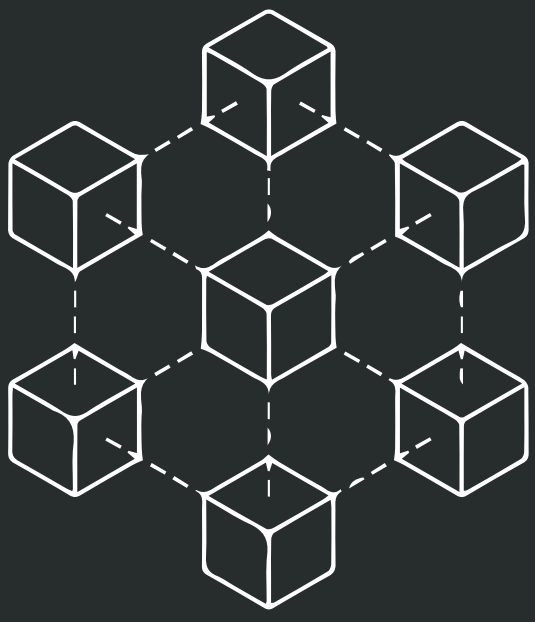
BINF sights.

ISSUE10
2021-T2-W10

The Building Blocks of Life

How the abundance of genomic sequencing data can be put back in the hands of the end user -- and how the lessons learnt from the world of finance can help achive it



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Society News

BINFSOC

Study Period.

We wish everyone doing BINF3010 this term all the best with their exam preparation. Make sure to go over the notes, practise answering questions (with timing) and most importantly, keep your study effective by taking breaks and looking after your wellbeing -- especially with the current lockdown situation.

Merch.

The order form for hoodies should be out soon after some logistic delays. Keep an eye on our Facebook page for updates.

Colours available will be Black, Charcoal, Navy and Forest Green. The design is our very own and based on a certain genomic sequence that you've probably heard of. Any guesses?

Student Guide.

We are now in the planning stages of a Student Guide for first year bioinformatics students. We're aiming to include info about degree structure, where to find help and advice regarding your courses, and a general overview on what to expect from the bioinformatics world. If you're interested in giving us advice on what to include, as someone thinking of changing to bioinformatics or as a past student who wishes they had been told something about their journey beforehand, contact us at binfsights@unswbinfsoc.com

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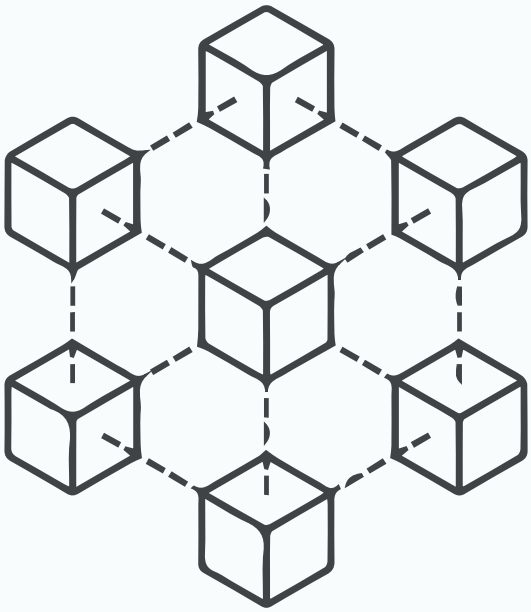
DNA is kind of like a blockchain — a memory of all the species that have come before.

— Reese Jones



the building block(chain)s of life

WITH THE RISE OF SEQUENCING TECHNOLOGY, DRAMATIC REDUCTIONS IN COST FOR GENOME SEQUENCING HAS PAVED THE WAY FOR NEW ADVANCES IN HEALTHCARE. BUT THE INFAMOUS DISREGARD FOR PRIVACY SEEN IN BIG-TECH HAS SEEN A RISE IN HESITANCY WITH DATA SHARING. WE LOOK AT HOW WE MIGHT BE ABLE TO HAVE OUR CAKE AND EAT IT TOO.

Writer *Anthony Nguyen* ***Editor*** *Cam McMenamie*

the building block(chain)s of life

Everybody spits— whether it is by accident during an important presentation, or to dispose of a surprise seed from that cheap, 'seedless' mandarin. However, in light of the events currently happening around the world, sharing that spit has become less than favourably looked upon. Here's why.

The debate on privacy, and in particular the nonconsensual use of it by third parties, has gained traction in recent years. Arguably, we see this in the fields that use Big Data methods such as social media, finance, and information technology. Think Apple's "A Day in the Life of Your Data", one nudge in its recent leap towards making its lifecycle for data collection and use more transparent to its users. As is often the case, the health and biology industry has coupled itself to the innovations from these fields in an attempt to push drug and disease research efforts. This plants the seeds for very similar data privacy concerns which have taken root in those fields mentioned before; namely where the individual data is being stored, who controls that data, and with whom it is being, potentially being shared.

Your saliva contains an incredibly large amount of information. Aside from the hundreds of complex proteins left over from your lunch, cells from the inside lining of your cheeks are suspended in abundance in just one drop of your saliva. Wrapped up within the nuclei of these cells is your DNA -- the recipe for all that is you. Anyone can spit into a test tube and have their DNA sequenced and interpreted by scientists in a lab to reveal all sorts of interesting things unique to you.

