

Genomics Cloud

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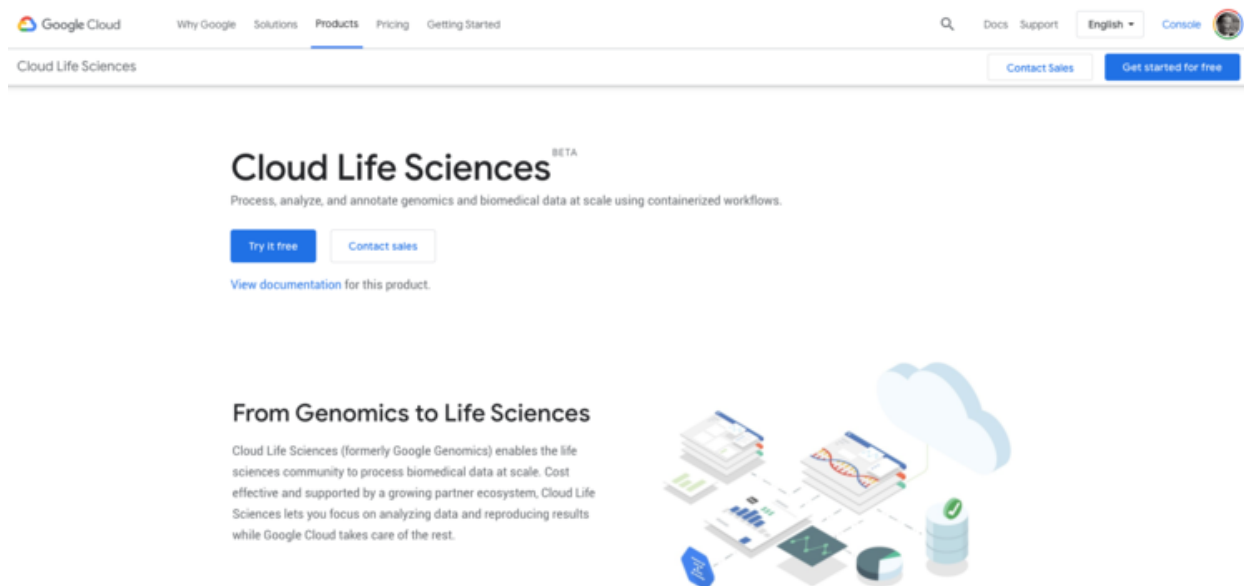
There are six rulers of the global consumer technology industry: Microsoft, Amazon, Apple, Facebook, Netflix and Google. Together, these companies – known as the “Silicon Six” or, simply, “Big Tech” – have come to dominate our global social infrastructure, from operating systems, social media, web searches, and advertising, to the cloud infrastructures from which they operate. These companies are also parent to other tech giants, such as AirBnB, Alibaba, Alphabet, Calico, DropBox, YouTube, Uber, and 23andMe, among many others that have their data stored in Amazon Web Services (AWS) or the Google Cloud Platform. While on the surface these companies serve different markets, they all inch towards the management of human social relationships by way of the cloud.

The management of human social relationships by Big Tech has become increasingly invasive over the past decade – though not always obviously or visibly so. Within an advertising framework, user data is now known to reveal much about our behaviours, tastes, habits, and interests by way of clicks, searches, and geolocation markers. As fitness trackers (like FitBit or Apple Watch) and face identification (like Facebook or Snapchat) were introduced, the biometrics data they gather further personalize our online experiences, and largely promised to help us become better, safer, and healthier. If we take this as a forward trajectory by Big Tech – to increasingly get inside users’ heads and bodies – we can assume that DNA, or our genomes, is the next frontier.

What happens when users become marketable from the inside, on the level of their genes? And how might this convergence between Big Tech and genomics industries shift societal understandings of corporeal ownership and control?

Storing DNA data is expensive. Scientists predict producing approximately 40 exabytes of data to sequence between 100 million and 2 billion human genomes globally, by 2025. The storage infrastructure required to sustain this, in addition to the massive industry investments in genomics, does not currently exist. Until recently, genomes were transported on hard drives and delivered by postal trucks. Focusing on this moment of

infrastructural expansion, then, is crucial for understanding the budding Big Tech-genomics partnership. Big Tech owns and operates server farms used to sequence, render, and analyze (big) data. Big Tech also owns massive data centers worldwide that serve as a genomics cloud.



Screen grab from: cloud.google.com - Cloud Life Sciences (formerly Google Genomics)

When it comes to the genomics cloud, Big Tech can offer cheap and sometimes free storage. For a while, Google charged 25\$ a year to store the ‘raw data’ of an individual’s human genome (100 gigabytes) with extra costs to conduct analyses. A ‘polished’ version of the same person’s genetic code is less than a gigabyte and costs only \$0.25 cents a year to store. This is because the data itself potentially contains what companies call ‘genetic gold’ – that is, DNA ‘variants’ that can lead to (among other things) lucrative targeted drug therapies. The idea is that those who invest in the infrastructure – hardware and software – ultimately become owners of the ‘discoveries’ made by storing, parsing and analysing the data. And so the storage services offered freely to genomic researchers, by Google and Amazon, can essentially pay for themselves later, making huge profits while also benefiting from the perceived contributions they are making to society. This could be thought of as a medical equivalent to ‘greenwashing’, where Big Tech frames itself as being at the service of progress, in terms of humans living, longer, healthier lives. However, Big Tech is also mining the human genome to ends not yet determined and that ultimately benefit its 2 3 profit motives (i.e. Amazon Rekognition, Azure Cognitive Services, Cambridge Analytica, the Selfish Ledger, etc).

Google and Amazon not only own the buildings and cables that enable the transfer of genomic data from site of research to Google- or Amazon-owned servers, but also the database structures and algorithms used to classify, sort, and define patterns in the data. This is sometimes referred to as ‘health intelligence’ in the ‘genomic analysis

pipelines' – analytics tools used to define a field of predictive and precision medicine – which are very likely to displace (if not altogether replace?) scientific analysis conducted by trained human scientists. Facebook's Genes For Good, Microsoft Genomics, IBM Watson Health, and Apple's ResearchKit, etc., are all budding enterprises that feed into the techno-medical imaginary that promises to decode humans to both predict and control variant tendencies. These imaginaries are largely built on medical acceleration (accelerating diagnoses), fostering citizen science (using biometric data), as well as a sense of control and hope for the (techno-fixed) future we've been promised since (at least) the Human Genome Project.

See: [Draft of the Human Genome Sequence Announcement at the White House \(2000\)](#)

The future, and the imagined increased pace of science, is essential to these imaginaries and the ways we come to entrust our lives and bodies to Big Tech. Together, company initiatives attempt to cash in on large scale aggregate data about our behaviours, relationships, and habits, as well as explorations into epigenetics (how our gene expressions change). Genomics research risks becoming totalizing.

How can we counter these totalizing sociotechnical imaginaries by Big Tech? One way is by taking the lead from interdisciplinary / critical / indigenous / STS / feminist / queer / scholars like Nathaniel Comfort, Lily Kay, Evelyn Fox Keller, Jessica Kolopenuk, Alondra Nelson, Kaushik Sunder Rajan, Jenny Reardon, Sophia Roosth, Kim TallBear, and others, in asking questions about this new 'wheres' of the genomics cloud – and how locating its politics has huge implications for the directions of future deployments of the genome, beyond the current neoliberal drive to generate more products and services hoping to optimize humans.

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