

**A  
Guide to  
Science and Religion  
for  
Young Adults**

*by  
Richard L. Lewis PhD*

Everyone is aware that the teenaged years are ones of confusion, especially emotional issues. Many teenagers also experience intellectual confusion, learning about God and religion on Sundays at church, then learning about science during the week at high school. They seem to have different explanations about a variety of topics.

The hope of this booklet is to show that this disparity is actually a result of history—of old science and old religion. Modern science and modern religion actually have a lot in common about a variety of topics, some of which we had will deal with in this booklet.

These topics are discussed in five chapters:

1. The Role of Natural Law
2. Mind and the quantum wavefunction
3. A Universe Designed for Life
4. The Physical and Spiritual Realms
5. The Evolution of Life on Earth.

Questions about the topics discussed can be emailed to the author, Richard Lewis, at:

RICHARDLLL@MAC.COM

# LAW AND LOGOS

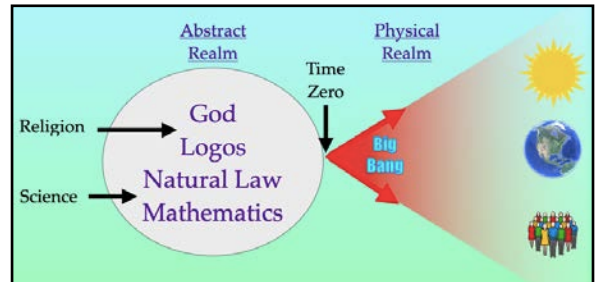
## Introduction

This presentation deals with natural law in modern science and Unification Thought (UT).

Both science and UT agree that there was something existing before the Big Bang birth of the Universe.

For science, it is mathematics that all theorists use in attempting to explain what caused the Big Bang. Some would say that Natural Law was already in effect, while believers in the Multiverse assert that these randomly emerged differently in each of the multitude (though there must have been a Law of Laws about their necessity). Mathematics exists in the Abstract Realm, which pre-existed the universe.

For UT, the Creator God designed a hierarchy of natural laws to start the universe and end up with human beings. This hierarchy is called *The Logos* in UT, the *Principle* in the **Divine Principle** and the *Word of God* in the Bible. God and the Logos also exist along with mathematics in the incorporeal abstract realm.

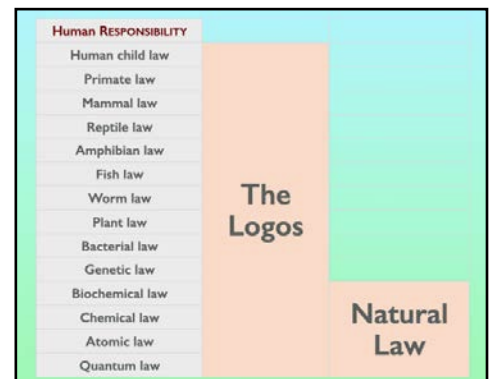


## Hierarchical Law

In *Unification Thought*, all of God's creative work went into an abstract construct called the Logos, a concept that embraces, but enlarges, the concept of Natural Law.

Many, if not most, religions embrace the concept of natural law but also insist that God can intervene and do whatever He wants to do without limitation. In UT, God only performs seeming miracles through human beings. Examples would be Moses and Jesus.

Before humans emerged, everything was fully controlled by the Logos alone. In the *Divine Principle*, the period before Man is called the indirect dominion of God. God working through spiritually mature humans is called the direct dominion of God.<sup>1</sup> God is not free to ignore the law that He created. The final step in Creation involves Human Responsibility (which has yet to be fulfilled), and God will not take this away.



If science had a dogma it would be: The Universe is fundamentally ruled by Natural Law. While most people assume that scientists view natural law as working at all levels in the hierarchy of science, this is currently not true in the life sciences where Darwinian selection and contingency—not natural law—are thought to govern evolutionary advance.<sup>2</sup>

A simple example involves the right-left isomers of biochemical molecules. All life on earth uses right-nucleotide bases and left-amino acids—the opposite forms being poisonous to life. Contemporary biology has this as a contingent R-L accident at the origin of life. It could just as well have been R-R, L-L or L-R.

This contingent aspect is absent from *Unification Thought* which has the patterns inherent in natural law applying at all levels of the evolutionary hierarchy. The composite of all Natural Laws at every level of nature is called the Logos (aka *The Principle*). This view predicts that all life that emerges in the Universe will also be R-L and thus not inherently poisonous.

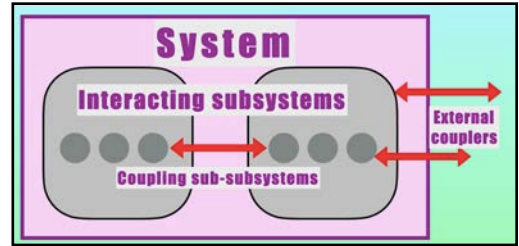
<sup>1</sup> <http://www.tparents.org/Library/Unification/Books/dp96/dp96.pdf#search=divine%20principle%20eu> p. 52

<sup>2</sup> <https://science.sciencemag.org/content/362/6415/eaam5979>

In a famous thought experiment, eminent evolutionist Stephen Jay Gould asked whether, if one could somehow rewind the history of life back to its initial starting point, the same results would obtain when the "tape" was run forward again. He speculated that it would be very different. To the contrary, UT would have life basically identical. Only when exobiology becomes a practical discipline will we have the ability to distinguish between Law or Contingency in the origin and history of life.

## Hierarchical Systems

In *Unification Thought* the Logos is progressively expressed through evolutionary history. Step-by-step a hierarchy of increasingly sophisticated systems is expressed in history as atoms progress to molecules to life to plants and animals. The final and complete expression of the Logos in *Unification Thought* is the advent of humans. Unlike the rest of creation, however, humans are not perfected by the power of the Logos alone but have a Portion of Responsibility in their own spiritual maturation and perfection.



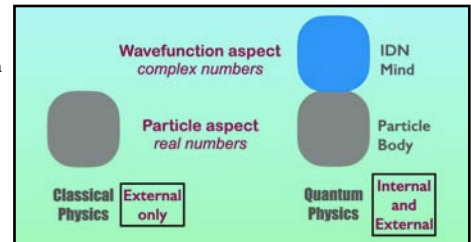
At all levels, the basic principle of triple-level system building applies: All systems are composed of interacting subsystems that couple with their sub-subsystems. A system interacts with other systems by coupling with a subset of its subsystems. An example would be a nucleotide molecule that is composed of interacting atoms. The atoms interact by coupling with their electron subsystems. The molecule itself can interact by coupling externally with electrons and also with atoms, as in the all-important hydrogen bonding so crucial in biochemistry.

This hierarchy of systems is developed under the influence of natural law, a resident of the Abstract Realm. Just how an abstract law could govern material objects was a great puzzle in materialistic science. How could abstract principles influence substantial matter? This was elaborated in Nobel Laureate Eugene Wigner's famous lecture "The Unreasonable Effectiveness of Mathematics in the Natural Sciences."<sup>1</sup>

## Internal Aspect

This influence became less unreasonable when science discovered that there was more to matter than just the external aspect. Early in the 20<sup>th</sup> Century, an intangible aspect was found necessary in a complete description if the behavior of matter was to be understood.

This non-corporeal, internal aspect is called the *wavefunction* in quantum mechanics, and it can only be delineated by *complex number* math in which linear size and angular rotation are unified into a single measure. This is unlike the familiar external particle aspect that is well-described by *real number* math where size and rotation are dealt with quite separately.



In UT, this aspect of matter is called the Inherent Directive Nature of inanimate systems, and the Mind of living systems.

In Classical physics, natural law was thought to work directly on the external particle aspect. Quantum physics, to the contrary, found that natural law works directly on the internal wavefunction, and has no direct influence on the external particle. It is reasonable for an abstract law to act on an abstract wavefunction, while to a materialist, it is now the concept of an abstract wavefunction that is unreasonable.

The internal wavefunction generates the probability of how the particle will move and interact. Do not confuse quantum probability with classical probability. Quantum probability is stronger than electromagnetism, stronger than gravity. So strong that quantum physics embraces the totalitarian principle: What is not forbidden is compulsory.

<sup>1</sup> *Communications in Pure and Applied Mathematics*, vol. 13, No. 1 (February 1960). New York: John Wiley & Sons, Inc.

An example of how different quantum probability is from classical probability (CP) can be illustrated with a pair of dice. Quantum probability comes in two different versions—BP and FP—neither of which is anything like CP. Rather than exploring the technicalities of Bosonic and Fermionic character, a simple analogy will suffice to show their differences to each other and classical probability:

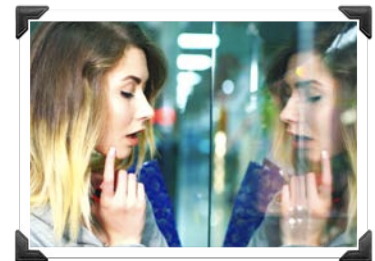
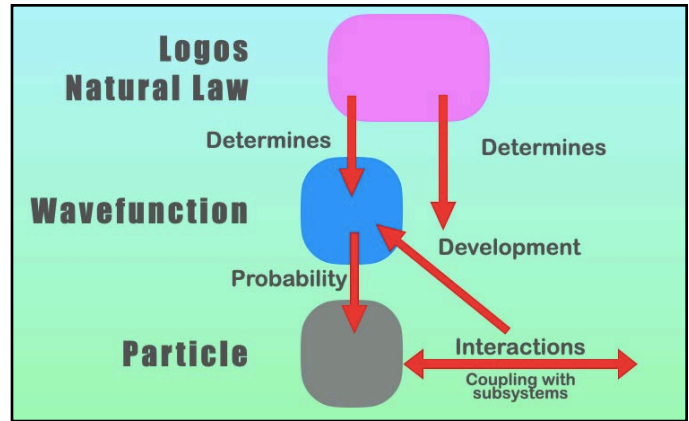
A pair of thrown CP dice can amount to any number from 2 to 12 with 7 the most probable. A pair of BP always comes up as doubles—1&1, 2&2...6&6—but never throws a seven. A pair of FP dice, to the contrary, always comes up a 7—1&6, 2&5...6&1—but never a double. Photons obey BP rules, as in a laser, while electrons obey FP rules, as in the structure of the Periodic Table of Elements.

