of power for cooling, electricity, and other needs to keep things running.[23] The storage "cloud," in short, is a metaphor that simply means computers that are out of sight and out of mind; or as the Collins dictionary explains: "If you say that someone has their head in the clouds, you are criticizing them because they are ignoring or are unaware of the problems associated with a situation."[24] Genomics in the cloud is problematic because it creates distance and disconnection between site and subject, and between molecular biology and its interpretations by corporations.

A large share of the world's cables and infrastructure belong to or are controlled by Big Tech. This infrastructure is required in order to make genomics an important second phase of genetics research, post-HGP, and therefore has become an integral part of the project itself, which endeavors to expand the terms under which humans know and understand themselves. Naturally, this relationship is not simply altruistic in its nature. Building from Lily Kay's[25] detailed account of the ways in which genetic archives are tied to eugenics thinking, Jenny Reardon asks: "Who and what benefitted from these informatic and automatic infrastructures designed to create, store, and manage ever-expanding archives of genomic data?"[26] One answer—framed as a worry—has been: the owners of the sequencing machines. This was as true during the earliest years of the HGP as it is now. As Reardon reflects, while the original medical and scientific orientation of the HGP was nonetheless "vulnerable to a venture capital takeover," today we cannot think of genomics as being anything but the domain of private-sector startups and the province of bioinformatic capitalism (fig. 3). Moreover, the field of genomics is also a distraction from the machines that generate and render its data into an ever more powerful disciplinary discursive formation.



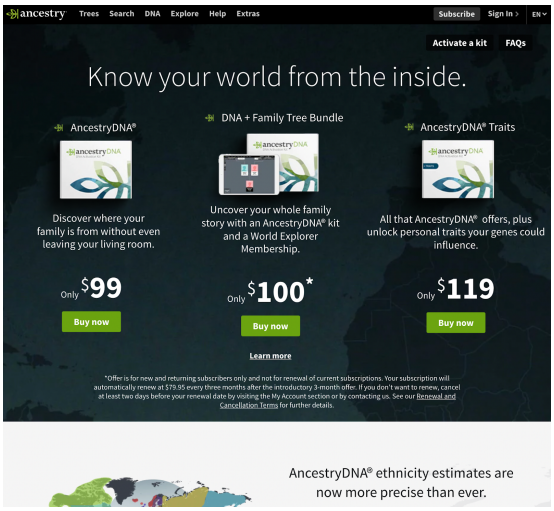


***Figure 3**. 23andMe was privately owned until 2021, when it merged with a Virgin Groups acquisition company (https://investors.23andme.com); Ancestry.com (https://www.ancestry.com/dna) is owned by one of the world's largest private equity firms, Blackstone (https://www.blackstone.com/our-businesses/private-equity).*

The shift from biology to bioinformatics was a product of a lineage of total archival thinking in both analog and digital form, and in both historical and contemporary manifestations. It first presupposed and presaged the production of a complete digitized human genetic data set, and subsequently envisioned the possibility of utility, followed by wealth generated from its use and storage as commodity. As Reardon puts it: "By the end of the HGP, it was the very goal of an open and total archive of genomic data that fueled the goals of production and wealth accumulation that befit the sequencing machines."[27] Where Reardon exits from her analysis, Big Tech enters to perform the very things she anticipated: Microsoft, Amazon, and Google are currently the biggest cloud service providers. Looking specifically at their investments in bioinformatics—Microsoft Genomics, Amazon's "Genomics in the Cloud" and Google Cloud Life Sciences—we determine that there is an ongoing conceptualization of the digitized genomic archive underway that not only functions as a new output born of the merger of DNA code (A/C/G/T) and binary code (0/1), but—and perhaps more importantly—an archive that thrives off the perpetual sequencing of big data as genomics *and* of genomics as big data. It is therefore a kind of new generic or catch-all big data that defines human possibilities—a new kind of biopower.[28] Big Tech owns not only the buildings and cables that enable the transfer of genomic data from the site of research to company-owned servers (via "genomic pipelines"), but also the database structures and algorithms used to classify and define patterns in the data.[29] As the data passes through, is recalled, manipulated and analyzed all within the confines of Big Tech's constellations of digital systems and infrastructures, it is likewise marked by, understood, and ultimately transformed within the context of these systems. The digitized storage and retrieval of human biological data as big computational data is itself a fundamental transformation that is a part of the meaning-making and potentiality for the use of this data.

