

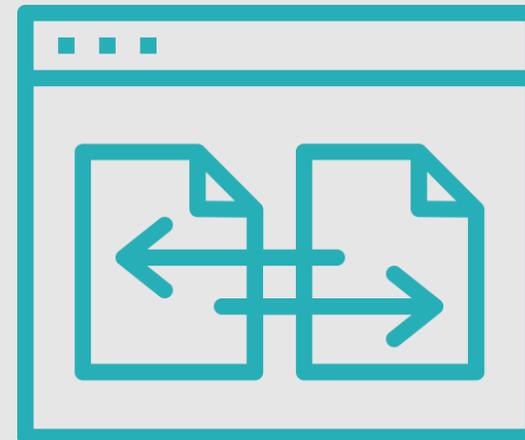
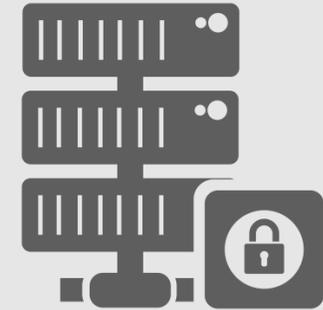
# The Gene-Chain, by Encrypogen, LLC

Security, Privacy, and Trust  
for a New Age in Genomic Science



# What Genomics Needs

- To maximize genomic science and personalized medicine, we need two things:
  - Sharing of data among researchers, and
  - Security of personal genomic data



# What Genomics Needs

- Imagine a cloud of genomic data that could be freely searched for important and interesting meta-data. The 1000 Genome Project offers a taste of that scientific utility. Scientists doing basic research use these repositories often and well.



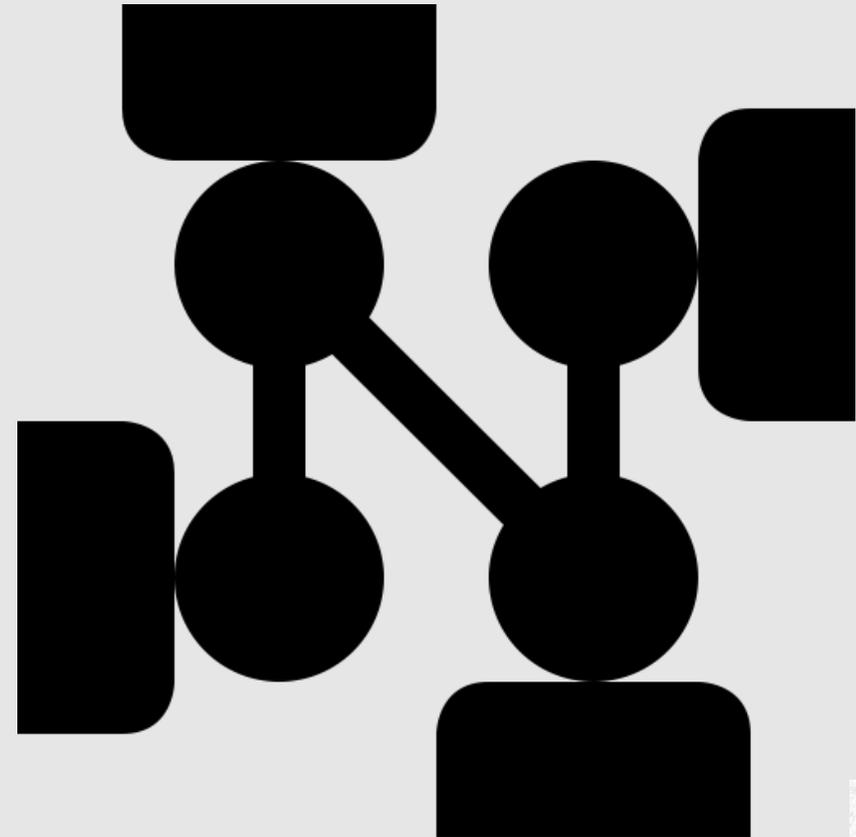
# What Genomics Needs

- Now imagine that cloud also as a safe storage place for personal genomic data, where patients could upload their data from any one of a number of sources, and ensure it is safe and secure. They could choose when they want to share and with whom they wish to share and set a time limit for its sharing.



# What Genomics Needs

- Imagine being able to reach out to any donor of data in this cloud and ask permission to use their data, and conducting the consent procedures appropriate to the relevant jurisdictions through that same cloud.



# What The Technology Lacks

- Current data cloud storage is insecure. The past few years have demonstrated the vulnerability of online, cloud-based data storage and sharing. Numerous high-visibility hacks, and even more that haven't been reported, have penetrated even encrypted, password protected clouds.