The external coupling with subsystems alters and develops the internal wavefunction, a give-and-take between internal and external aspects. This development and change in the internal wavefunction by external interaction is governed by natural law. A well-known example of this is the slit experiment where the wave aspect embraces both slits but, in the interaction with a detector atom, becomes localized around it.

While this probabilistic aspect to natural law might seem esoteric and solely of interest to physicists, there is a simple everyday occurrence that completely flummoxed the genius of Issac Newton and was only explained completely by the advent of the internal wavefunction in quantum mechanics. This familiar phenomenon is your partial reflection in a shop window along with the mannequins on display inside.

Each photon of light passing through the glass has a small probability of bouncing back, so a small number of the billions passing through the glass are returned to you. If you want to know more about this internal aspect, I recommend Richard Feynman's *QED: The Strange Theory of Light and Matter* as a great introduction for the nonspecialist.

Nobody can predict what a photon, or any other particle, will "choose" to do, or how it makes the choice, a problem that vexes philosophers to this day.



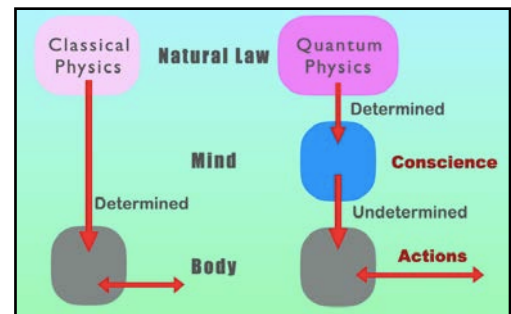
## Determinism and Free Will

UT along with the Abrahamic religions has always asserted that humans have free will, and are responsible for their actions. Materialistic science, however, had a problem with this as it embraced determinism: natural law governed all things, including the human brain, so behavior was determined by chemistry, not free will.

Materialistic science is problematic in both the justice system and organized religion where people are held responsible for their actions. This does not seem reasonable if criminal actions are just the result of chemical imbalances in the brain. If so, perhaps chemical adjustment should be imposed to redirect the criminal chemistry at work.

Fortunately, modern science is no longer simply deterministic. The view of the relation between abstract natural law and what actually happens externally is now more complex and sophisticated. While the development of the internal wavefunction by interaction is fully determined by natural law, the internal only determines the probability of what the external will do: what actually happens is not determined.

That elementary entities have an element of freedom seems unreasonable to materialists. It should be noted that this random choice—in the sense that it is not determined—amongst a set of probabilities is the most difficult thing to emulate in computers, which almost by definition, are



defined by their programming. The best they can do is generate a sequence of numbers whose properties approximate the properties of sequences of random numbers.

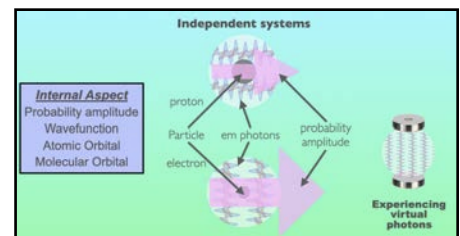
Unlike post-Reformation science, Quantum science has plenty of room for free will. In human experience, the natural law of the Logos determines that our conscience directs us to do good, but we are free to ignore this and do something bad.

## Emergent Properties

All entities have an internal wavefunction; their external interactions by coupling alters this wavefunction, as determined by the Logos. The altered wavefunctions of the entities when interacting as subsystems of a system merge together to generate the wavefunction of the entire systems. This is the origin of the wavefunction of every system, from the simplest to the sophisticated.

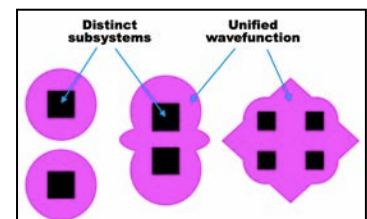
The emergent wavefunction has a set of properties determined by the Logos. When simple systems interact and combine as subsystems into a more sophisticated system, the emergent system displays a set of characteristics that are entirely absent in the subsystems. These “emergent properties” appear at every level of sophistication. The emergent properties come from the Logos.

An example: neither a proton nor an electron have the property called ‘chemical valence.’ They both have an external particle aspect and an internal abstract aspect. (Note: Science is so unsure about the internal aspect of matter that it gives it different names at every level, which can be confusing: *Probability amplitude* for a particle moving from one place to another; *Wavefunction* for the overall behavior of entities; *Atomic Orbital* for electrons in atoms; *Molecular Orbital* for atoms and electrons in molecules. It can be confusing.)



While the proton has a complicated internal structure and the electron is called “fundamental” particle, both particles are composite, their subsystem structure including a cloud of virtual photons called an electromagnetic field. (If you find it hard to believe in non-real photons, try pressing the North poles of two strong magnets together: the invisible cushion you feel between them is composed solely of virtual photons.)

The proton and electron particles couple with these virtual subsystems. This alters the internal aspect of both, governed by the Logos, which merge them into an atomic wavefunction called an orbital. This resultant orbital gives the nascent system, called a hydrogen atom, the emergent property of chemical valence.



This principle applies throughout the hierarchy of matter: the external subsystems retain their individual identity while their wavefunctions merge into the unified entity of the system wavefunction.

Just where these emergent properties come from is not a question asked, or answered, in modern science. All it can say is that the contrasting properties of diamond and graphite can be explained by the different interaction of carbon atoms. A more sophisticated example, is the quality called *life* that emerges in complexes of interacting proteins, nucleic acids, etc.

Religion, at least in *Unification Thought*, states that these qualities are imbued into natural law by the Creator and—according to science—are expressed via the wavefunction into the physical realm. This is similar to the quality of maternal sorrow and grief expressed in marble as the Pieta; these emergent properties, not possessed by a block of marble, come from the mind of Michelangelo.

In UT, it is the input from the Logos that drives the process and is the source of the emergent properties, while in Darwinism, these new characteristics appear out of nowhere randomly by chance and accident.



## Living and Inanimate Systems

While there are a great number of differences between living and inanimate systems, we will discuss just one here; the origin of systems.

The direct involvement of the Logos applies to the emergence of all non-living systems. For example, the origin of every hydrogen atom is the same as the origin of the very first—and there was a first—hydrogen atom in the universe.

This does not apply to living systems. The origin of the very first of a species is exactly the same as in non-living systems—a new analog pattern of interacting subsystems from the Logos is expressed along with its set of emergent properties. In living systems, however, this novel analog pattern from the Logos is captured in digital information that is stored in the nucleic acids.

The analog form of the second, third, etc, generations does not involve a direct input from the Logos but is directed by the stored digital information passed down the generations in the DNA. The emergent properties of the analog forms are still, however, a reflection of those in the Logos.

While the origin of the first of any system involves the direct input from the Logos, the origin of the second, and all subsequent living systems is very different as these have input from stored digital information rather than direct input from the Logos.

### Properties from the Logos

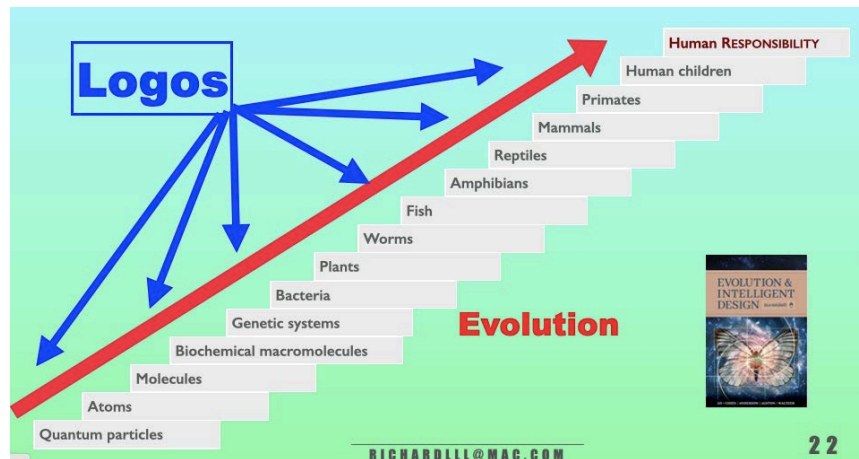
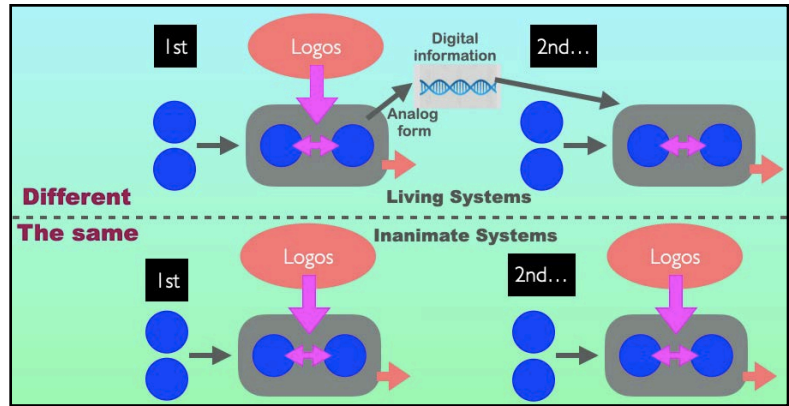
This is a selective list of some of the emergent properties of systems, with the Logos expressed in the analog form of the interacting subsystems and functioning of systems.

Interacting subsystems	Resultant System	Emergent Properties from the Logos
Protons & electrons	Atom	Chemical valence
Atoms	Molecule	Hydrogen bonding
Amino acids	Proteins	Manipulation of analog form
Nucleotides	DNA, RNA	Manipulation of digital information
DNA, RNA, Proteins	Cell	Life
Glia & Neuron cells	Brain	Human mind

Hydrogen bonding is of paramount importance in the structure and function of proteins—with their extraordinary ability to manipulate the analog form of molecules—and the nucleic acids—with their exceptional ability to manipulate digital information.