There are other Big Tech players in the race to capitalize on genomics that reach beyond storage and retrieval archival practice and into application; Facebook's Genes for Good,[30] IBM's Watson

Health,[31] and Apple's ResearchKit[32] are all budding enterprises that feed into the technomedical imaginary that promises to "decode" humans in order to both predict and control "variant" tendencies. The "Selfish Ledger" project described earlier, emanating from Google's X labs, also finds itself intertwined in the genomics-as-data landscape. Also implicated in these imaginaries are propensities and industries reliant on medical acceleration (accelerating diagnoses), fostering citizen science (using biometric data) as well as a sense of control, empowerment, care, and hope for today and for the future.

The latter may be implicated by the rise of consumer-directed DNA kits that solicit individuals' DNA to then be uploaded "to the cloud" and into massive proprietary commercial databases. Some persistent features of these commercial DNA testing services are, on the one hand, their propensity for inaccuracy as a result of overbroad interpolation, and on the other, their purposeful conflation of DNA data and their subsequent analysis with much thornier, complex and oft-contested matters of culture, heritage, "race," and belonging, just to name a few.[33] Nevertheless, these companies are incredibly lucrative; they have gained millions of consumers, who pay for the privilege of enriching the proprietary archive of digital DNA data, which is then interpreted and delivered back to them, while their biological data is extracted, digitized and held in perpetuity, likely to be commercialized for other purposes as yet unknown.

But this latter purpose is hardly transparent to those who pay hundreds of dollars for the privilege of uploading their biological material. Indeed, the descriptive copy for an ad from one widely distributed television campaign for the consumer DNA interpretation company 23andMe, entitled "100% Nicole" and featuring a racially and ethnically ambiguous woman traveling the globe and interacting with a variety of cultural groups, reads as follows: "One woman, Nicole, travels the world to explore the areas that her DNA shows are a part of her heritage, leading her to take selfies with friends in East Asia and challenge locals to a ball game in West Africa. 23andMe invites you to learn more about your DNA and enter for a chance to win a trip to explore your genetic history with The Golden 23 Sweepstakes."[34] In the campaign, and in the products themselves, not only do these companies largely oversell what is possible through interpolation of genetic material, they also confusingly and deliberately blur the lines between consumer/product and genetics/identity. This blurring, and its underlying promise, have convinced consumers to voluntarily donate their biological and genetic material to a private company that will use this information to enrich its own database, stored for safekeeping for novel future uses and a variety of not-yet-imagined monetization schemes.

