

# WHERE IS GOD IN MODERN SCIENCE?

by Richard L. Lewis PhD

Ever since Darwin's divorce decree, God has been rejected by science, and the creator of life and human beings has been reduced to random chance and accident. One problem, of course, is that science explores and theorizes about objects of study. So far, science places God in the same place as Mary Poppins, creation of the human mind.

If God is to be included in science, He has to become an object of study—which is difficult if the location and object is unknown. This essay will propose a solution which will allow God to enter naturally into scientific debates. To start, we will allow religion to make a brief contribution.

It is written in the *Divine Principle* that, "God's form is also mathematical<sup>1</sup>." The enquiring minds of scientists ask, 'Where is this form' and "What kind of mathematics?" One thing we know from religion and science is that creation comes in complementary interacting pairs, so the math of natural law will deal with pairs and collections of them.

Although it is not explicitly stated, it's quite clear from the statement that Religion places God in the same realm where mathematics resides. For science, it's an ongoing philosophical discussion between "invention" (math is human-made) and "discovery" (math as inherent to the universe).

We will assume, with *religion* and *discovery*, that the 'math realm is an aspect of the cosmos, and that God resides there and is constructed of math. This realm is intangible in both the physical and spiritual realms.

## REAL 1D MATH

What kind of math are we talking about. Clearly, the simple 'real' math we learn in grade school is not up to the task, for science has found that real math is unable to describe even a simple electron or photon of light. We will be dealing with complementary pairs in the higher math, and *real* math does not have any, so it's the foundation of the coming hierarchy, at Rank 0.

Almost all the math in the biological sciences (and *Divine Principle*) is Real Math, and it is obviously well-suited to describe certain aspects of the real world. In symbols suitable to the higher levels, (but rather meaningless on this level) we can say the real number structure is:

$$z_0 = 1$$

## COMPLEX MATH, 2D

The math that can deal with one pair uses complex numbers. The pairs to which this math has been applied, for example are: linear/circular motion, internal wavefunction/external particle aspects, voltage/current in electric oscillators, etc. This math deals with a single pair as one, so it is Rank 1 in the math hierarchy.

Even scientists are so unused to this complex math, that the differences it brings to quantum physics is called 'spooky.' Quantum science is written in this complex math that deals with the complementary pair in a single number with a structure:

$$z_1 = 1 + 2e_1$$

The second component is an 'imaginary number line' orthogonal to the real numbers. in a 2D math space

This level of mathematics is quite capable of dealing with the relationship between mind and body in the simplest of entities, where the pair is wavefunction and particle. The math relation is that that the square of the internal is the probability of what the external will do.

The complex numbers have properties absent in the reals. A well-know example is the Mandelbrot set, an infinitely complex fractal in the complex plane. It is generated just by adding a multiplying a complex number.. If the result stays local, it's in the set, if it goes off, getting larger and larger, it is not in the set. These simple rules give complex results, as illustrated in this magnified tendril of the Set's border.



From the Mandelbrot Set

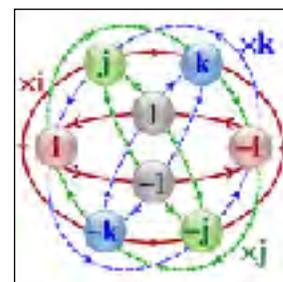
These complex numbers suffice for all of physics since the usual regular numbers are actually complex numbers with a zero rotation.

## CHEMISTRY • QUATERNION 4D MATH

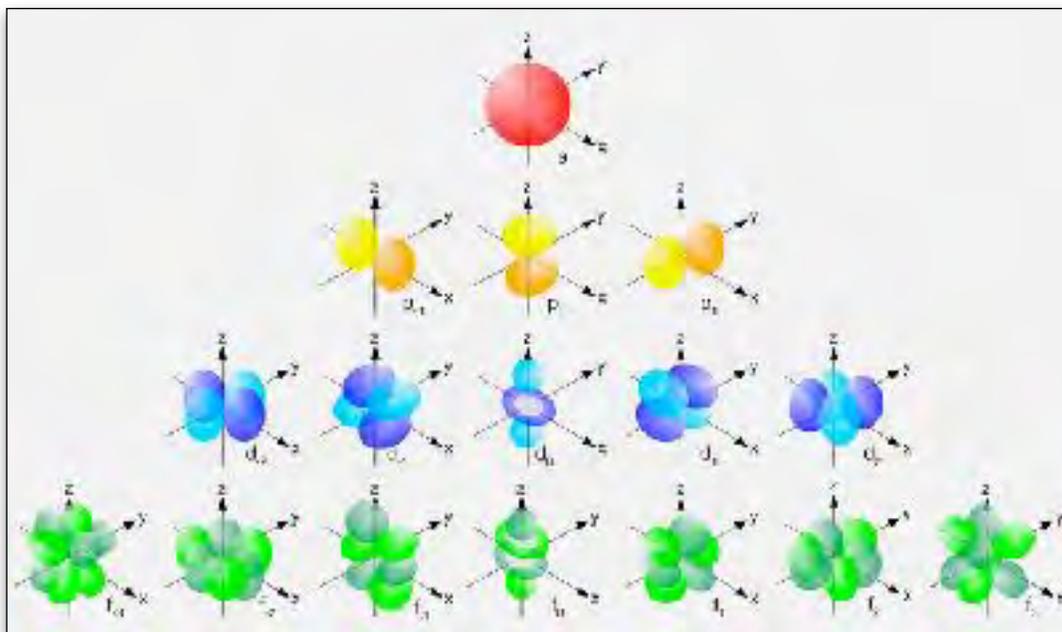
The next level is capable of coordinating two pairs in a single number. All four of the components are orthogonal to each other in 4D math space. Quaternions unite two pairs, so is a Rank 2 in the hierarchy. The structure of quaternions<sup>2</sup> is:

$$z_2 = 1 + 2e_1 + 3e_2 + 4e_3$$

While complex number excel at 2D patterns, quaternions are capable of creating 4D patterns that can exist in 4D spacetime. The orbitals of chemistry are 3D objects that can change over time. While physics can use 2D complex numbers for its language, they fail in chemistry where the internal wavefunction—now called *orbital*—is a 3D object that can change with time. To describe 4D forms and their transformations, 4D quaternions are required; standard complex numbers are insufficient because they only model 2D forms.