The interactions of these macromolecules express the quality of life from the Logos in simple cells, such as bacteria, and the variety of cells in the plant and animal world.

The interactions of cells underly the Logos-derived functioning of all the organs in the human body. Of particular note being the quality of the human physical mind expressed through the interactions of the glia and neuron cells—with complementary roles similar to DNA and proteins in cells—that compose the human brain.



In this way, the Logos drives the evolutionary process. The many books on Intelligent Design make an excellent case for the failures of Darwinism random mutation, and evidence of an input by intelligence into evolution. They do not, however suggest just how this input occurred in history. Unification Thought, in the manner just described, does suggest an outline for the mechanism by which this input occurred.



# The Wavefunction and the World

**T**here are basically three different ways to approach a great movie such as Star Wars IV:

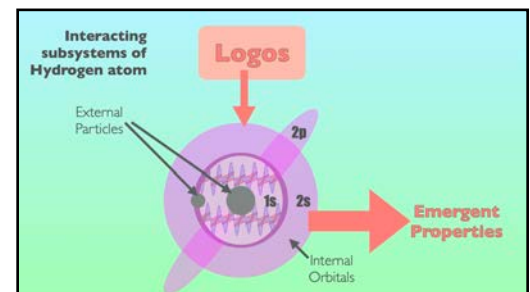
1. Wow, I loved it!
2. What's the big deal.
3. How did they do that?



In this series of talks, we are not going to be enthralled by God's Creation, or take it for granted, rather we are going to ask: How did Heavenly Parent construct the world, the realm of scientific curiosity. Hopefully, this talk will be comprehensible to those with a science background. For those not so fortunate, I hope you take away the sense that science and religion are in agreement on this topic.

In the previous talk we discussed the Logos, natural law, and how it was expressed through the wave function in the physical world in this talk we will discuss the wave function in detail. If you missed that talk you can get a PDF of it by sending an email to [RICHARDLLL@MAC.COM](mailto:RICHARDLLL@MAC.COM), the address at the bottom of every slide. You can type any questions in the chat box and I will attempt to answer them as we go along.

When science really got started about a demi-millennium ago, a great deal of effort went into exploring the various laws that governed the many different aspects of nature: gravity, light, magnetism, fluid flow, etc. Nowadays things are a lot simpler, if more sophisticated. Scientists want to understand how to calculate just one thing about the world; The Action.

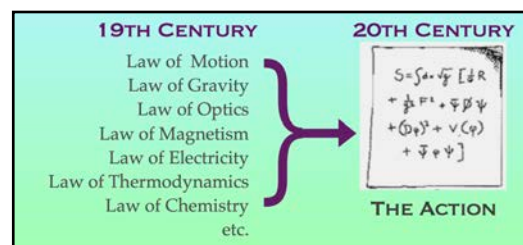


## The Action

A noted scientist explained this development in nontechnical terms:

*“Our search for physical understanding boils down to determining one formula. When physicists dream of writing down the entire theory of the physical universe on a cocktail napkin, they mean to write down the action of the universe. [The accompanying illustration is a contemporary action*

equation; 'S' is the total action.] It would take a lot more room to write down all the equations of motion... The action, in short, embodies the structure of physical reality... Some physicists would like to believe that the Ultimate Designer thinks in terms of the action."<sup>1</sup>



While the equation is complicated and takes graduate years to understand, anyone can see the many +'s adding up all contributions of all the interactions to get the total action.

The reason that scientists are on this quest is that a very simple rule seems to govern all that happens in the world: The Principle of Least Action. The Action is not a familiar term to nonscientists, it is the scientific measure of existence, with the units of energy over time.

*Intriguingly, beneath the very different ideas about the universe found in Newtonian physics, Maxwell's electromagnetism, quantum mechanics and Einstein's relativity, we find a common core. They are all boil down to a principle of least action.*<sup>2</sup>

Like almost everything that was considered continuous in classical science existence—like time, space, energy—comes in discrete pixels, called quanta. All of these are grainy, but seem continuous because, like the 72dpi pixels of my computer screen, they are too small to be noticed. The pixel of existence, called a Planck's Constant, is tiny at  $1.3 \times 10^{-34}$  Calorie-seconds.

It got this name as Dr. Planck was the first to discover that every pixel of electromagnetic radiation—from radio, through microwave, to light, to X-ray to gamma—had exactly one pixel of existence, of the action. Light minimized its action by always taking the path of least time. There are also some simple entities in the world that do not have even this tiny pixel of existence, called *virtual particles*. They are the underpinnings of the electric and magnetic fields.



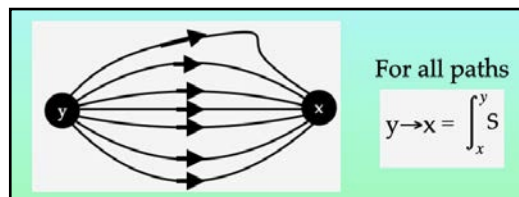
This basic law commanding minimizing the action underlies all that happens, and it corresponds to the Universal Prime Energy in the *Divine Principle*:

*"The fundamental energy of God spirit is also eternal, self existent, and absolute. It is the origin of all energies and forces that allow created beings to exist. We call this fundamental energy universal*

<sup>1</sup> A. Zee, *Fearful Symmetry*, Macmillan, NY (1986), pp. 106 - 112.

<sup>2</sup> G.F. Lewis, L.A. Barnes, *A fortunate universe: Life in a finely tuned cosmos*, Cambridge University Press, 2016 p.228

prime energy. Through the agency of universal prime Energy the subject and object elements of every entity form a common base and enter into interaction. This interaction, in turn, generates all the forces the entity needs for existence, multiplication, and action.”<sup>3</sup>



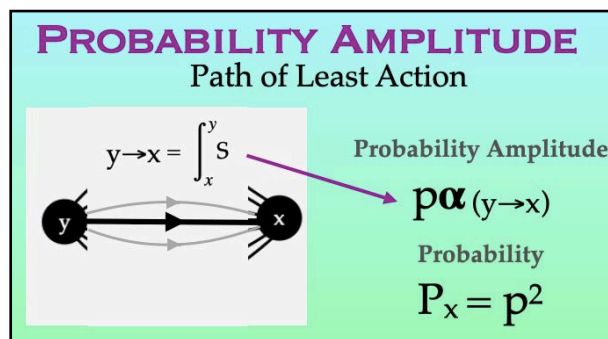
## Probability Amplitude

While simple in principle, its application can be tedious. Consider an electron and our desire to know if it will go from y to x. First we have to consider all the possible paths it by which it might make the transition. Then for each path we have to integrate the action over the path. The path the electron will choose will be the one with the least integral. There will be similar paths with low action, so it is impossible to predict exactly which path will be chosen. These integrals are complex numbers, the measure of the probability amplitude for the y to x transition.

This probability amplitude, a complex number, for the path of least action has a linear size, p, and a circular rotation,  $\alpha$ ; the real probability of the transition being  $p^2$ . This combination of linear size and circular motion in a complex number is used throughout the sciences, and is featured in the *Principle*.

“A movement in a straight line cannot be sustained forever. For anything to have an eternal nature it must move in a circle.”<sup>4</sup>

Nature involves both linear and circular changes, so it makes sense that the numbers used to describe it need to combine both. Such numbers are called *complex* numbers while the familiar numbers that deal with linear aspects are called *real* numbers. The real numbers lie on the real axis that stretches from minus infinity through zero to plus infinity. The operation, “rotate by 90°” is symbolized by the letter “i”, and the real axis rotated by 90° is called the *imaginary* axis. These two define the complex plane which stretches to infinity in all directions.

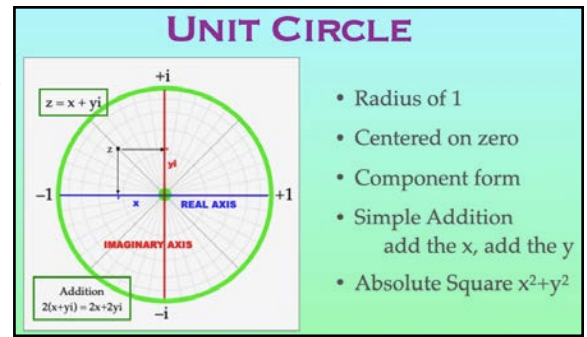


For describing the probability amplitude all we need is a tiny patch of the complex plane, the unit circle with a radius of 1 centered on zero. This limit is imposed by a probability that

<sup>3</sup> *Exposition of the Divine Principle*, 1996, p. 35

<sup>4</sup> *Exposition of the Divine Principle*, 1996, p. 43

can never be greater than 1, a certainty, or smaller than zero, forbidden. The real axis goes from  $-1$  through zero to  $+1$  while the imaginary axis goes from  $-i$  through zero to  $+i$ . Just as  $x$  and  $y$  are traditionally used for real numbers,  $z$  is used to signify a number on the complex plane.



There are two basic ways to measure  $z$ , the rectangular and the polar. The rectangular describes  $z$  in terms of its real and imaginary components.

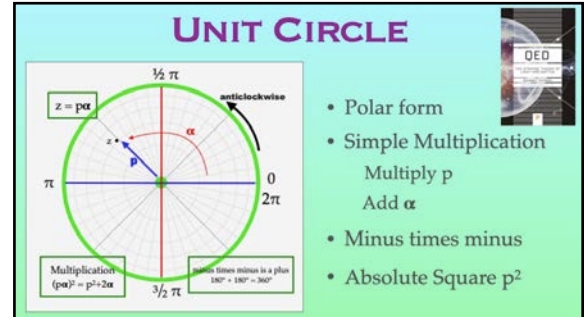
$$z = x + yi$$

This form makes the addition of complex numbers simple: add the  $x$  components, add the  $y$  components— $2(x + yi) = 2x + 2yi$ . In this form, the absolute square giving the probability from the probability amplitude is  $|z|^2 = x^2 + y^2$ .