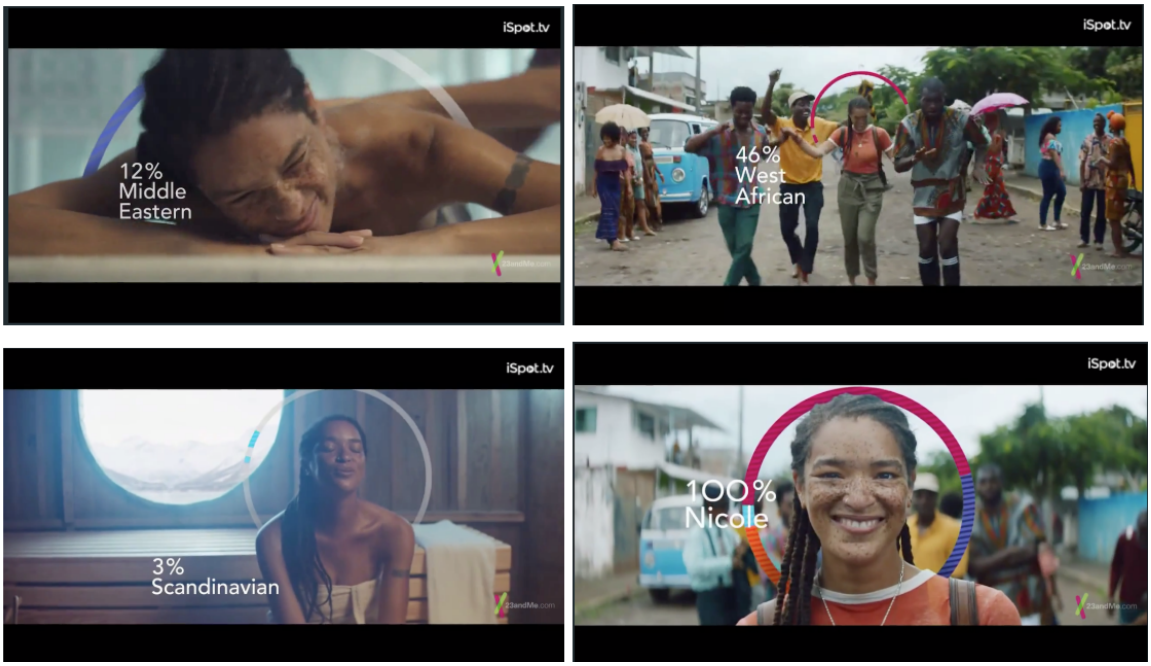


Figure 4. A series of four screenshots from the 2017 "100% Nicole" ad campaign by DNA testing company 23andMe. The percentages in the first three images go to the 100% value revealed in the last frame, where the totality of the ad's protagonist is made up of the sum of her cultural and ethnic parts—as revealed through the company's testing.

Moon

The tech industry now touts space as the safest new wave archive. Witness the circus-like proprietary rocket launches by billionaires Richard Branson, Jeff Bezos, and Elon Musk.[35] Their archival-frontier thinking, however, extends beyond space tourism for the wealthy; both Elon Musk's SpaceX's Starlink satellite internet service and Richard Branson's Cloud Constellation, a satellite start-up that has recently raised millions of dollars, offer clients cloud storage in space.

Branson's Cloud Constellation aims to launch what they call a "Space Belt,"[36] a network of data centers built on satellites in orbit. They explain the new project in terms of data sovereignty, stating that they are "eliminating the risk [of data breaches] associated with terrestrial infrastructure."[37] Others are attempting to bring a selection of humanity itself off Planet Earth. Since 2002, Musk has led Space Exploration Technologies (SpaceX), a company perpetuating the sociotechnical imaginary that living as humans is possible elsewhere—or perhaps less explicitly, that we can dispose of our Earthly waste elsewhere and continue our extractivist ways in outer space. SpaceX writes on their website that "By pioneering the development of fully and rapidly reusable rockets and spacecraft, SpaceX is dramatically reducing the cost of access to space, the first step in making life on Mars a reality in our lifetime."[38] The idea of "making life" off Planet Earth has inspired the Netherlands-based start-up SpaceLife Origin to build a space capsule lasting twenty-four to thirty-six hours, to enable a woman to give birth in space. The company executives believe that "spacefaring childbirth is part of creating an insurance policy for the human species."[39] The

insurance policy is for the inevitable destruction of Earth, and the further human colonization and resettlement of space by humans.

Figure 5. Offline at the time of writing, Space Life Origin (2019) prepares for humans to reproduce in space! The images are from the Wayback Machine archive (http://web.archive.org/web/20190215004919/https://spacelifeorigin.com/en)

Most overtly archival in its mission, the Arch Mission Foundation and Astrobotic announced in May 2018 that they were sending data for storage into the solar system.[40] According to Astrobotic's promotional materials, it is "pioneering affordable planetary access that promises to spark a new era of exploration, science, tourism, resource utilization, and mining."[41] Specifically, as announced in 2019, "Astrobotic Technology flies hardware systems into space for companies, governments, and universities."[42] The Arch Mission Foundation, a US-based non-profit corporation, has the more explicit mandate of preserving and disseminating "humanity's most important information across time and space, for the benefit of future generations."[43] The non-profit corporation, governed by a two-person board of directors (at the time of writing, with a science and engineering advisory board) has tasked itself with overseeing the curation (or the curation of curators) of long-term archives that are housed in devices called Archs (pronounced "Arks"), made to "survive for long durations in space, as well as on the surfaces of planets, moons and asteroids."[44] The idea, according to the project's planners, is for this archive to house the "longest-lasting records of human civilization ever created," to outlive many of Planet Earth's great wonders, and even Earth itself.