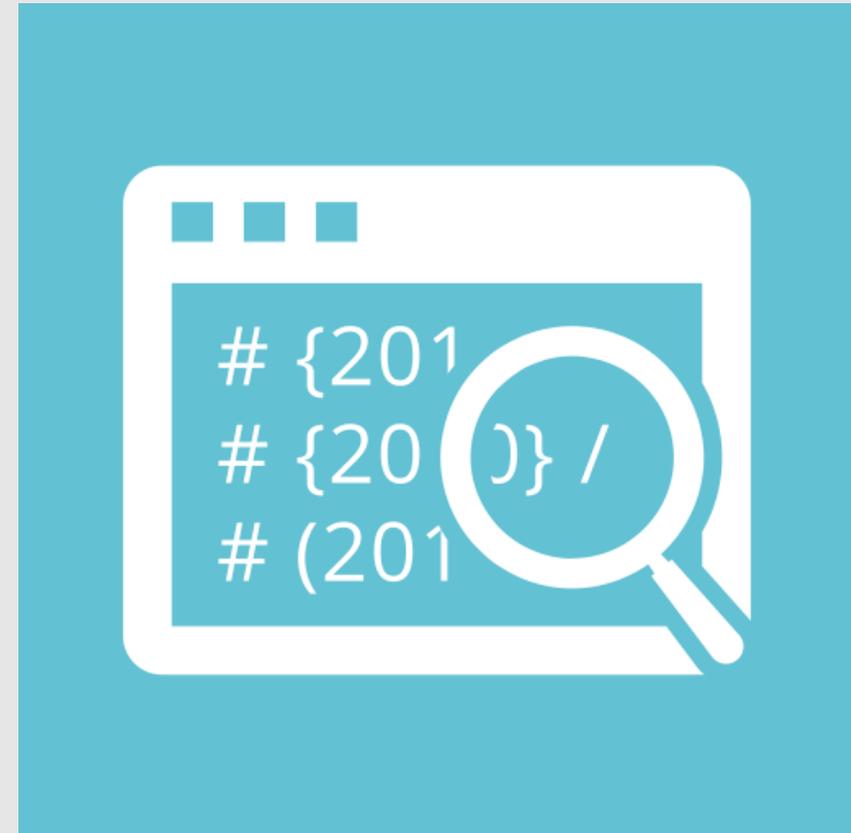
# What The Technology Lacks

- Even de-identified public data is risky for the donors, as recently revealed by studies using data from the Personal Genome Project, in which 40% of the data was re-identified. Cloud-based data meant to be used privately, if hacked, could also be re-identified with the same techniques.



# What The Technology Lacks

It is unwieldy to scan and search for data across differing sequencing platforms and formats, and choosing a particular NGS platform might limit your integration of data from multiple cohorts later. Partners who wish to cooperate and share raw data must choose early on and stick with a particular platform.



# What The Technology Lacks

- Current cloud-based data storage solutions are insufficiently:
  - Secure
  - Private
  - Robust
  - Verifiable
  - Immutable
  - Platform-agnostic

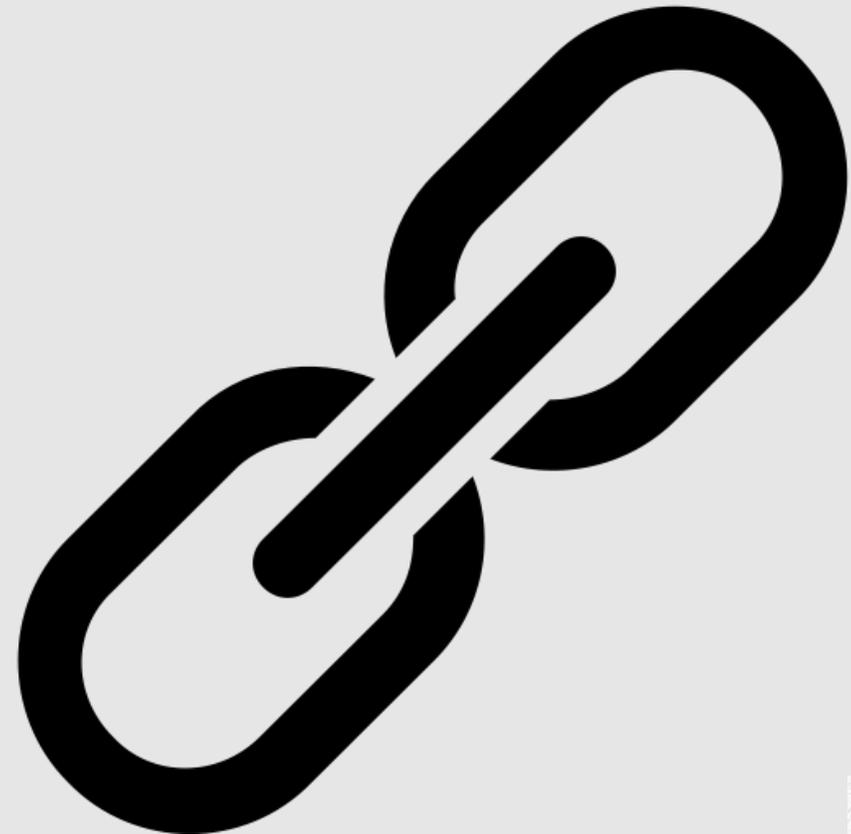
Locking disk drives in cabinets or safes is safer, but stifles the science