The polar form views  $z$  as a little arrow with a length,  $p$ , and a rotation from the positive real axis by an angle,  $\alpha$ —a linear size and an angular rotation.

$$z = p @ \alpha$$

Scientists always measure angles in radians—the distance around the unit circle—but for the nonprofessional we will use the familiar degree notation,  $90^\circ = \frac{1}{2} \pi$ ,  $180^\circ = \pi$ ,  $360^\circ = 2\pi$ .



This form makes multiplying complex numbers together very simple: multiply the lengths, add the angles. In this form the absolute square is  $|z|^2 = p^2$ . It is this form that provides a simple reason to the schoolyard ditty:

*Minus times minus is a plus,  
for reasons we will not discuss.*

*Minus one* as a complex number is  $1 @ 180^\circ$ , and squaring it gives *plus one*:

$$(1 @ 180^\circ)^2 = 1^2 @ (180^\circ + 180^\circ) = 1 @ 0^\circ$$

So the reason is:  $180^\circ$  plus  $180^\circ$  is  $360^\circ$ . Note that  $i$  is the complex number  $1 @ 90^\circ$  and squaring it gives  $1 @ 180^\circ$ , which is the explanation why the rotation operator,  $i$ , is familiarly known as “the square root of minus-one.”

There is an excellent book—*QED: The Strange Theory of Light and Matter*—by the Nobel Laureate Richard Feynman that explains much about the probability amplitude. He uses layman terms, and avoids dealing with complex numbers by “adding little arrows” and “shrink-and-turn” for multiplication (p is always 1 or less and multiplying them is always a shrink).

A note to conclude this detour into complex numbers and the probability amplitude. In classical science, to calculate the probability of an OR situation you add the separate probabilities, while for an AND situation you multiply the separate probabilities, to get the final probability.

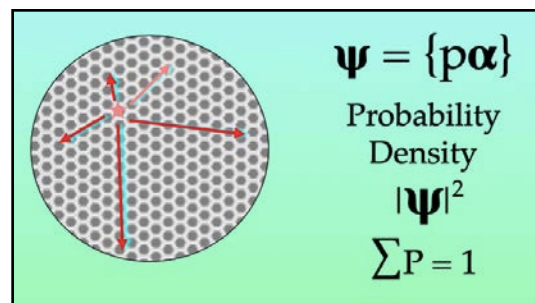
In quantum science, in OR situations you add the separate probability amplitudes, while in AND situations you multiply the separate probability amplitudes, to get the final probability amplitude. The absolute square of this gives the final probability.

It is the subtle difference between the math of real numbers and the math of complex numbers that underlies the apparent weirdness of the quantum world.

## The Wavefunction

Consider an electron, for example, constrained within a sphere such that the probability of finding the electron there is 100%. There will be a probability amplitude to move from any location within the circle to any other, including one for staying in the same place.

The set of all the probability amplitudes is called the wavefunction, usually symbolized with the Greek letter psi,  $\Psi$ . The electron will not have the same probability of being found at all locations.

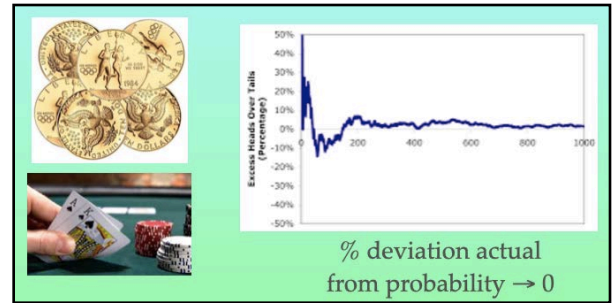


It is one thing to have a probability projected from the abstract realm, but another to know how it influences the w=real world. Mathematics proves that the impact on the physical realm is governed by the Law of Large Numbers (LLN). The LLN states that, given a sufficient number of tries, an abstract probability will become the real result—the more the events, the closer it will express the probability.

One example of this law in action are the Las Vegas casinos. Each game is designed so that the casino has a small probability of winning. The house edge on blackjack is 0.5%—one of the lowest—so you’re looking at an average loss of 50 cents every time you bet \$100. Will

some will win big, and some will lose big, the house is sure to make its 0.5% overall when thousands of people play.<sup>5</sup>

While a coin has a 50% chance of heads or tails, a single coin toss is always 100% one or the other. Tossing 100 coins almost 50% will be one or the other. Analysis shows that the error is usually close to the square root of the number of attempts. Tossing 100 coins the error would be plus or minus 10, a 10% error. Tossing 1 million coins, the results would deviate from the probability by  $\pm 1,000$  coins, a percentage of 0.1%. A trillion coins, the deviation would be  $\pm 1,000,000$ , a 0.000,001% error. The electron moves a trillion time a second, so the difference between the abstract probability and the actual density is  $\pm 0.000,001\%$ .



The topography of probability within the sphere is the absolute square of the wavefunction, and is called the probability density of the electron in this wavefunction.

If there are 100 locations, each has associated 100 tendencies to move to any other location. This wavefunction is thus a set of 10,000 probability amplitudes. With 1,000 locations; the set is a million, etc.

This is a lot of complex numbers to deal with! Luckily, scientists have found ways to simplify the math. For instance, in a helium atom the wavefunction of the nucleus and the wavefunction of the two electrons blend together to form a sphere called a 1s orbital. This sphere has a volume about a trillion times that of the nucleus.

The nucleus is about 8,000 times more massive than an electron, and just sits quivering at the very center of the orbital. The lightweight electrons, however, zip about the orbital so rapidly that it appears to be solid. *Solid* is a concept built on the probability density of electrons in atoms. The actual

The diagram shows a central green circle labeled 'He' representing the nucleus, surrounded by a large, grey, textured sphere representing the 1s orbital. To the right, the text reads '1s orbital Helium atom'. Below this, the Schrödinger wave function equation is presented:  $\frac{\partial^2 \psi}{\partial x^2} + \frac{8\pi^2 m}{h^2} (E - V) \psi = 0$ . Labels point to the terms: 'Second derivative with respect to X' for  $\frac{\partial^2 \psi}{\partial x^2}$ , 'Position' for  $x$ , 'Schrödinger Wave Function' for  $\psi$ , 'Energy' for  $E$ , and 'Potential Energy' for  $V$ . To the right of the equation, text explains 'Combining Probability Amplitudes' with the following relationships:  $p\alpha \rightarrow p^2$ ,  $2 p\alpha \rightarrow 4 p^2$ , and  $p\alpha + p\bar{\alpha} = 0$ .

external electron density is a full expression of the abstract probability density, itself a projection of the abstract wavefunction. A helium atom, in normal situations, has a zero probability of losing or gaining an electron, it is chemically inert.

It was Nobel laureate Erwin Schrodinger who discovered an equation that simplified calculating atomic wavefunctions. It is a differential equation involving kinetic and potential

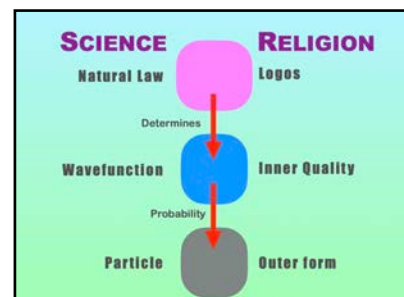
<sup>5</sup> <https://www.gamblingsites.com/blog/the-house-edge-in-blackjack-28277/>

energy and can be completely solved for the helium atom. For more complicated atoms, solutions are only approximations, but good enough for most situations.

The stability of the paired electrons is an example of the quantum math just mention. Two equal probability amplitudes constructively combining create a probability four times greater than that of a single one. Two probability amplitudes destructively combining create a probability of exactly zero, it will never happen. It is this that underlies the structure of the Periodic Table of the Elements and the Pauli Exclusion Principle.

In the Principle, this internal aspect giving form to the external is called the Inner Quality and the external aspect the Outer Form:

*Every entity possesses both outer form and an inner quality. The visible outer form resembles the inner quality. The inner quality, though invisible, possesses a certain structure which is manifested visibly in the particular outer form. The inner quality is called internal nature and the outer form or shape is called external form.<sup>6</sup>*



Clearly, what the Principle calls the Inner Form is what science calls the Wavefunction. In the previous talk we discussed this relation of Logos/law, the internal wavefunction, and the external form in more detail.

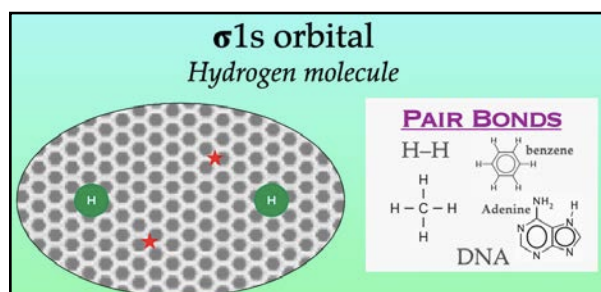
## Chemical Activity

While a helium atom, with its highly probable electron-pair is remarkably self contained, the hydrogen atom with its lone electron, its probability density just 1/4 that of the helium electrons, is not so confined within the 1s orbital. Depending on the environment, there is a probability that another electron will cross over from elsewhere (such as a sodium atom) and create a stable pair (sodium hydride), and an even stronger probability that the electron will depart and join a chlorine atom and create a stable pair there:



A simpler stability occurs when two hydrogen atoms meet, their 1s orbitals merge in to a molecular orbital, and the two electron pair-bond happily tying the two atoms into a hydrogen molecule. This pair bond appears throughout chemistry, it is the single line in molecular diagrams, such as methane.