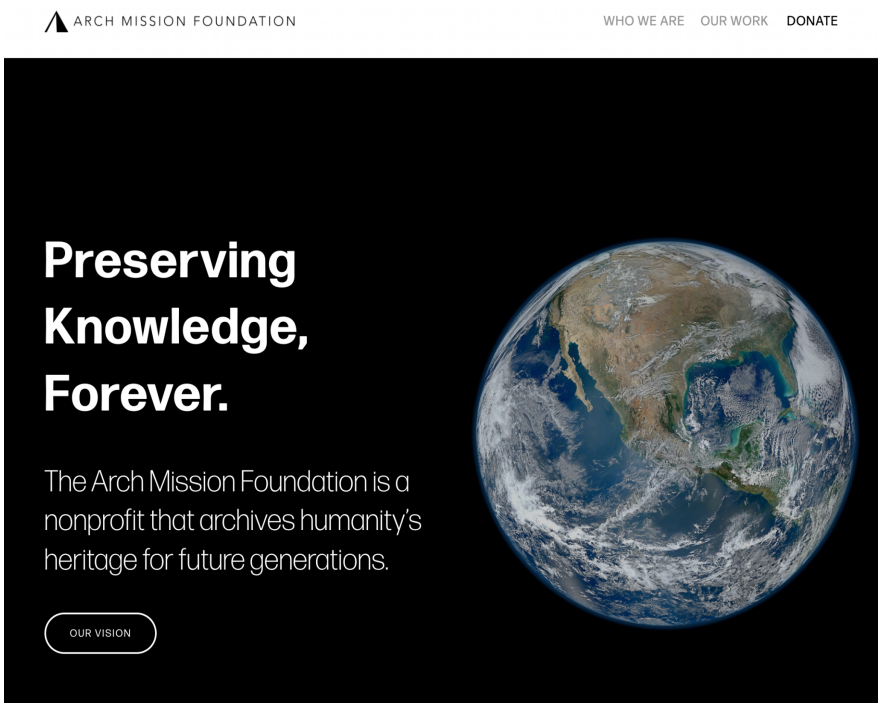


Figure 6. A screenshot (2022) from the Arch Mission Foundation promotional material online (https://www.archmission.org).

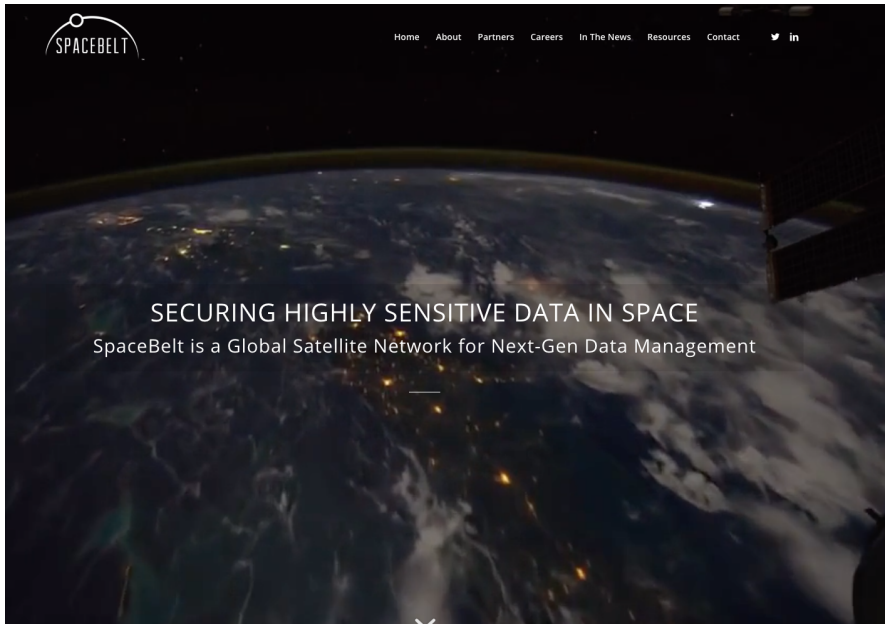


Figure 7. A screenshot (2019) from the Spacebelt promotional material online (http://spacebelt.com/). Spacebelt is a proposed global data storage network located in space.

In this project, the archive will be made redundant, dispersed in terms of diversity of materials and locations. Storage materials include quartz or nickel films, DVD, synthetic DNA molecules, and quantum information storage. Synthetic DNA molecules seem most promising in terms of storage technology. According to the company: "A day may come—in less than 100 years—when everyone will carry a copy of the Arch with them in a piece of jewelry, or perhaps in their own body."[45] The idea of reinjecting media-rich DNA into people's bodies suits both the colonial and the god-like positionality of the project's biblical namesake: similarly grandiose but in terms of locations, the sun, moon, and Mars seem to be targets. The site provides little discussion of contents—beyond Wikipedia, and the Long Now Foundation's Rosetta Project, the potential of storing the entire internet itself, and ideally avoiding curation altogether—or what counts as culturally, politically, or historically valuable. There is, however, an acknowledgement that the archive "might be useful to non-human intelligent lifeforms in the distant future,"[46] though no notes specify how materials archived might be rendered useful, or why this may be the case.

