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All Biological life on earth is possible because of a discrete digital mechanism of preservation and replication.

The mechanism of signaling between the superorganism we know of as bacteria and its ongoing war against viruses is through a digital mechanism.

The source of innovation in biology is in this milieu of microbiome and viromes that are ubiquitous in every complex multicellular organism on earth. Humans are walking ecologies and cannot survive stripped of these ecologies.

We can picture this as a cloud of digital interaction that surrounds all of us.

The cells of multicellular creatures however do not communicate in the same way as bacteria. The DNA of mammals are sequestered from daily activity so as to prevent wear and tear.

The lifespan of mammals are related to their metabolism. The faster a mammal's heart beats the less time it has to live. A multicellular creature degrades like an analog system with each iteration error is accumulated.

Death is inevitable for multicellular creatures because our bodies have similar dynamics as non-linear systems found in chaos theory. The attractors that lead to our existence can lead to chaos and thus death.

Fortunately, evolution has gifted us with some of the digital mechanisms that bacteria have. The immune system is digital in nature. The same system that protects us from bacteria and viruses is also the same system that corrects for errors in our bodies.

At higher scales, evolution creates species that are more analog. But there is a constant tension between the drive to become analog and the need for preservation and replication.

All biological creatures balance these opposing forces by leveraging what is known as code duality. Every system has both an analog part that meets with the world and a digital part that preserves itself against the world.

In biology, the stuff that interprets the digital code of RNA are analog devices. More specifically, mechanical and electrical nano-machines.

The molecular machinery that converts energy into motion and energy into sensing are a consequence of biological innovation happening at bacteria and viral level.

But what meets the reality of physics and chemistry are analog machines. Living things require analog machinery to interpret and act within the world. The language of reality at higher scales is an analog language.

But to scale in size any organism requires digital mechanisms. Therefore this code duality must exist at many scales in a complex organism.

A common idea about the brain is that it is a dynamical system. A dynamical system is unlike a digital system like a computer. Brains have evolved to make sense of and move within their environments. They can only do so if they meet with the analog environment.

This idea however is an incomplete picture in the framing of code duality. The brain should have a digital component as predicted by this hypothesis of code duality. That digital component shares the same origin as our immune system.

Our immune system has the fascinating capability of recalling all the pathogens that have attempted to infect the body. What is the mechanism of this incredible memory system?

I've mentioned earlier that the human cognitive system consists of 3 'brains'. The nervous system, the endocrine system and the immune system. It's a very different triune brain that people conventionally think of.

The difference with biology and things that we design is that the latter has a designer that organizes things. So in a computer, the common currency is electrons. In biology, there is no common currency but a bureaucracy of transactions between different incompatible coins.

RNA has a surprisingly common currency (i.e. nucleotides). It is universal across earth originating living things. The power of digital systems come from a multitude of possible combinations. This only comes from standardization that leads to compatibility.

So evolution despite not having a designer with a mind, it has arrived at a strategy that acts like it has a mind!

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