QUATERNION SPACE



### 3D SHAPES OF THE ATOMIC ORBITALS

It is the shapes of these orbitals, and the properties they have when topped up (or not) with electrons, that give each element its unique flavor. For instance, the orbital primarily responsible for gold's unique properties is the 6s orbital. This gives gold atoms their distinctive yellow color and chemical nobility—spurning corrosion. All properties clearly described by the math, to those fluent in the language.

While investigation of quaternions is still in its formation stage, there are some hints of its use in biology law in the literature:

Like functions of a complex variable, functions of a quaternion variable suggest useful physical models. For example, the original electric and magnetic fields described by Maxwell were functions of a quaternion variable.<sup>3</sup>

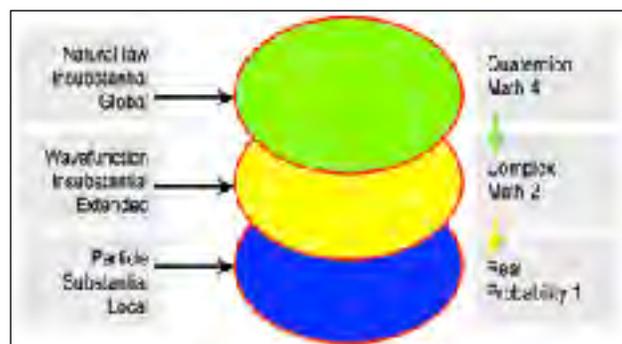
Also, in a discussion of Dixon functions on quaternions:

What I had was an out-of-control intuition that these algebras were key to understanding {fundamental laws}...<sup>4</sup>

As the shape of all atomic orbitals is determined by mathematics of natural law, and the properties of each element atom is determined by the shapes of its orbitals, we conclude that the emergent properties of the elements are all inherent in the mathematics, namely the quaternion level of natural law.

#### **Basic Principle of Sophistication**

The shapes of the wavefunctions that determine



Three Levels of Matter

the emergent properties and interactions at every level of life's sophistication are inherent in the sophisticated level of math at that level of natural law.

## BIOCHEMISTRY • OCTONION 8D MATH

While chemistry occurs throughout the universe, as far as we know only on Earth did biochemistry and the preparations for life occur.

Once the primordial Earth had cooled, and the world ocean condensed, volcanic activity created kind of created volcanic vents on the ocean floor. This biochemical activity eventually gave rise to **LUCA**, the Last Universal Common Ancestor of all life, which lived approximately 4.2 billion years ago.

This entity possessed a set of emergent properties that include:

- **Advanced Organelles:** It possessed early organelles, such as polyphosphate storage sites, which are universal structures used for energy currency in modern microbes.
- **Genetic Machinery:** It featured a sophisticated translation apparatus, including ribosomes and the standard genetic code to synthesize proteins from DNA and RNA templates.
- **Energy Processing:** LUCA utilized ATP as its universal energy currency and likely generated it through chemiosmosis.
- **Metabolic Versatility:** It likely used the reductive acetyl-CoA pathway to fix carbon dioxide and nitrogen, using hydrogen gas as an energy source.
- **DNA Integrity:** It possessed enzymes DNA polymerases to maintain and replicate its double-stranded DNA genome, estimated to be roughly 2.5 to 2.8 million bases in size—comparable to modern bacteria.
- **Immune system:** In a landmark discovery, researchers found that LUCA likely possessed an early RNA-based CRISPR-associated immune system to defend itself against wandering strands of DNA invading. This indicates life was already in an evolutionary "arms race" with viruses 4.2 billion years ago.

This set of sophisticated emergent properties requires sophisticated math to organize, the level of octonion math. As far as life's evolution is concerned, the chemical transformations of the early earth created the volcanic vents, and the biochemical level guided their transformation into the fundamentals of biochemistry, such as Acyl Phosphate and simple sugars. This is the realm of biochemistry.

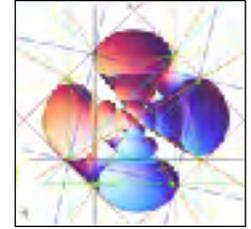
This level of math is capable of coordinating three pairs in a single number. All eight of the components are orthogonal to each other in 8D math space. Octonions unite three pairs, so are Rank 3 in the math hierarchy. The structure of octonions is:

$$z_2 = 1 + 2e_1 + 3e_2 + 4e_3 + 5e_4 + 6e_5 + 7e_6 + 8e_7$$

This is an 8-dimensional number with one real part and seven "imaginary" parts, all orthogonal to each other.<sup>5</sup>

In nature, the third pair in natural law probably deals with electron flows, the basics of biochemical activity. Biochemistry coordinates three pairs as one unit.