A more complicated situation arises in benzene,



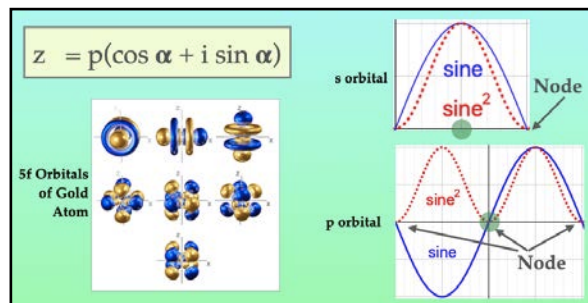
<sup>6</sup> Exposition of the Divine Principle, 1996, p. 31

where the six simple bonds are complemented by three pairs that encompass all six carbons, making benzene remarkably stable. Such “delocalized bonds” play a significant role in adenine which plays important biological functions in energy transfer, hydrogen transfer and as a bit in the digital manipulations of RNA and DNA.

## Entangled Wavefunction

So far we have discussed simple wavefunctions, such as spheres and oblate spheroids. We now move on to more sophisticated waveforms. You might, at this point, wonder why the name is *wavefunction* as we have not encountered waves so far. Yet another expression for a complex number involves the circular functions, the *sine* and *cosine* of trigonometry, and the shape of the wavefunction often reflects these functions. The simple polar symbolism,  $p@α$  is a précis of the actual expression,  $pe^{iα}$ , which gives rise to the delightful:  $-1=e^{iπ}$ .

A simple example is the sine wave. A simple wave, such as the 1s orbital is just one half of a sine wave, with a zero at the boundary and maximum at the center, around the nucleus. The technical name for a zero in a wave is *node*.

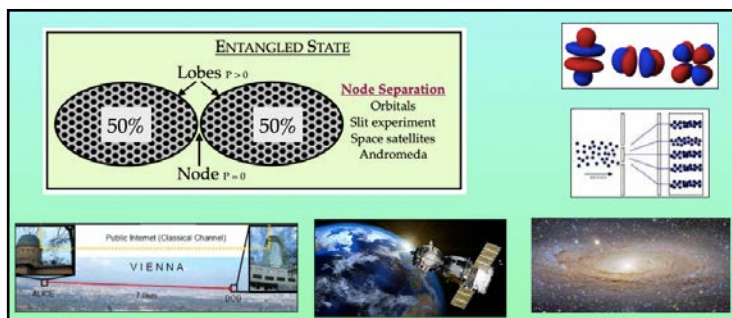


The 2p orbital—there is no 1p—is a full sine wave, with nodes at either boundary, and an internal node at the very center, at the nucleus. An electron in the 2p spends 50% of its time on one side, 50% of its time in the other, and no time whatsoever at the node, at the nucleus. This node is not a barrier, however, and the electron ignores it as it flits from one side to the other filling out the shape of the orbital with a probability density.

Other orbitals, such as the 5f in the gold atom, have peculiar shapes and four internal nodes. The electron, as explained, timeshares in all areas (the blue and yellow signifying the up and down flex of the wavefunction) while ignoring all the many nodes.

These nodes are an introduction to an area of physics that is currently exploding—the phenomenon of entanglement.

*Albert Einstein colorfully dismissed quantum entanglement—the ability of separated objects to share a condition or state—as “spooky action at a distance.” Over the past few decades, however, physicists have demonstrated the reality of spooky action over*





*ever greater distances—even from Earth to a satellite in space.*<sup>7</sup>

Einstein considered this node aspect of quantum science a sign that something was wrong with the theory as there is no limitation on the size of a node, on the spatial separation of the zero probability between the lobes of positive probability.

In an atom, the separation between lobes is on the scale of nanometers. In the slit experiment where it seems the particle passes through both slits at the same time, it is actually two lobes of the wavefunction that pass through both slits, the particle flitting between the two as always. The lobes interfere with each other on the far side creating a pattern of probability at the detector. The separation between lobes is on the scale of millimeters.

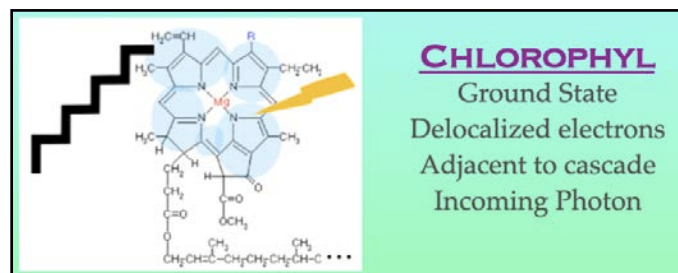
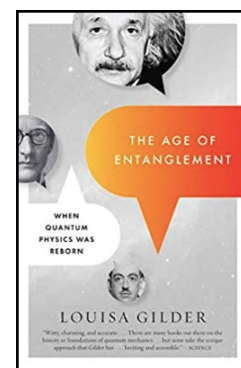
Experiments have been performed using the sewer pipes of Vienna as protective conduits for optical fibers—scale of miles—and earth/satellite communication—scale of hundreds of miles. Theoretically, the scale is unlimited—Earth to Sirius, scale light years; Earth to Andromeda, scale millions of light years—are all possible separations for entangled lobes of a wavefunction. It is no wonder that this opens up a whole new field of technological possibilities.<sup>8</sup>

## Wavefunction in Life

Leaving aside such exciting possibilities, we move into the realm of living organisms. Without a doubt, the most important foundation for life on earth is the trapping of the energy in sunlight, and its storage in the form of carbohydrates. While some simple forms of life find other ways, all familiar organisms are dependent on this source of nourishment. We can only summarize the sophisticated details here.<sup>9</sup>

The molecule central to this miracle is chlorophyll, and its core action involves its wavefunction and an electron donated by the magnesium ion held captive at the center.

In the ground-state, the wavefunction that this electron moves in is delocalized around the



<sup>7</sup> <https://www.sciencemag.org/news/2018/04/einstein-s-spooky-action-distance-spotted-objects-almost-big-enough-see>

<sup>8</sup> The Age of Entanglement: When Quantum Physics Was Reborn

<sup>9</sup> <https://www.ncbi.nlm.nih.gov/books/NBK9861/>

conjugated bonds of the core molecule. The long chain serves to anchor it in a membrane adjacent to an electron transport chain, a cascade of molecules, such as cytochromes, that give-and-receive electrons readily.

An incoming photon of light is absorbed by the delocalized electron and it enters an excited state orbital. In an atom, the ground-state orbital is smaller than the excited-state orbitals. In chlorophyll, it is the opposite; the ground-state orbital is delocalized while the excited-state orbital is localized at a spot adjacent to the electron transport chain.

The excited electron drops onto the electron transport chain, then as it cascades down its energy is used to generate ATP. At the end of the chain, the electron is returned to the chlorophyll in the ground-state. This is Photo System 2.

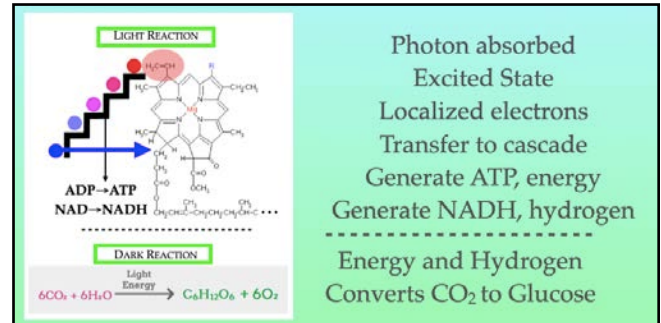
Alternatively, the excited electron can be channeled into Photo System 1 where it gets an extra boost and ends up generating NADH, an activated form of hydrogen. The electron-deficient chlorophyll in PS 1 gets back to the ground-state by taking an electron from a water molecule and releasing oxygen.

The ATP and NADH generated in this Light Reaction are used in the Dark Reaction to synthesize carbohydrate from carbon dioxide in a cycle of transformations. The first step in this process involves what is listed as the most abundant protein on earth.

This protein, called Rubisco, takes a single carbon molecule (1-C) of carbon dioxide molecule, which is stable and unreactive, adds it to a 5-C molecule, and releases two 3-C molecules. This is the fixation of carbon. The ATP and NADH are used to drive the 3-C molecules back to the 5-C starting point as well as liberating the basic building blocks of carbohydrates. Rubisco is so abundant as it is rather inefficient and often mistakes an oxygen for a carbon dioxide.

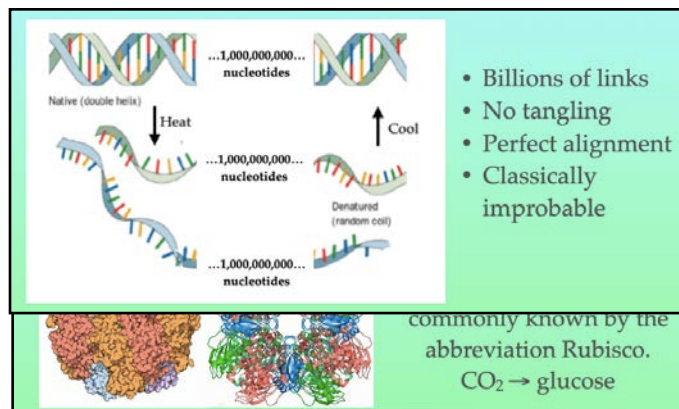
Fascinating, but the key point here is the transformation of the linear chain of 500 or so amino acids as spooled out of a ribosome into the precisely-folded active form of the enzyme. This is still a major field of study with, as yet, no clear answers:

*“Proteins are the workhorses of life, mediating almost all biological events in every life form. Scientists know how proteins are structured, but folding—how they are built—still holds many mysteries.”<sup>10</sup>*



<sup>10</sup> <https://www.sciencedaily.com/releases/2016/03/160331134308.htm>

The problem is that the folding takes place quite rapidly into the form that allows it to perform carbon fixation. The mystery arises because there are zillions of ways the chain *could* fold, and the probability of it picking the correct one is essentially zero. This, of course, is classical thinking along the lines of the Traveling Salesman Problem<sup>11</sup> with 500 locations involved. The Rubisco folding, in classical thinking, should take decades, not fractions of a second.

