CREATION MINISTRIES INTERNATIONAL

CREATION.com

CREATION UPDATE

Vol. 47 No. 1

Million, billion, trillion

Big numbers and magnificent DNA

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We hear about millions of years in an evolutionary context. For instance, that 65 million years ago the dinosaurs went extinct due to an asteroid impact from space.

People who hold to this long-age worldview also believe the heavens and the earth are billions of years old. The current 'understanding' is 13.8 billion years for the universe.

When it comes to the number of stars in the universe, they really do run in the trillions. Similarly, there are many trillions of cells in our body. What do such big numbers mean? Can we grasp their quantity?

Here, you can follow an analogy that world-leading nanotechnologist and chemist Prof James Tour has used.[1,2] Imagine (or remember) proposing marriage to the love of your youth, and the time you have (had) to wait for an answer:

- One second (10^0): This is arguably the best result, if the answer is affirmative, and maybe also if negative (at least you know where you stand).
- A thousand seconds (1,000; 10^3): This is equivalent to almost 17 minutes; plenty of time to bite your fingernails but have clarity soon enough.
- A million seconds (1,000,000; 10^6): This is a little over 11.5 days or a week and a half. This would be pretty nerve-wracking and enough time to come up with all manner of thoughts as to why it is taking so long.
- A billion seconds (1,000,000,000; 10^9): This is almost 32 years, so if you could predict the future, you would want to get your question in early (unless of course you know the answer would be 'no'). A good time would be to walk over to 'pop the question' as soon as you're able to walk!
- A trillion seconds (1,000,000,000,000; 10^{12}): This is equivalent to approximately 31,710 years, which is about five times the biblical age of the heavens and the earth![3] I think it is safe to say that Jesus will return first. Since the church will be His bride, you might as well forget about it and serve the Groom until He returns and then serve Him some more.[1]

Another way to describe large numbers is to add a letter in front of the unit. In the world of data storage, you are likely familiar with, for example, kilo-, Mega-, Giga-, and maybe even Terabytes. Starting with 'kilo' (10^3), every next letter increases the number by three orders of magnitude, that is 10^3 (thousand) times as many.[4]

DNA data storage

Now that you have a good handle on large numbers, let's put it into practice, using information storage in DNA. Your

body consists of trillions upon trillions of cells. Most of those carry inside them a tightly packed bundle of genetic information. The information of the genome is stored on the deoxyribonucleic acid (DNA) molecule. A lot depends on DNA's information density and how well that data is used.

One cubic millimeter (mm^3) of DNA contains about 470 petabytes (3.76×10^{18} bits) of data.[5] This is equivalent to 470,000 laptop computer 1-Terabyte hard disk drives. The unofficial standard thickness of such drives is 9.5 mm, equating to over 4.4 km high pile—half the height of Mt Everest! The form factor of the 1 TB drive beside me measures (LxWxH) 145 mm x 100 mm x 19 mm = 275,500 mm^3. This is 470,000 times less data in a volume many thousands of times bigger!

Chips with 128 GB of storage that fit on the nail of your pinkie have been in existence for over 10 years. Micro SD Extreme cards of 2 TB are readily available nowadays, but you would still need roughly 235,000 of them to match 1 mm^3 of DNA—a pile about 235 m high,

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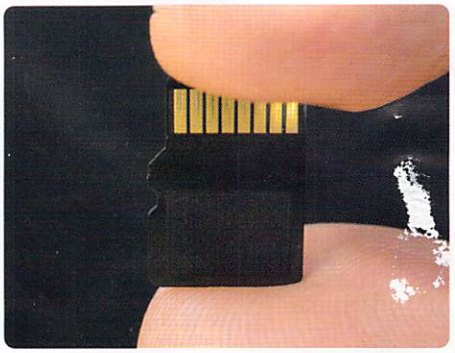

A small SD card can hold a lot of data, but a tiny amount of DNA contains significantly more data.

much taller than the Trump Tower in New York. Even though storage doubles roughly every two years,[6] it is extremely unlikely that man will get close to the information density of DNA.[5]

God is greater still!

In the end, no matter how big a number we can imagine (something my young daughter is interested in), it cannot begin to describe the magnitude of our God. He is all-knowing (omniscient), all-powerful (omnipotent), and everywhere (omnipresent), existing from everlasting to everlasting (Psalm 90:2). Big numbers blow our minds, but the Bible says God does "marvellous things beyond number" (Job 9:10). So rather than being dazzled by millions, billions, and trillions, our humble attitude before our Maker should be "to number our days so that we may get a heart of wisdom" (Psalm 90:12).

Notes and references

1. Pangambam, S., James Tour: The mystery of the origin of life (transcript), singjupost.com, 18 Mar 2023.
2. James Tour, once ranked as one of the world's top 10 chemists (Thomson Reuters, 2009) is a strong Christian and advocate of Intelligent Design.
3. Sanders, L., How does the Bible teach 6,000 years? *Creation* **35**(1):54–55, 2013; creation.com/6000-years.
4. More precisely, a kilobyte is 1024 bytes, a megabyte is 1024 kilobytes, a gigabyte is 1024 megabytes, etc.
5. Gitt, W., *Without excuse*, Creation Book Publishers, Powder Springs, GA, USA, p. 283, 2011.
6. Moore's Law, wikipedia.org, accessed 21 May 2024.