While in its infancy, the properties of these numbers are being explored. One researcher has used them to bring order to the Standard Model of Fundamental Particles,<sup>6</sup> while others have certain complex, non-mainstream theoretical models where octonions are used as an underlying mathematical structure to potentially explain the origins of physical constants and the organization of the periodic table.<sup>7</sup>



Octonion 8D space

For living entities, the added pair is probably used in managing H-bonding, upon which all the structure and functioning of all living organisms depend. We are suggesting that this level of sophistication is needed to describe metabolism, and the origin of LUCA, life's ultimate ancestor.

The ancestor of all life was, apparently, an organic film in a white smoker volcanic vent about 4 billion years ago.<sup>8</sup> This was LUCA, whose 'food' was activated hydrogen from the vent.

As always, this ancient ancestor went through a period of growth, starting with simple biochemistry and ending with a mature LUCA able to generate progeny. This was the pinnacle of biochemical 8D sophistication. This was the very first living organism, utterly dependent on the volcanic vent for sustenance.

### **QL-1 • TO BACTERIA • SEDENION 16D MATH**

LUCA was confined to the volcanic vent, but about 4 billion years ago, she budded off two types of free-loving organisms, the bacteria and archaea. The emergent properties of these now freely-living organisms include:

- **Peptidoglycan Cell Walls:** While LUCA likely lacked a rigid cell wall, bacteria, guided by natural law, developed a unique peptidoglycan-based wall. This provided structural integrity and osmotic protection, allowing them to inhabit more diverse and less stable environments than the hydrothermal vents typically associated with LUCA.
- **Specialized Fatty Acid Membranes:** LUCA is thought to have had a "leaky" or mixed membrane. Bacteria emerged with specialized ester-linked fatty acid lipids, which differ chemically from the ether-linked isoprenoid lipids that became the hallmark of Archaea.
- **Effective Ion Pumping:** Early bacteria evolved advanced  $\text{Na}^+/\text{H}^+$  transport proteins and ion pumps. These systems created impermeable membranes that could maintain internal homeostasis more effectively than LUCA's theorized permeable, "leaky" membrane.
- **Distinct DNA Replication Systems:** While LUCA used DNA, modern research suggests it may have been a "chemically stable repository" for replication that was still largely RNA-based. Bacteria developed their own specific, efficient DNA replication machinery, often distinct from the systems found in Archaea.

- **Genomic Streamlining:** LUCA was a genetically redundant and a potentially "messy" population, the first bacteria underwent reductive evolution or streamlining. This allowed for faster reproduction and specialization in specific ecological niches.

- **Ecological Diversification:** Unlike LUCA, which was likely restricted to specific high-hydrogen environments like hydrothermal vents, early bacteria quickly evolved to capture energy from a wider range of sources, eventually leading to emergent metabolic pathways like glycolysis and later, primitive forms of photosynthesis.

This is not biochemistry, it's *organized* biochemistry, a higher level of sophistication in natural law.

This level of sophistication is the sedenions, numbers that coordinates four pairs with its sixteen orthogonal components in a 16D math space. The sedenions have some unusual properties, such as numbers that multiply to zero! The reverse, of course, is creating something out of nothing, *Creatio ex nihilo* no less, a math that religion finds useful.

As noted, all the emergent properties at this level of bacteria are inherent in the sedenion 16D math level of natural law.

The use of sedenions in biology is rare, but there is a small use of them in the realm of physics:

Some theories use sedenion geometry (specifically conic sedenions) for quantum gravity, suggesting deviations from standard tensor algebra at extreme energies like the early universe.<sup>9</sup>

From Quantum Physics, we learn that natural laws create the probability, not actuality, of structures and functions. To guide us further, we will use two simple concepts:

- 1. Each leap in life's sophistication requires a leap in math sophistication.**
- 2. The pathways from simple to sophisticated are made probable by natural law**

This is speculative, but open to improvement as our biological understanding increases. So we now need an overview of known biological history and the quantum Leaps (QL) that occurred along the way.

From LUCA, descended the two tribes of bacteria that ruled the earth for two billion years, and are still extant. Now away from the natal vent food, these descendants had to manage energy by proton gradients and protein 'wires' to make ATP. The Logos offered two ways to do this, and both were taken.

## **QL-2 • TO EUKARYOTE CELLS • 32D MATH**

For the next billion years or so, the two bacterial races transformed the Earth—e.g. they created our oxygen environment—and communally cooperated in creating layered stromatolite

structures in the ocean. In this protective environment, a very un-Darwinist symbiosis occurred.

Two lineages developed metabolically in such an environment. One was a metabolically robust archaea—they colorize Yellowstone. The other was an energy manipulating eubacteria—such as the cheese making lactic acid bacteria.

In human terms, the archaea domesticated the eubacteria, feeding them substrates and milking them of useful products. Then, one cosmically momentous time three billion years ago, the archaea actually enfolded the eubacteria entirely.

This combination developed over time, guided by the Logos, to become a new Domain of life; the Eukaryotes. The domesticated bacteria became the mitochondria that power cells to this day.

This was the quantum leap from bacterial to eukaryote cells. From this inauspicious beginning—the Last Eukaryote Common Ancestor, LECA—sprang the protists (ameba), the fungi, the plants and animals. It is humbling to realize that our most ancient ancestors were a bacteria and an archaea.

The emergent properties of LECA from natural law were numerable, and include:

- **Intracellular Compartmentalization:** Unlike prokaryotes, LECA possessed a well-defined, membrane-bound nucleus that separated transcription (DNA to RNA) from translation (RNA to protein), allowing for more complex gene regulation.