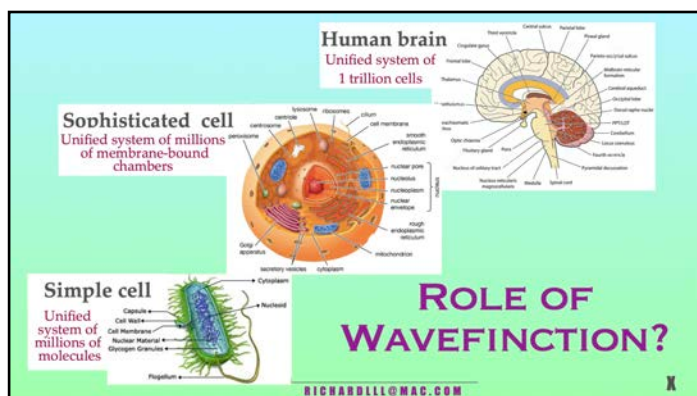


Once we consider the wavefunction aspect of the 500 long chain, we see that the chain is moving from an excited state to the ground-state, and the particles are just moving from an improbable state to a highly probable state.

A similar challenge involving linear chains of billions molecules is the phenomenon of DNA annealing. The iconic double helix of a DNA molecule can be disrupted by gentle heat, separating the double helix into two independent strands. The DNA is denatured. If the mixture is cooled, the two strands will align and recreate the double helix, the nucleotides hooking up with their partner in correct alignment. This is routine in the DNA polymerase chain reaction that forensic science is enamored with as it allows 1 molecule of DNA to be multiplied into the thousands need for analysis.

This renaturing of DNA is even more classically impossible than protein folding as billions of nucleotides have to align correctly. It should take centuries, not the seconds that it actually takes. Yet when considered as a change from an excited state of the wavefunction to the ground state, it does make sense.

One would think that wavefunction-thinking would have permeated science, applied to the workings of cells all the way up to the brain, but that is for the future—biology has yet to respond to the quantum revolution in physics. My PhD thesis choice was: *The Impact of the Quantum Revolution on the Biological Sciences*, and after months of study, I had to report that the impact was negligible other than in biochemistry. The response, “That was



<sup>11</sup> [https://en.wikipedia.org/wiki/Travelling\\_salesman\\_problem](https://en.wikipedia.org/wiki/Travelling_salesman_problem)

interesting in itself" was sufficient to allow me to finish my thesis.

A bacterium is a unified system of millions of molecules; an animal cell is a unified system of millions of bacterial-sized, membrane-bounded chambers; the human brain is a unified system of a 100 billion neurons (a protein-like role) and 900 billion glia cells (a DNA-like role).

The concept of an all-embracing wavefunction creating all that unification has yet to enter into the scientific discussion. That is the task of future generations of scientists.

# A UNIVERSE JUST RIGHT FOR LIFE

*As modern science has delved deeply into the structure of reality, it has become apparent that we inhabit a universe in which many parameters and laws are finely adjusted to allow for the presence of life. These have been extensively documented in books by scientific authors.*

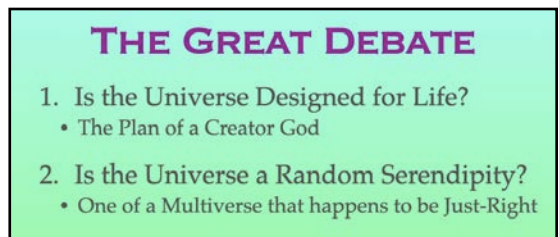
While this is not in dispute, there is no agreement as to what caused this fine-tuning. One book on the topic concluded with a discussion of the various theories:



*Our conclusion is that the fundamental properties of the universe appear to be fine-tuned for life.... We would like to know: why is the universe like this?... The ideas inspired by the fine-tuning of the universe for life range from realistic science to informed guesswork to unfettered speculation.<sup>1</sup>*

In this essay we will just discuss two contrasting possibilities: the universe is designed for life by a creator God, or, the universe is a random serendipity, one of a multiverse that happens to be just right for life.

While it is quite possible to sense the hand of God in the stars, the flowers, the people, etc., these are topics for debate and we shall dig much deeper into the foundations of all the wondrous aspects of our reality.

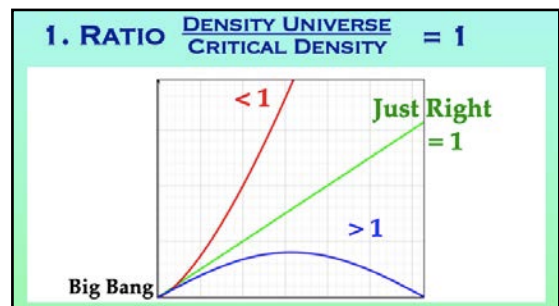


## The Big Bang

We will start at the very beginning, with the Big Bang and a very important ratio of the density of the universe and the critical density. For a flat universe such as ours today the ratio is approximately unity.

As the universe expands, any deviation from unity is magnified. A small deviation to less than one results in runaway inflation into a universe too diffuse for stars to form. A small deviation to greater than one results in a big crunch in which the universe collapses quite rapidly.

*If we look at the density of the universe just one nanosecond after the big bang it was immense, around  $10^{24}$  kg/m<sup>3</sup>. This is a big number, but if the universe was only a single kg/m<sup>3</sup> higher, the universe would have collapsed by now. And with a single kg/m<sup>3</sup> less the universe would have expanded*



<sup>1</sup> G. F. Lewis, L. A. Barnes (2016) *A fortunate universe: Life in a finally tuned universe*, Cambridge University Press, p. 290

*too rapidly to form stars and galaxies.*<sup>2</sup>

For neither of these catastrophes to happen, the ratio at the very beginning of the big bang had to be exactly one to an accuracy of  $10^{60}$ . The Big Bang was tuned to an extraordinary degree to allow our universe to be just right for life.

Two long-range forces emerged from the Big Bang: the force of gravity and the force of electromagnetism. Gravity is by far the weakest of the forces, but it has the advantage that all matter has positive gravitation. Electromagnetism (EM) is by far the stronger but is usually neutralized by positive and negative charges in equal amounts. The ratio of their strengths is  $1:10^{32}$ —EM is an astounding billion, trillion, trillion times stronger than gravity.



If gravity was stronger, stars would be short lived and unable to support life; if gravity were weaker they would be no stars at all, and no life. The ratio of these two long-range forces is finely tuned to allow for life.

The next topic involves the two short-range forces that emerged from the Big Bang, the strong and the weak nuclear forces.

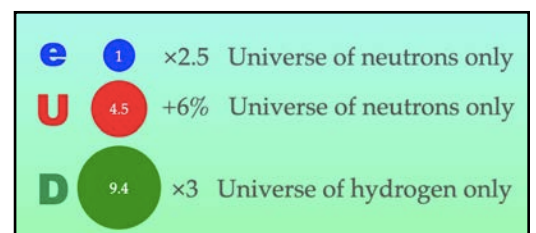
The Big Bang generated hydrogen 75% and helium 25% along with an abundance of photons and neutrinos. For most of their lifetime, stars generate their profligate energy by converting hydrogen into helium. This essential process is very sensitive to the ratio of its efficiency to the strength of the strong force, in the appropriate units. If it were a little higher, the combination of two protons would be stable, and the star would rapidly convert all its hydrogen and explode in the process. If it were a little weaker, the essential intermediate of deuterium—its neutron generated by the weak force—would be unstable and stars could not convert hydrogen.



This is another ratio that has to be just right to allow for stars that can support life.

One of the most astonishing advances in modern science is that all the amazing, beautiful and complex entities in creation are constructed out of just three entities (like a Lego set with only three types of pieces).

These fundamental building blocks are the U and D quarks of the atomic nucleus, and the electrons that surrounds them in atoms. Their relative masses are significant (note that a nucleon of three quarks is  $\sim 2,000$  times the mass of the electron—most of this extra mass being in the field of energy binding the quarks together). The balance is such that a neutron (DDU) can decay into a proton (DUU) and an



<sup>2</sup> ibid p. 167

electron.

If the electron or U quark were larger, the proton would be unstable and the universe a neutrons-only wasteland. If the D were larger, the nuclear neutrons would be as unstable as isolated ones, and the universe a sterile hydrogen-only wasteland. These three entities emerging from the Big Bang are balanced just right for a fecund universe.

*That we are all constructed from molecules of carbon and oxygen is only possible because the masses of the quarks and the strength of the forces lie within an outrageously narrow range!<sup>3</sup>*

## Star Lifetimes

Our Sun has been a source of light and heat for the last 5 billion years—converting 600 million tons of hydrogen every second into 596 million tons of helium and radiating 4 million tons of energy. It will continue to do this for another 20 billion years before it runs out of hydrogen to burn.

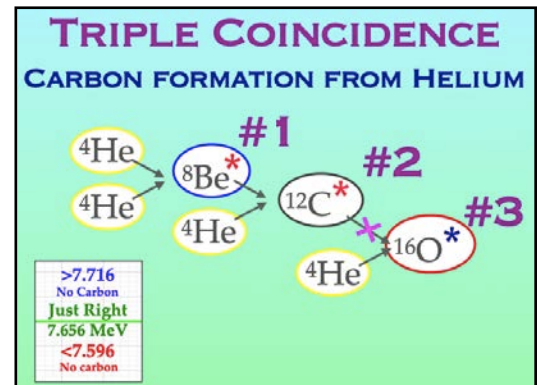
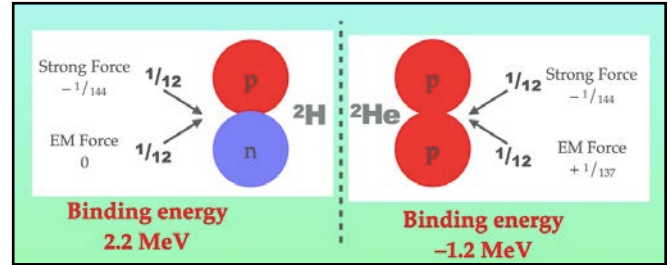
The Earth, which formed at about the same time, has over the eons evolved from a barren sphere of molten rock to the pleasant home of humanity and a plethora of animals and plants it is today. The longevity of the sun played an important role in energizing this long and complicated process. A short-lived sun would be useless.