# The Gene-Chain

Secure and Immutable

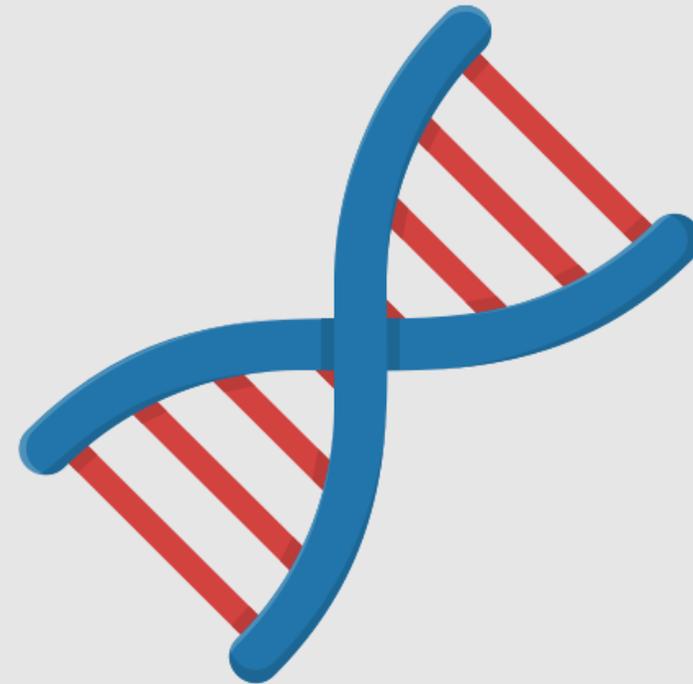
- A “blockchain” solution for genomic data developed by EncrypGen, LLC
- Blockchains are distributed, peer-to-peer, virtually unhackable, immutable, permanent records of transactions. They store data, and ours stores genomic data



# The Gene-Chain

Safe and Shareable

- The Gene-Chain is a blockchain, pre-populated with thousands of public genomes, and able to accommodate safe storage, search, and browsing of any type of genomic data. It has an open application layer on which new apps can be developed.



# The Gene-Chain

Immutable

- Individuals may deposit their genomic data to the Gene-Chain for free, for permanent, safe, secure, and private storage and sharing with their physicians and genetic counselors using time-expirable keys.



# The Gene-Chain

Ethical

- Research centers, universities, and corporations may purchase licenses to store their data on the Gene-Chain, easing their collaborations, ensuring compliance with local laws regarding privacy and consent, and easing ethics procedures.



# The Gene-Chain

Empowering donors

- The Gene-Chain allows immediate and permanent tracking of transactions on the Gene-Chain, allowing for a complete and permanent record of “withdrawals” negotiated and completed, and putting donors and curators of data in charge of its use, providing a means of instantaneous, jurisdiction-appropriate consent.