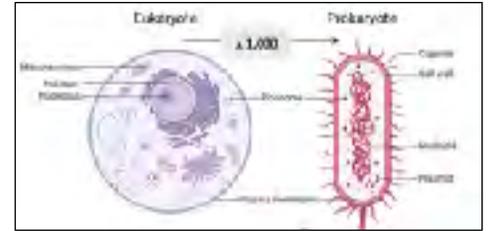
- **Energy Conversion Systems:** LECA had fully functional, aerobic mitochondria which supported a high energy burden required for its complex cellular architecture.

- **Sophisticated internal membrane System:** It featured a complex internal membrane network, including the endoplasmic reticulum (ER), Golgi apparatus, lysosomes, and peroxisomes, facilitating specialized intracellular "labor" and efficient molecule transport.

- **Dynamic Cytoskeleton:** LECA possessed a microtubule- and actin-based cytoskeleton with motor proteins (kinesin and dynein). This system enabled complex motility via cilia/flagella and pseudopodia, as well as the ability to move and separate linear chromosomes during mitosis.

- **Advanced Genetic Organization:** It utilized linear chromosomes (rather than circular DNA) associated with histone proteins. Unlike bacteria, the genes were split into coding *exons* and non-coding *introns*. Its genome contained spliceosomes for linking the exons together in RNA processing to mRNA.

- **Sexual Reproduction:** One of its most significant emergent traits was a unique sexual cycle involving meiosis and cell fusion, which allowed for the reshuffling of genetic material.



The Two Domains of Life



Stromatolite section

- Eating Embrace: LECA is widely reconstructed as a heterotrophic flagellate capable of engulfing other organisms.

This was Quantum Jump Two in life's sophistication, and it requires another level of math sophistication. To organize all this is a level of math in natural law that has yet to be (officially) named, that of the 32D math unifying 5 different complementary pairs together.

The mathematicians will have to explore this realm first—along with all the others we have yet to encounter— before becoming a useful language to describe eukaryotes effectively.

### QL-3 • TO SEAWEED, TO FUNGI • 64D MATH

The protists—single cells like an ameba—ruled the planet for a while, until about one and a half billion years ago, fossils resembling primitive seaweed appear, followed later by the diversion into fungi, plant and animal lineages.

Instead of separating after cell division, cells learnt from the Logos how to stick together and develop a set of simple method of survival. This developed in two directions: building up and breaking down.

**Building-up** The first seaweeds, appearing in the fossil record approximately one billion years ago, exhibited several emergent properties that fundamentally changed Earth's biological and environmental trajectory. Unlike their single-celled ancestors, these early macro-algae learnt traits from the Logos that allowed them to colonize and dominate marine environments.

The transition from single cells to macroscopic bodies was a defining event, with the emergent properties of:

- **Specialized Cell Types:** Early seaweeds evolved cells dedicated to specific functions, such as reproduction and the formation of dormant, spore-like cells to survive harsh conditions.
- **Branching Structures:** The ability to grow in branched patterns increased surface area for light absorption and nutrient exchange.
- **Benthic Attachment:** These organisms became primarily benthic, meaning they could anchor themselves to rocks in shallow, sunlit seas rather than just floating freely.
- **Bioactive Compounds:** Early seaweeds produced sulfated polysaccharides and phenols that provided anti-fungal, antiviral, and antibacterial protection. They also provided hydrophilic coatings to prevent drying out during low tides. They learnt how to bind water and cations to manage osmotic stress.
- **Intercellular Communication:** They utilized bioactive proteins called lectins to facilitate communication between their diverse cell types, a necessity for coordinated multicellular growth.
- **Dormancy:** The ability to produce spore-like cells that could remain dormant when conditions were poor and regrow later allowed these species to survive environmental fluctuations for over a billion years.

- **Ancestry to Land Plants:** These emergent traits—including chlorophyll use and multicellular organization—provided the blueprint for the much later evolution of land plants and trees.

Such sophisticated organizing and unifying of multiple aspects requires a math with 64D patterns with the inherent emergent properties of the seaweeds.

**Breaking-down** On a similar level of sophistication to the origin of plants, there is the origin of the fungi. The only visible difference between the two is that the plants went on to greater levels of sophistication on land, while the fungi did not in their essential role of breaking organic and inorganic structures down to useful chemical building blocks. While there are fungi in the ocean, they flourished mightily on land as pioneers. Rather than separate cells, the fungi went for multi-nuclear structures. The emergent properties of the early fungi include:

- **Thread-like Growth and Polarized Extension:** The most significant emergent property was the development of hyphae-tubular, branching filaments that grow indefinitely at their tips. This allowed fungi to traverse patchy terrestrial environments to find nutrients.

- **Chitinous Cell Walls:** The evolution of a rigid cell wall made of chitin provided structural support, enabling fungi to penetrate solid substrates and, eventually, develop upright fruiting bodies.

- **Compartmentalization:** Early hyphae were mostly lacking cross-walls, but later lineages developed septa to compartmentalize cells. This allowed for regulated transport of nutrients and organelles and provided a defense against cytoplasmic "bleeding" if the organism was injured.

- **External Digestion:** Fungi evolved to secrete digestive enzymes externally to break down complex organic polymers (like cellulose) and absorb the resulting nutrients. This property made them primary decomposers.

- **Ecosystem Engineering:** By breaking down rocks through mineral dissolution and organic acid secretion, early fungi helped create the first fertile soils on Earth.