The new memory modalities and storage in space, on the moon, or on Mars afford one of the most powerful reconceptualizations of the archive. The archive, in a future for which all technology is currently available but not yet deployed, coexists with humans who have quickly become a space-dwelling interplanetary species. In this archival imaginary, the human has been genetically modified to withstand space radiation or has terraformed planets for human survival. Here, Mars serves as a launching pad for further and deeper space explorations. While technically tethered to Planet Earth for food and other resources, many visions of future space-dwelling humans fail to include social inequalities and capitalism (for example) as systems and coproducts that follow humans wherever they go. While Arch Mission may claim that "the Lunar Library [is] the ultimate in cold storage for human civilization"[47] the project fails to truly account for growing fractures in how humans are conceived, modified, and deployed.

Technosocial imaginaries such as these are more than plans, they are projects whose technical components are in production.[48] Archives in space as a case study is a powerful modern reinscription found at the union of preservation and colonialism, with its proposed constant off-world and into-the-future quests mutually reinforcing settler-colonial thinking and terrestrial fatalism, in archival form.[49] Returning to Hayles and Chun, the infinity of the universe as storage for the always-already-partial data generated from Planet Earth reveals to us the limited lens with which Big Tech conceives of such powerfully human expressions of memory, culture, embodiment, history, and so on. Ironically, the limitations of its view and manifestation of these human expressions are tied directly to the affordances and constraints of the very technologies upon which Big Tech relies for such archives' containment and dispersal. The notion of the future itself, and the imagined increased pace of science and technology, are essential to these imaginaries and the ways we come to entrust ourselves to Big Tech.[50] Yet it is a future extraordinarily limited by the profit motive at the center of the industry's logic, and the reinscription in the stars of the settler-colonialism that has characterized, to a catastrophic degree, life on Earth in the present. In this sense, it is a future that offers little escape.

Conclusion

There is a growing technologically driven ideal that sees no conflict with open and connected data collection being understood as a universal good while paradoxically being privatized; that the full complement of the world's information about itself should be held and saved by a small few

because to control more of it in this way is always a net gain; that more data means more knowledge, more insights, more control over a collective destiny, more benefit to humanity.

However, as demonstrated through the archival logics of the ledger, the cloud, and the moon as imagined or implemented by Big Tech, preserving and ensuring future access to humanity's data in technologically innovative ways is not designed foremost as a collective social good. Rather, it is designed as another mechanism for extraction of all kinds for a privatized corporate elite inextricably tied to settler-colonial ideology and the extraction of value as a core impetus of each project. Much of this ideology rests on the symbolic and material powers of encoding life in the genome, and of DNA as code. Further, under the guise of scientifically vetted innovation and collective global betterment (but drawing on a long and more accurate legacy of publicly funded innovation that is then recaptured and taken up by private industry), Big Tech takes profit from and credit for these particular future-oriented developments and projects, but takes on few to none of the attendant social, political, and environmental responsibilities as their stewards.

This essay has explored the particular sociotechnical imaginaries of three Big Tech case studies in which the data and storage industry is deployed to capture humanity's archival future. These case studies reveal that Big Tech's archive is self-replicating, in other words, that it is most invested in its own survival, more likely to destroy its competition—real or perceived—even if this means destroying the very conditions that enabled its development and would allow further growth. It has become more important in late capitalism to undo the conditions for life than to preserve them. In these diverse projects, we observe a connective tissue of cynical fatalism, in that they plan for a future that is privatized, corporatized, and possibly not even sustainable on Earth, as Earth itself has been rendered unsustainable by the very extractive industries seeking to move beyond the planet. Rather than Big Tech's desire for an archive that is total, its archives for extinction are self-fulfilling and final.