This stellar longevity depends on two parameters.

- 1) The weak force has to be so feeble that the transformation of protons into neutrons takes billions of years, allowing the key intermediate of heavy hydrogen to be generated slowly.
- 2) The strong force must not be too brawny, allowing two protons to stick together into a  ${}^2\text{He}$  and causing a runaway explosion that would destroy a star. It is when two protons are briefly in contact that the weak force can flip one of them into a neutron, forming a deuteron.

The balance has to be just right: the strong force is so short range that only where the nucleons touch can it work,  $\sim 1/12$ th surface overlap. The EM force has no such limitation and the repulsion between two protons is sufficient to overcome the strong attraction. The neutron, having no charge, allows the deuteron pair a moderate—on the nuclear level—stability. Two deuterons are rapidly converted into very stable helium-4 with a substantial binding energy of 27 MeV.

So, as the eons pass since the Big Bang, the relic hydrogen has been gradually converted into helium to mingle with the relic helium. A universe of just hydrogen and helium is not very interesting, the rest of the elements have to be made. This happens when stars run out of hydrogen. The source of energy keeping the star inflated against gravity's pressure is reduced and the star starts contracting.



<sup>3</sup> ibid p. 120

The core, which is now almost all helium, is compressed and its temperature rises to the point that Helium starts to fuse. How this happens was a great puzzle, because the natural product, beryllium-8 is utterly unstable and falls apart in a million-billionth of a second, leaving no time for a chance encounter with another helium to form carbon.

It was Dr Hoyle—the originator of the hoped-to-be derogatory term ‘Big Bang’—who figured out the answer. He reasoned that beryllium-8 must have a specific resonance that had a stability sufficient for a third helium to arrive. Furthermore, he realized the carbon-12 would also have to have a specific resonance that gave it stability. This is the triple alpha process. Finally, he realized that oxygen must *not* have a suitable resonance, otherwise all the carbon would get turned into oxygen.

He calculated the resonance energies that were required for carbon synthesis, and all his predictions were validated when tested.

*The triple alpha process is extremely important in determining the elemental composition of the universe and allowing life as we know it to exist.*

*Yet that the process occurs at all is somewhat improbable, as its discovery showed it was only made possible by the complex interplay of physical constants that cause the excited resonance of C-12 to occur where it does. The philosophical and scientific implications of this have prompted much discussion.<sup>4</sup>*

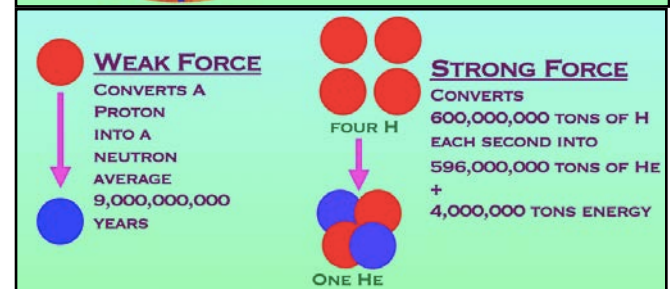
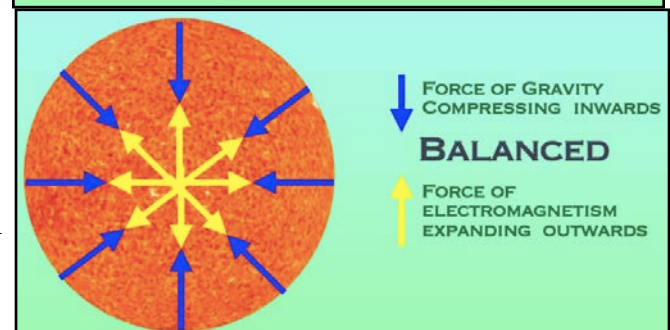
This brings us to the balance the four fundamental forces crucial to the functioning of our Sun, the provider of all the energy needed to supply our Earth. Their strengths vary across 36 orders of magnitude; two are short-ranged, two are long-ranged, yet they all work in harmony to provide a perfect balance for the functioning of our Sun.

The Sun, as you might imagine, is very hot at the core, and this heat expands the Sun. Gravity, on the other hand, tends to compress the Sun, so in the stable configuration, they balance each other.

The strong force unites hydrogen into helium, releasing plenty of energy. The rate is controlled, however, by the weak force, which has to convert protons into neutrons, which takes 9 billion years on average.

The balance between these two forces allows the Sun to remain stable in the ‘main sequence’ burning hydrogen slowly and steadily for billions of years.

Force	Relative Strength	Range
Strong nuclear force	1	nuclear
Electromagnetic	0.0073	infinite
Weak nuclear force	0.000,001	subnuclear
Gravity	0.000,000,000,000,000,000,000,000,001	infinite



<sup>4</sup> <http://large.stanford.edu/courses/2017/ph241/udit2/>



# Star Death

Eventually, all stars run out of fuel. Our Sun will end up making carbon from helium, but not get hot enough to burn carbon into heavier elements. It will settle in old age as a white dwarf with the mass of the Sun but the size of the Earth cooling slowly into darkness.

For larger stars, say 20 times the mass, the helium burning progresses through carbon, oxygen, neon, magnesium, sulfur and silicon fusion—generating less and less energy at each stage—until iron is formed. This is the dead-end point as no more energy can be extracted from rearranging nucleons. All the elements so crucial to life have been formed, but they are locked away in a massive star.

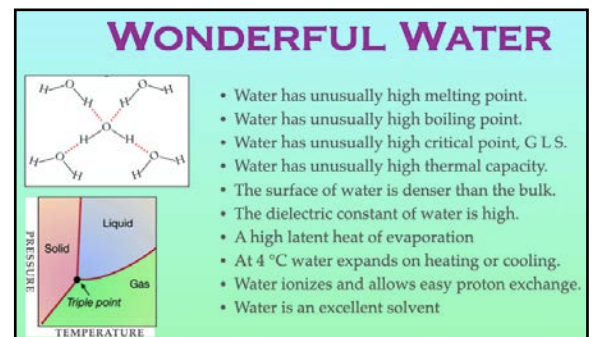
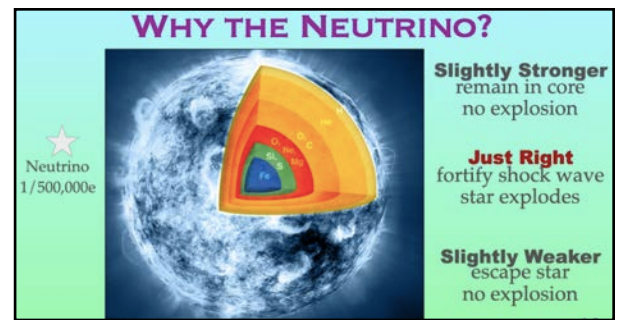
The production of energy in the core ends, and the gravitation contraction commences. Eventually, the core conditions become so extreme that electrons are forced to combine with protons into neutrons, and the core collapses into a massive nucleus with the mass of the Sun and size of Mt. Everest. The loss of support at the center, causes the remaining 19-suns worth of mass to plummet inwards. The rebound is a shock wave that explodes towards the surface.

This shock wave, pushing 19-suns worth of mass outwards, would stall if it were not for the immense number of neutrinos released by the core. These energize the shock wave which then explodes the star as a supernovae that temporarily outshines an entire galaxy of 100 billion stars.

*The core collapse phase is so dense and energetic that only neutrinos are able to escape. ... The two neutrino production mechanisms convert the gravitational potential energy of the collapse into a ten-second neutrino burst, releasing [a huge energy flux] ... Through a process that is not clearly understood, ... the energy released (in the form of neutrinos) is reabsorbed by the stalled shock wave, producing the supernova explosion. Neutrinos generated by a supernova were observed in the case of Supernova 1987A, leading astrophysicists to conclude that the core collapse picture is basically correct.<sup>5</sup>*

The life-essential elements are now freed, and dispersed for the next round of solar-system creation. Our Sun and solar system are 3<sup>rd</sup> generation, and have inherited the elements created by the 1<sup>st</sup> and 2<sup>nd</sup> generation of stars. All the carbon, oxygen, etc, that our bodies rely on are there thanks to the tiny neutrino!

*“The weak interaction has to be just right to allow enough neutrinos both to escape from the core and to interact with the shock wave.”<sup>6</sup>*

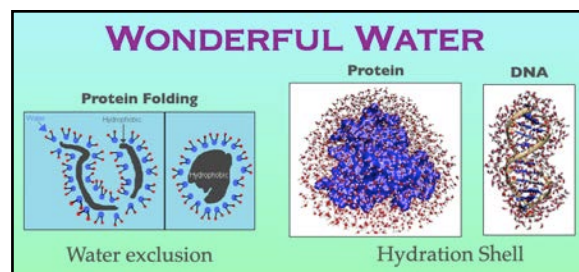


<sup>5</sup> [https://en.wikipedia.org/wiki/Type\\_II\\_supernova](https://en.wikipedia.org/wiki/Type_II_supernova)

<sup>6</sup> Gribbin, John. *Cosmic Coincidences* (2014) ReAnimus Press. p. 250

# Chemical Beneficence

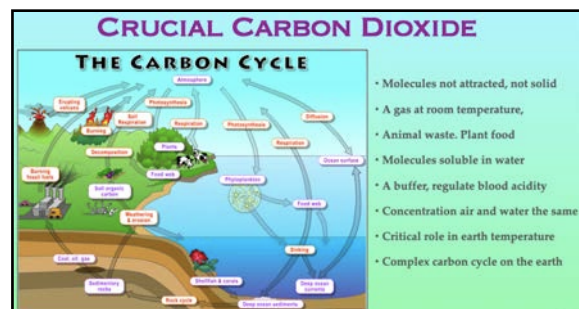
So far we have discussed the fine-tuned parameters of physics, and now we shall briefly venture into the realm of chemistry. The most important molecule, by far, for life is water. It has too many essential properties to list them all here.<sup>7</sup> Without water we have a lifeless desert, with just a little water, there is life.