- **Symbiotic Partnerships:** Early fungi formed essential mutualistic relationships with ancestral land plants (mycorrhizae), providing them with phosphorus and water in exchange for carbohydrates.

- **Loss of the Flagellum:** As fungi moved from water to land, most lineages lost the ancestral flagellum used for swimming, shifting toward dispersal via non-motile spores.

- **Complex Multicellularity:** Independent of plants and animals, fungi learnt from the Logos complex 3D structures (like mushrooms) that required new mechanisms for cell-to-cell adhesion and communication.

- **Early Diversification:** Fungi were diversifying hundreds of millions of years before land plants, possibly as early as 1 billion years ago.

Such sophisticated organizing and unifying of multiple aspects is very similar in scope to that of the plants. Like the plants, the fungi pattern is also inherent in the 64D level of Logos

math. Just as, on a lower level, there were just two patterns in the Logos: the Bacteria and the Archaea.

### QL-4 • TO LAND PLANTS • 128D MATH

While the simple seaweeds flourished in the bosom of mother ocean, learning from the Logos how to thrive in a dry atmosphere required a whole new level of sophistication. The emergent properties needed from the Logos for this transition included:

- **A waxy cuticle:** A waterproof, fatty-acid polymer layer, learned from the Log evolved to seal the plant's surface, preventing lethal water loss to the atmosphere.
- **Stomata:** To allow "breathing" through the impermeable cuticle, specialized pores appeared. These pores use guard cells to regulate the exchange of carbon dioxide and oxygen while minimizing water vapor loss through transpiration.
- **Apical Meristems:** These regions of actively dividing stem cells at the tips of shoots and roots enabled directional growth. This allowed plants to simultaneously explore the ground for water and grow upward toward sunlight.
- **Parenchyma Tissue:** The evolution of solid, three-dimensional masses of tissue (parenchyma) provided the structural complexity needed to build specialized organs, unlike the simpler filaments of their algal ancestors.
- **Lignin:** Later in early evolution, the tough, hydrophobic molecule lignin reinforced cell walls, providing the structural strength to grow tall and support the weight of the plant against gravity.
- **Alternation of Generations:** Early land plants developed a life cycle with two multicellular phases: a haploid gametophyte (producing gametes) and a diploid sporophyte (producing spores).
- **Embryo Retention:** A defining trait is the retention and nourishment of the developing diploid embryo within the protective female tissue (the archegonium).
- **Spores were encased in a chemically resistant polymer,** which protected them from UV radiation and desiccation during dispersal through the air.
- **UV "Sunscreen":** Without water to filter sunlight, plants evolved flavonoids and secondary metabolites that absorb harmful UV-B radiation to prevent DNA damage.
- **Fungal Symbiosis:** Early land plants likely formed symbiotic relationships with fungi to extract nutrients like phosphorus from barren, rocky soils in exchange for carbohydrates.

The math needed in the Logos to coordinate this Quantum Jump #4 in sophistication was the 128D level uniting and coordinating 7 pairs of complements. This is also unknown territory and is not yet been named.

## **QJ-5 • TO WORMS • 256D MATH**

We now abandon all others and focus on the main event, the evolution of animals and of ourselves. Like the plants, it started with cells sticking together after cell division and the quantum leap to multicellularity. This necessitates cooperating in feeding, excreting and multiplication. Emergent properties in the evolution of worms include fundamental animal traits such as bilateral symmetry, the development of a distinct head and tail region, and the ability to burrow and reshape environments.

A very useful principle in animal development is that it recapitulates—sometimes metaphorically—each of the lessons learned in history as cells learned how to do one thing after the other from the Logos. Our own first hours in the womb repeat the pattern: First a many-celled sphere, then a hole in the sphere as mouth/anus, then secondly another hole which becomes the anus in one lineage (insects), and the mouth in our lineage.

These early animal worms had a set of emergent properties, such as:

- **Bilateral Symmetry and Cephalization:** The worm-like body plan, essentially a "tube that eats food," was one of the earliest simple body plans to emerge in animal evolution. This development resulted in the emergent properties of having two mirrored sides and the formation of a distinct head and tail ends which allowed for more directed movement and the seeking of food.

- **Ecosystem Engineering:** The collective, widespread burrowing and digging behavior of prehistoric worms and other invertebrates along ocean bottoms during was a significant emergent property at an ecosystem level.

- **Genetic Adaptability:** A major reorganizations, patterned by the Logos, of the annelid worm genome occurred when transitioning from marine to terrestrial environments. A major adaptation was to getting oxygen from air, not water.

As before, there are two worm patterns in the Logos —the protostomes and deuterostomes primarily distinguished by their embryonic development: in protostomes ("first mouth"), the first embryonic opening (blastopore) becomes the mouth; in deuterostomes ("second mouth"), it becomes the anus, with the mouth forming later. The mouth-first lineage includes the insects; the mouth-second lineage includes the animals and us humans.

The math needed in the Logos to coordinate this Quantum Jump #5 in sophistication is the 256D level math uniting and coordinating 8 pairs of complements. This is also unknown territory and is not yet been named.

## **QJ-6 • TO FISH • 512D MATH**

In the next quantum jump in evolution, the Logos presented a number of basic patterns in the Cambrian explosion (roughly 500 million years ago). In a (geologically) brief . the rapid emergence of nearly all major animal body plans (phyla) occurred, including:

- Arthropoda: The most abundant group, represented by early crustaceans, and others with jointed legs and hard exoskeletons.