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ENDNOTES

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[6]Anjali Arondekar, *For the Record: On Sexuality and the Colonial Archive in India* (Durham: Duke University Press, 2009): 12.
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[8] Lily Kay, *Who Wrote the Book of Life? A History of the Genetic Code* (Stanford, CA: Stanford University Press, 2000); Evelyn Fox Keller, *The Century of the Gene* (Cambridge, MA: Harvard University Press, 2002); Mél Hogan, "DNA," in *Uncertain Archives*, eds. Nanna Thylstrup, Daniela Agostinho, Annie Ring, Catherine D'Ignazio, and Kristin Vee (Cambridge, MA: MIT Press, 2020) , 171–78, https://dusp.mit.edu/publication/uncertain-archives-critical-keywords-big-data; Mél Hogan and Deb Verhoeven, "Sustainable DNA," in *Right Research: Modelling Sustainable Research Practices in the Anthropocene*, eds. Chelsea Miya, Oliver Rossier, and Geoffrey Rockwell (Cambridge: Open Book Publishers, 2020), 133–54.
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[16] Jack Bratich and Sarah Banet-Weiser, "From Pick-Up Artists to Incels: Con(fidence) Games, Networked Misogyny, and the Failure of Neoliberalism," *International Journal of Communication* 13 (2019): 5003–27; Debbie Ging, "Alphas, Betas, and Incels: Theorizing the Masculinities of the Manosphere," *Men and Masculinities* 22, no. 4 (2019): 638–57.
[17] Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (New York: PublicAffairs 2019).
[18] The term genomic data refers to an organism's complete set of genetic instructions. In more scientific terms, the human genome is approximately three billion base pairs long and is packaged into twenty-three pairs of chromosomes made from four types of base (adenine [A]), cytosine [C], guanine [G] and thymine [T]). It is sequenced, annotated, and visualized via a genome browser based on this code.
[19] Michel Foucault, Arnold I. Davidson, and Graham Burchell, *The Birth of Biopolitics: Lectures at the Collège de France, 1978–79* (2004; New York: Springer, 2008), 140. Foucault defines biopower as "an explosion of numerous and diverse techniques for achieving the subjugations of bodies and the control of populations."
[20] See Mél Hogan, 2020b "Genomics Cloud," *Heliotrope* (September 7, 2020), https://www.environmentalmedialab.com/heliotrope/genomics-clouds-by-mel-hogan

[21] Genomics is an interdisciplinary field of science focusing on the mapping of genomes. The mapping of genomes requires tremendous computational power, given the precise and complex nature of genes. A genome is the complete set of an organism's DNA, including all of its genes. DNA molecules are made of two twisting, paired strands, often rendered visually as a double helix. A gene is the unit of DNA carrying the instructions for the creation of specific proteins. See "A Brief Guide to Genomics," https://www.genome.gov/18016863/a-brief-guide-to-genomics/.
[22] See https://genome.ucsc.edu/cgi-bin/hgGateway?db=hg38.
[23] Louise Amoore, "Cloud Geographies: Computing, Data, Sovereignty," *Progress in Human Geography* 42, no. 1 (2018): 4–24; Allison Carruth, "The Digital Cloud and the Micropolitics of Energy," *Public Culture* 26, no. 2 (2014).
[24] See Collins definition of "have one's head in the clouds" https://www.collinsdictionary.com/dictionary/english/have-ones-head-in-the-clouds
[25] Kay, *Who Wrote the Book of Life?*
[26] Jenny Reardon, "THE GENOMIC OPEN," in "The Total Archive," *Limn* 6 (March 2016), https://limn.it/articles/the-genomic-open/.
[27] Ibid.
[28] Foucault, Davidson, and Burchell, *The Birth of Biopolitics*.
[29] See, for example: DNAnexus, Edico https://www.dnanexus.com/edico.
[30] https://genesforgood.sph.umich.edu/facebook_app.
[31] https://www.ibm.com/watson-health.
[32] https://www.apple.com/newsroom/2015/03/09Apple-Introduces-ResearchKit-Giving-Medical-Researchers-the-Tools-to-Revolutionize-Medical-Studies/.
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[34] See 23andMe, "The Golden 23 Sweepstakes TV Commercial, '100% Nicole,'" (n.d.), http://www.ispot.tv/ad/wbfO/23andme-the-golden-23-sweepstakes-100-nicole
[35] See Jackie Wattles, "Space Tourism in 2021: Branson, Bezos, Musk—Reviewing Year of the Billionaires," *CNN Business* (January 2, 2022), https://www.wraltechwire.com/2022/01/02/space-tourism-in-2021-branson-bezos-musk-reviewing-year-of-the-billionaires/.
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[44] Ibid.
[45] "FAQ," Arch Mission Foundation, https://archmission.org/faq/.
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[48] Sheila Jasanoff, "The Sociotechnical Imaginaries Project," Program on Science, Technology & Society, Harvard Kennedy School, Harvard University, 2014, http://sts.hks.harvard.edu/research/platforms/imaginaries.
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