# The Gene-Chain

Secure and Private

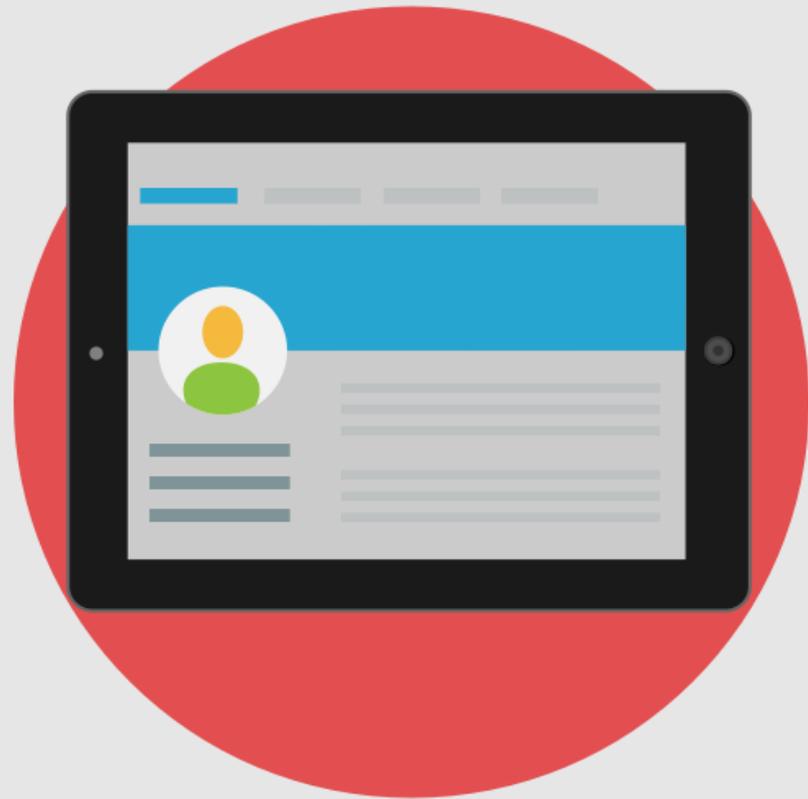
- The Gene-Chain uses several layers of security to ensure the privacy of data. Besides the inherent safety afforded by blockchains (virtually unhackable encryption), we use rotating reference genomes, compression algorithms aided by deep learning software, and time-limited keys, among other security measures.



# The Gene-Chain

Platform-agnostic

- The Gene-Chain doesn't care what the original format of your data is, which platform you use for sequencing, or how you wish to browse it. Use whatever browser you prefer, let the Gene-Chain safely store and secure it. It is NGS platform-agnostic.



# The Gene-Chain

Revolutionary

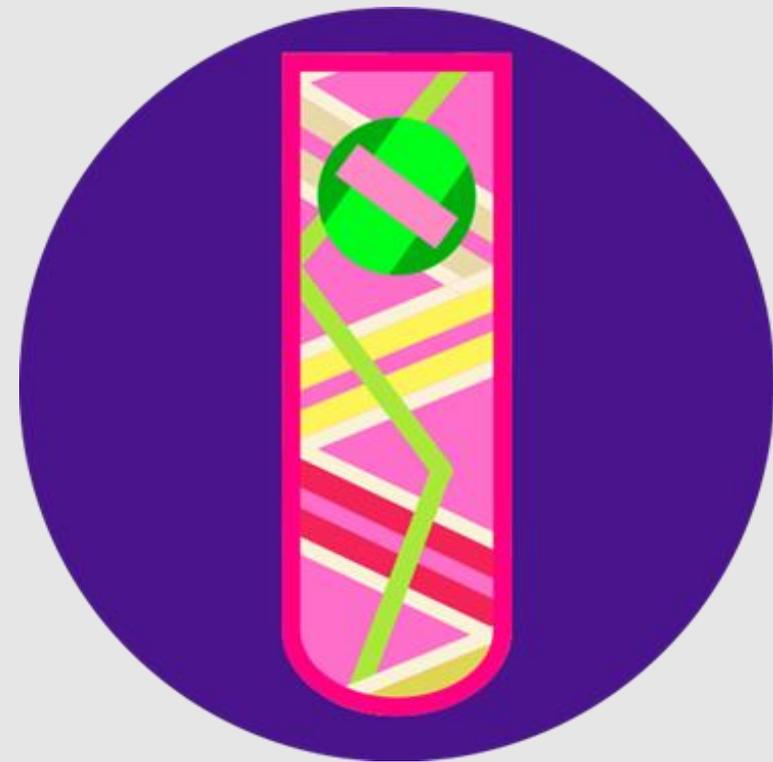
- The Gene-Chain, developed by EncrypGen, LLC, is a revolution in genomic science, meant to be a central repository for genomic data, allowing scientists to search for and share data for basic study, empowering patients and donors to track and control the use of their data, affording better security and privacy than any other cloud-based data storage tool for genomics.



# The Future

- Besides genomics, this same technology can be applied to proteomics, metabolomics, and other big data repositories requiring enhanced security and privacy

... with applications even beyond medicine



# The Future

- Anyone can help the Gene-Chain.
- A downloadable passive mining client assists in computational power for the gene chain. It also generates Gene-Chain Coin, the medium of exchange for transactions on the Gene-Chain, and an exchangeable cryptocurrency in itself.



## The Present

- The Gene-Chain is live now, pre-populated with thousands of genomes and public genomic data, searchable, and ready for your deposits.
- License fees are now at introductory rates for academic licenses, research centers, and corporate clients to begin safely and securely storing their genomic data.
- <http://encrypgen.com>