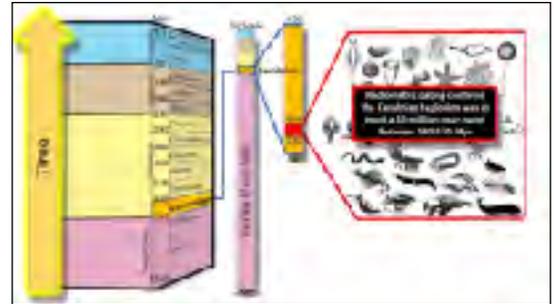
- Chordata: The phylum to which humans and all vertebrates belong; early primitive forms with notochords emerged here.

- Mollusca: Included early ancestors of snails, clams, and cephalopods, many of which developed mineralized shells.

- Echinodermata: Ancestors of modern starfish and sea urchins,

- Annelida: Segmented worms, such as bristle worms, which are often found in fossil sites with exceptional soft-body preservation.

- Porifera: Sponges, including the reef-builders that were widespread in the early Cambrian period.



Origin of almost every animal form, including us vertebrates

## FISH

As before, for seeking all others, we will follow the main event of the Chordata and the spinal chord. The first great success with this pattern of life were the fish. The first fish in evolution, appearing during the Cambrian Period roughly 530 million years ago, exhibited several emergent properties that fundamentally changed vertebrate history. These properties arose from the combination of new biological structures and physiological shifts.

The primary emergent properties of early fish include:

- Active Predation and Feeding Mobility: Unlike their sessile or suspension-feeding ancestors, early fish were active feeders. This was enabled by a distinct head with complex sensory organs, including eyes and a mouth, allowing for directed movement toward food.

- Aerobic "Horsepower" from Respiratory Gills: A critical functional shift occurred as gills transitioned from filter-feeding apparatuses to dedicated respiratory organs. This allowed for much higher oxygen uptake, supporting larger body sizes and more active lifestyles compared to non-vertebrate chordates.

- Increased Navigational Precision: Anatomical innovations in early jawless fish included enhanced inner ears for sensing vibration and orientation, as well as paddle-like fins for sudden bursts and turns. They were the fastest organisms of their time.

- Structural Support and Locomotion: The emergence of a notochord (a primitive cartilaginous backbone) provided a flexible rod for muscle attachment. This allowed for efficient side-to-side swimming movement, a major advance over simpler ciliary or worm-like locomotion.

- **Defensive Armor and Environmental Resilience:** Many early jawless fish developed heavy bony armor. This provided protection against large predators while allowing them to expand into new ecological niches like shallow coastal waters.

- **Bilateral Coordination:** Early fish possessed a well-defined head-to-tail axis and bilateral symmetry (mirror-image left and right sides), which is a foundational requirement for the sophisticated, coordinated movement seen in all later vertebrates.

The math needed in the Logos to coordinate this Quantum Jump #6 in sophistication is the 512D level math uniting and coordinating 9 pairs of complements.

### **QJ-7 • TO AMPHIBIANS • 1,024D MATH**

We are now in well known territory so we can simplify things by just listing the sophisticated emergent properties and the sophisticated math at that level of the Logos.

Amphibian Emergent Properties:

- **Terrestrial Locomotion:** The most significant emergent property was the ability to support their body weight and move on land. This emerged from the development of weight-bearing limbs (with a humerus / femur, radius / tibia, and ulna / fibula structure) from lobe-fins, coupled with a robust vertebral column, stronger musculature, and modified shoulder and pelvic girdles. In water, the tail provided propulsion and buoyancy supported the body; on land, a completely new system for movement and support was required.

- **Air Breathing Capability:** The ability to breathe air using lungs (which evolved from the fish's gas bladder) in conjunction with internal nostrils was a critical emergent property. While some fish had primitive lungs, the integrated system of drawing air through the nose and into increasingly efficient lungs created a primary respiratory system for use outside of water.

- **A Mobile Neck:** The loss of certain skull bones and the modification of the first neck vertebrae resulted in a mobile neck, an emergent property not found in fish. This new flexibility allowed the head to move independently of the body, which was crucial for foraging and scanning the environment for predators or prey on land, where visual fields were different from those underwater.

- **Adaptation of Sensory Systems:** The transition led to the emergence of sensory functions adapted for an air-based environment.

- **Hearing:** The development of eardrums and a middle ear allowed for the reception of sound waves through the air, which is a different mechanism from how aquatic vibrations are sensed.

- **Sight:** The evolution of eyelids helped keep the eyes moist and protected them from drying out on land.

- **Smell:** Internal nostrils communicating with the mouth allowed for the air-based sense of smell.

- **Reproduction** remained in the water domain, and a few adjustments had to be made.

The math needed in the Logos to coordinate this Quantum Jump #7 in sophistication is the 1,024D level math uniting and coordinating 10 pairs of complements.

### **QJ-8 • TO REPTILES • 2,048D MATH**

Reptile Emergent Properties:

- **The Amniotic Egg:** The most significant innovation learnt from the Logos, featured a protective shell and internal membranes (amnion, chorion, allantois). This "private pond" allows embryos to develop on dry land by providing nourishment and waste storage without a larval water-dwelling stage.
- **Keratinized, Watertight Skin:** Unlike the moist, permeable skin of amphibians, reptiles evolved dry, scaly skin rich in keratin. This property emergent from specialized tissue development prevents desiccation and provides protection against physical abrasion in terrestrial habitats.
- **Advanced Pulmonary Respiration:** While amphibians often rely on skin for oxygen exchange (cutaneous respiration), reptiles evolved more complex, partitioned lungs with greater surface area. This shift was necessary as keratinized skin is generally impermeable to gas exchange.
- **Internal Fertilization:** To reproduce on land, reptiles developed penis-like organs and behavioral adaptations for internal fertilization, eliminating the need for water as a medium for sperm travel.
- **Enhanced Skeletal Support and Locomotion:** The Logos provide the patterns that favored a more robust vertebral column and reinforced pelvic and pectoral girdles to counter gravity. This structural reinforcement enabled more efficient movement and supported larger body sizes on land.