Keeping this in mind, at-home genetic testing has been brought into mainstream markets by companies such as 23andMe and Ancestry. This has led to a huge spike in the amount of genomic data produced and stored in the databases of these companies. What happens with this data beyond providing customers with insightful information on their family ancestry, as well as their personal risks for certain diseases, is largely out of the customer's hands. Again, data is valuable and the privacy policies are often very nuanced and can be changed at any time. In addition, where data is stored under one roof, this can pose security concerns for a number of reasons. One only needs to think of the 'Cambridge Analytica' data scandal as an example of misuse; and imagine the compromised 'personal data' as being a lot more personal.

Cases where third parties (such as law enforcement agencies) have attempted to access and use that genomic data or where data has been sold to bio-pharmaceutical companies for research, have since deterred many potential customers from sending their DNA off to be sequenced. Fewer customers means much less data, and less data is counter-productive to the reaches of bioinformatics in medical or health applications.

Re-establishing confidence that consumers have in sharing their genomic information is tricky, but there have been efforts by start-up companies like Nebula Genomics, Gene-chain, and Zenome to address privacy concerns. Their approach draws on another method arguably best-known for its use in the financial sector: blockchain.

Blockchain technology is just another type of database. It is the basis for well-known cryptocurrencies like BitCoin. However, contrary to traditional database designs in which data is siloed in a centralised database (for example, that of a genomic sequencing company), blockchain infrastructures are decentralised. This means that rather than having all of that data stored under one roof and controlled by one entity, a record of all that data is, instead, copied and distributed across multiple points in one large network. Any new data to be added to that network is stored in a *node* that is created at that time, and this data can be encrypted such that access to it is under the control of that node's 'owner'. To add to this, data in the blockchain is immutable; that is, it cannot be easily tampered with.

What this means very broadly is that customers interested in sharing their genomic information do not require a middle-man. Instead, the company simply places the data into the blockchain-based genetic marketplace and hands customers the 'key' to their data. As per standards, data is de-identified on the customer's end so that privacy is protected, however, once on the blockchain control is in the hands of the customer who is free to donate or monetise on the data directly with research centres.

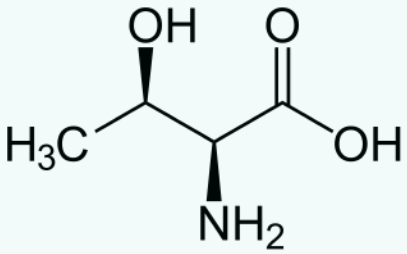
In such a marketplace, or 'bazaar' as termed by Nebula, both potential customers and big data researchers are able to benefit from the trading of genomic information. While the dynamics of blockchain in this space is much more detailed and its implementation still poses some computational concerns, it comes at a time where the volume of data in research has shown immense importance in medical and scientific innovation. The key takeaway remains that considering privacy concerns and the ways to address them sooner rather than later has become as important as ever. In that way, we can look forward to more saliva heading into our labs.

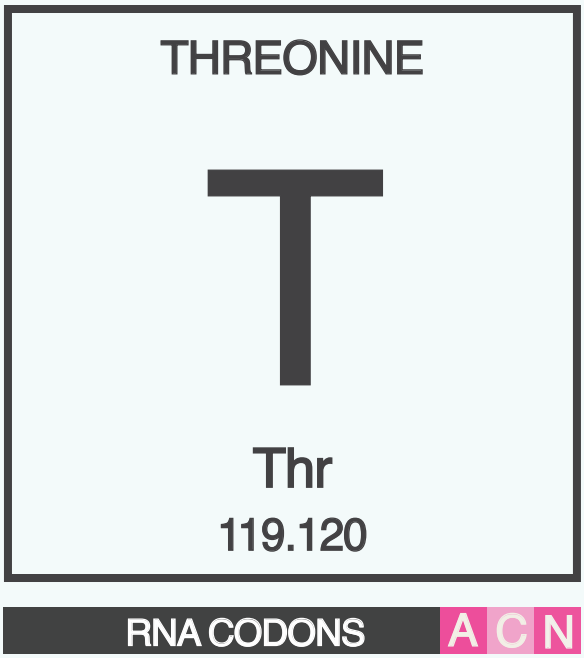
SOURCE: NEBULA GENOMICS

AMINO ACID OF THE WEEK

[THREONINE]

CHEMICAL STRUCTURE





POLAR.

UNCHARGED AT PHYSIOLOGICAL pH.

BUILDING BLOCK OF PROTEINS.

THE LAST OF THE (20) PROTEINOGENIC AMINO ACIDS TO BE DISCOVERED.

DISCOVERED IN 1936 BY WILLIAM CUMMING ROSE AND CURTIS MEYER.

SIDECHAINS CONTAINING THREONINE ARE OFTEN H-BONDED, COMMONLY WITH SERINE. THIS OCCURS AT THE BEGINNING OF ALPHA HELICES.

ESSENTIAL; CANNOT BE SYNTHESISED BY HUMANS.

CAN BE SYNTHESISED FROM ASPARTATE IN E. COLI.

HIGH IN FOODS SUCH AS COTTAGE CHEESE, LENTILS, AND SESAME SEEDS.

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Contact us

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IF YOU HAVE ANY COMMENTS or feedback regarding BINFsights, please write to us at binfsights@unswbinfsoc.com

We also encourage anyone to share with us anything you'd like us to take a look at, be it a bioinformatics tool that you have made or find useful; or news in the bioinformatics world that you'd like to see written about in future issues.

TO VIEW PAST AND PRESENT issues of BINFsights, check out our website at unswbinfsoc.com/binfsights

Stay tuned on our Facebook page for updates regarding events and society news.

-- The BINFSOC Team

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