The math needed in the Logos to coordinate this Quantum Jump #8 in sophistication is the 2,048D level math uniting and coordinating 11 pairs of complements.

### **QJ-9 • TO MAMMALS • 4,096D MATH**

Mammal Emergent Properties:

- **Insulation:** The development of hair and fur provided critical insulation to maintain a constant internal body temperature independent of the environment.
- **High Metabolism:** Supported by a four-chambered heart and efficient double circulation, allowing for sustained high levels of activity compared to the burst-activity patterns of cold-blooded reptiles.
- **Secondary Palate:** A bony shelf separating the nasal and oral cavities emerged, allowing mammals to breathe while chewing or suckling, which is essential for maintaining the high oxygen intake required by an active metabolism.

- **Advanced Hearing:** Reptilian jaw bones (articular and quadrate) were reduced and migrated into the cranium to become the malleus and incus of the mammalian middle ear. Combined with the stapes, this three-ossicle system allows for much more sensitive hearing, particularly for high-frequency airborne sounds.
- **Encephalization:** The simplification of the lower jaw into a single bone freed up space in the skull, facilitating the expansion of the brain case and the development of a larger brain.
- **Tactile Navigation:** The evolution of a highly innervated face suggest the early emergence of whiskers, allowing for nocturnal navigation and enhanced environmental awareness.
- **Differentiated teeth** (incisors, canines, and molars) emerged, allowing for specialized functions like slicing, grinding, and chewing.
- **Precise Occlusion:** The development of molar occlusion—where upper and lower teeth meet exactly—enabled efficient mastication, releasing more calories and nutrients from food to fuel high metabolic demands.
- **Gait:** Limbs moved from the sides to directly under the body, increasing efficiency and speed.
- **Spinal Flexibility:** Mammals lost the belly ribs, which allowed for bending and twisting of the spine. This flexibility supports rapid running and grooming behaviors.
- **Lactation:** Mammary glands likely evolved from ancestral skin glands to provide moisture and eventually nutrient-rich milk to young.
- **Live Birth:** While early ancestors laid leathery eggs, most modern mammals give birth to live young, allowing for internal protection and longer developmental periods.

The math needed in the Logos to coordinate this Quantum Jump #9 in sophistication is the 4,096D level math uniting and coordinating 12 pairs of complements.

### **QJ-10 • TO HOMININS • 8,192D MATH**

Emergent Properties:

- **Encephalization and Sentience:** Increasing neurobiological complexity, specifically a higher number of neurons and specialized neural hierarchies, led to the emergence of higher-order mental representation. This shift allowed for "incompressible" cognitive patterns that cannot be fully explained by simple neural firing.
- **Bipedalism and Structural Freedom:** The transition to an upright posture emerged from changes in the pelvis, spine, and feet. This property "freed the hands," enabling the emergence of advanced tool use, carrying capabilities, and gestural communication.
- **Symbolic Language and Culture:** Language is considered a major evolutionary transition, representing a new level of information transmission that changes the "rules" of biological evolution. This emergent property allows for the accumulation of cultural knowledge over generations.

- **Cooperative Social Structures:** As hominins transitioned to open environments, group-level properties like cooperative defense, communal breeding, and food sharing emerged. These traits exhibit basic cultural norms so that the survival benefits for the group exceed the sum of individual efforts. This was the Old Stone Age culture that lasted 3 million years, and only ended 12,000 years ago.

- **Precision and Power Grip:** The evolution of the fully opposable thumb and dexterous hands allowed for complex manipulations, an emergent physical capacity that supported the development of technology.

- **Neocortical Expansion:** A dominant pattern in mammalian history, especially in hominins, was the enlargement of the neocortex, which facilitated adaptation to climate change and the development of culture. Cave art, and the like.

- **Life History:** Hominins learned of lengthened gestation and infancy from the Logos, which is linked to increased social learning and complex brain development.

- **Dietary and Energetic Shifts:** The move toward high-calorie diets (including meat and tubers) and persistence hunting provided the energy necessary for maintaining an enlarged brain.

The math needed in the Logos to coordinate this Quantum Jump #10 in sophistication is the 8,192D level math uniting and coordinating 13 pairs of complements.

### **QJ-11 • TO HUMAN • 16,384D MATH**

This might get personal. Emergent Properties:

I hardly need to list the emergent properties of us humans. While we see fragments of these in animals, in humans they are developed to a vast degree. Scientists see us as successful animals, while religion teaches of a higher level that must be learnt.

Both types of academics, however, believe that they have an “I am” awareness that makes them special.

### **SOURCE OF LOGOS • 32,768D MATH**

Religion goes one step further, and has that the Designer of the Logos also has this “I Am” quality, and inhabits the highest levels of mathematical space. We have a few clues to understanding where and what God is. Christianity insists on an intelligent Creator. Science demurs, but claims that the “I Am” of consciousness is generated in our brains. Unfortunately, it has not an iota of explanation of how or where this occurs.

Moses reported that God was insistent their conversation that He to had an “I Am,” but also gave no clue, to how and where this occurred.

The view here seems to indicate that God is an emergent property of the higher mathematics, which should energize both academics and theologians to ponder higher mathematics.

## Hierarchy of Sophistication in Mathematics and Living Organisms

Level	D	numbers	emergent property
<15	32,768		Divine "I Am"
14	16,384		Human "I Am", Logos
13	8192		Hominin
12	4096		Mammal
11	2048		Reptile
10	1024		Amphibian
9	512		Fish
8	256		Worm
7	128		Land Plant
6	64		Seaweed, Fungi
5	32		Eukaryote
4	16	<i>Sedenion</i>	Bacteria
3	8	<i>Octonion</i>	Biochemistry
2	4	<i>Quaternion</i>	Chemistry
1	2	<i>Complex</i>	Physics
0	1	<i>Real</i>	Everyday life

What we have described so far is what science and math knows almost 500 years after Copernicus kicked off the Scientific Revolution. Seeing the pace of change, this is just a minimum to the actual sophistication. Perhaps LUCA juggled 6 rather than 3 pairs as the Logos provided the probable path for biochemistry to transition to Life.

One thing I am certain of is, that if Darwin had known all these incredibly emergent properties at every level of life, and how utterly complicated life was, he would never have thought that it 'varied by chance and accident,' never.

## MATHEMATICS AND THE COSMOS

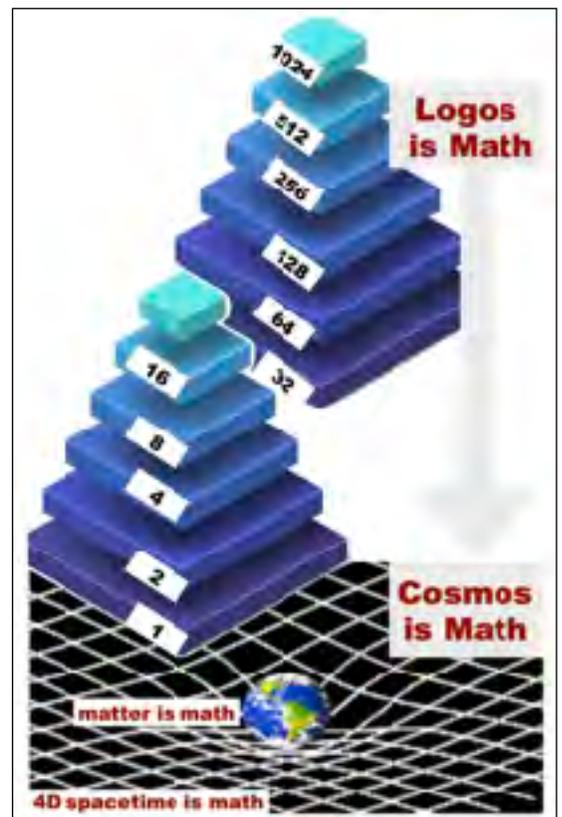
A quite natural question is how do the mathematics of natural law connect with the reality of our universe? We will start with, "What is spacetime." Science has no definitive answer, so we look to analogy. The best metaphor I have is that of the Clock in modern computers. This sends a 'run' tick to every transistor on every chip—and modern chips have tens of thousands.

This is a tick of time is taken for granted in computer coding, just as the presence of oxygen is not taken into account in African history. My computer runs at 4,400,000,000 ( $4.4 \times 10^9$ ) ticks per second, so most of the time I am being ignored. Reality runs at  $10^{44}$  (Planck) ticks per second where a second is an eon.

Let's look at the basic components of our universe: first, we have spacetime which is more mathematical than anything, secondary of particles of various kinds of light which are ripples and twists in spacetime itself, and finally we have the electrons and protons and matter itself, which all are twisted in spacetime, and where all the mass is basically in the binding force that holds the nucleus together. We might be star stuff, but we are definitely mathematical stuff.

One point is mathematical domains. The complex domain, like the others, stretches from plus infinity to minus directions along both axes as the complex plane. The physical laws that rule the wavefunction only function in a tiny part of that plane—the circle with radius 1 centered on the zero, the Unit Circle. It is most likely that limited domains apply all the way up the levels of the Logos.

In the abstract world of mathematics the concept of size does not apply, instead we can look at the number of influences the natural law has.



The mathematical construct that is the Cosmos

Take for example of your own self as the domain of natural law.

At the bottommost level, there are zillions of particles being guided by natural law at level 1. There are a trillion trillion atoms all obeying level 2 law. There are a million trillions of molecules obeying rank 3 biochemical laws. There are thousands of trillions of organelles obeying level 4 laws. There are trillions of cells obeying level 5 laws. Etc. All the way up to the top is just one at level 11 law, the simple-seeming “I Am” we so cherish. This rules all the lower levels. Think and move your finger: Zillions of particles now have a very different 100% probable future—just by your simple thought.

Very early in the discussion we mentioned the vertical relation of mind and body, wavefunction and particle that is central to the Logos. Coordinated with this is the horizontal relation of plus and minus, male and female, which is also central to the structure of the Logos. Unification teaches that the true love union of a man and a woman is the complete expression of the logos. The entire universe is also a complete expression of the logos, just a matter of scale.



This would explain the biblical Word (Logos) that is expressed in the Cosmos while also being expressed in a single man like Jesus or True Father and True Mother.

This is deceptive simplicity in abundance.

So, the question in the headline, “Where is God in Modern Science,” has the answer this essay that God is somewhere way beyond level 15 in the mathematical hierarchy. Math is real; the Logos is real; God is real. Here we go.

One implication of this point of view is that both theologians and biologists will become *mathamaddicts*, so to speak.

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