*Water is the most important liquid for our existence and plays an essential role in physics, chemistry, biology and geoscience. What makes water unique is not only its importance but also the anomalous behavior of many of its macroscopic properties. The ability to form up to four hydrogen bonds (H-bonds), in addition to the non-directional interactions seen in simple liquids, leads to many unusual properties such as increased density on melting, decreased viscosity under pressure, density maximum at 4 °C, high surface tension and many more. If water would not behave in this unusual way it is most questionable if life could have developed on planet Earth.<sup>8</sup>*

The anomalous properties of water are numerous, and many are important to life. While some are of lesser consequence, a list of up to 70 properties have been published.<sup>9</sup>

Water is essential to biochemistry, the molecules of life. The driving force of water molecules seeking minimal energy hydrogen bonds, helps in the folding of linear amino acid chains into the active folded form, and the hydration shells of proteins and DNA that help maintain the active structures.



*How water relates to and interacts with those systems—like DNA, the building block of all living things—is of critical importance, ... a previously unknown characteristic of water. "DNA's chiral spine of hydration," ... is the first observation of a chiral water superstructure surrounding a biomolecule. In this case, the water structure follows the iconic helical structure of DNA.<sup>10</sup>*

The addition and subtraction of water molecules in cell metabolism is ubiquitous, and for plants, water serves as a source of the hydrogen needed to convert carbon dioxide into carbohydrates,

<sup>7</sup> <http://www.lsbu.ac.uk/water/index.html>

<sup>8</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4686860/>

<sup>9</sup> <http://www1.lsbu.ac.uk/water/anmlies.html>

<sup>10</sup> Cornell University. "Water forms 'spine of hydration' around DNA, group finds." ScienceDaily., 25 May 2017. <[www.sciencedaily.com/releases/2017/05/170525141530.htm](http://www.sciencedaily.com/releases/2017/05/170525141530.htm)>

liberating the oxygen do necessary to animals. It should be noted that the properties of carbon dioxide are only secondary to water in life's requirements.

Some of the important properties of carbon dioxide are:

- Molecules are not attracted to each other, so not a solid at room temperature
- A gas that is an animal waste product and nourishment for plants
- Molecules soluble in water
- Acts as a buffer, regulating the acidity of blood
- Concentration in air and water are equal
- Critical role in maintaining the temperature of the Earth
- Complex carbon cycle in air, water, soil, and deep mantle.



We will not deal with any of the other elements with properties essential to life—such as nitrogen, phosphorus, calcium, etc—as the point of being Just Right has been made.

## Explanations

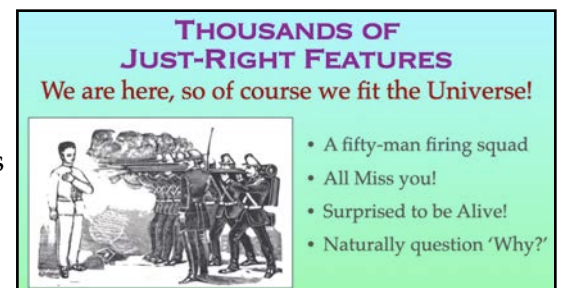
We have looked at just a few of the parameters that rule the universe. There are many, many more parameters that were established at the Big Bang, all set so that the resultant universe was Just Right for life and human beings. There are thousands of settings that have to be Just Right for life—and humans—to flourish. There are a variety of responses to this fact of the universe

Some would say—the Weak Anthropic Principle—that we are here, aren't we, so it has to be that way or we wouldn't be here to question the laws. Philosophy has dealt with this "so what" view of reality and its many, many parameter settings that are Just Right for life:

*The Canadian philosopher John Leslie has offered a neat analogy. Suppose you are facing execution by a fifty-man firing squad. The bullets are fired, and you find that all have missed their target. Had they not done so, you would not survive to ponder the matter. But, realizing you are alive, you would legitimately be perplexed and wonder why.<sup>11</sup>*

There are many, many parameters that have to be just right for life to exist. Just like the firing squad where just one on-target bullet would be fatal, if just one of these parameters was set wrong, there would be no life possible. So the question "Why?" is justified.

One fallacious idea is that the natural laws went through some sort of Darwinian variation until the correct ones were chanced upon. While a case can be made



<sup>11</sup> Gribbin, John. *Cosmic Coincidences* (pp. 267-268). ReAnimus Press.

of biological laws, the ones we have been examining are those of fundamental significance, and are not subject to variation and selection:

*The fundamental laws and constants of nature did not gradually evolve into the present life-supporting character through a process of natural selection, as is widely believed, instead they spontaneously came into existence with the origin of the universe itself, perfectly calibrated and ready for action.<sup>12</sup>*

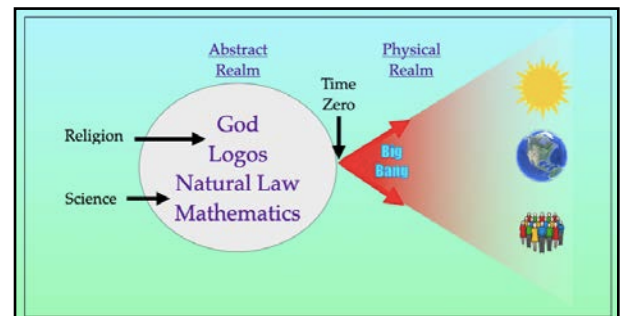
Unwilling to abandon Darwin, the variation and selection has been pushed back to pre-Big Bang times and the concept of many universes, each with a random set of laws and constants. Our universe just happens to be the one where they are all Just Right for life and for us to evolve.

**THE GREAT CHOICE**

1. Is the Universe Designed for Life?
  - The Plan of a Creator God
2. Is the Universe a Random Serendipity?
  - So many possibilities: Multiverse needs  $10^{500}$

This is the concept of the multiverse. As there are so many settings, and so many possibilities for each setting, there has to be a great deal of universes for even one of them to have the correct set of parameters.

A typical suggestion is that we are one of  $10^{500}$  universes, all of which are inherently unobservable by being not in our universe for examination. While 500 does not seem excessive, the powers of ten really add up, and the suggested number in the Multiverse it actually humongous. It is far, far larger than the  $10^{99}$  photons of light in the universe, the probability of winning fifty Powerball Jackpots in a row, of tossing 1,500 pennies and having every single one of them come up heads. A truly staggering number of universes.



The alternative is a lot simpler, and science and religion are already in partial agreement about it. Before anything substantial existed, all scientists agree that before the Big Bang the truths of mathematics existed. This is never explicitly stated, but all the atheistic multiverse theorists use mathematics in describing their theories.

The logic of mathematical proof is these truths could not possibly be any other way. It is impossible, for instance, for the square root of two to be a fraction. There was an Abstract Realm before the Big Bang in which mathematical truth existed. While science never explains exactly what a Natural Law is—that is for philosophers to debate—all science is based on the assumption that the world obeys these natural laws, and that it is a worthwhile endeavor to figure out what these abstract laws are.

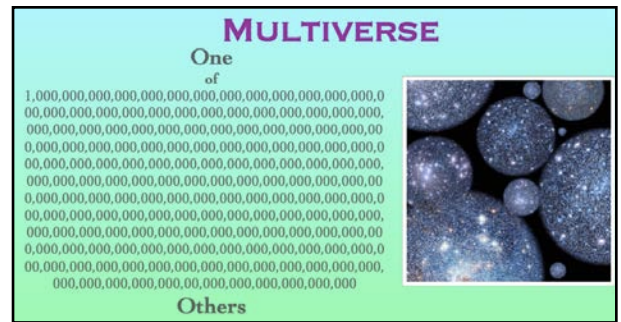
• **One God; One Universe**  
• **One of a multiverse of  $10^{500}$  universes**

**OCCAM'S RAZOR**  
A Parsimonious Shave Every Time!

When faced with **two opposing explanations** for the same set of evidence, our minds will naturally prefer the explanation that makes **the fewest assumptions**.

<sup>12</sup> M. A. Corey, *The God hypothesis: Discovering design in our 'just right' Goldilocks universe*, Rowan and Littlefield, 2001, p.11

Religion agrees that this Abstract Realm existed before the Big Bang, but goes much further by including an intelligent, abstract Creator who designed the laws and initiated the Big Bang.



This is the choice that science is now dealing with:

1. One well-crafted universe designed for life and the eventual emergence of humans.
2. A random assembly of zillions of universes, our one being accidentally just right for life and humans.

As neither God nor the putative other universes are available for direct, scientific study, there is nothing to inform our choice except the philosophical principle: sufficient and simple explanations are better than complicated ones with a plethora of assumptions.

*As we survey all the evidence, the thought insistently arises that some supernatural agency must be involved. Is it possible that suddenly without intending to we have stumbled upon scientific proof of the existence of a Supreme Being?<sup>13</sup>*

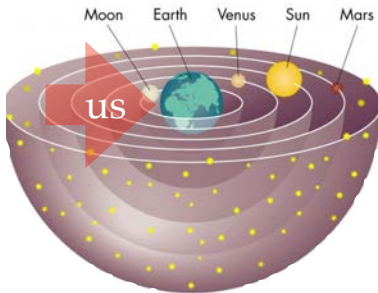
This is a controversial statement. Is it proof in the absolute mathematical sense, or in the relative jury sense of 'beyond reasonable doubt'?

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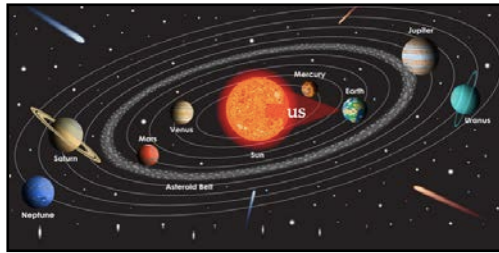
<sup>13</sup> George Greenstein (1988) *The symbiotic universe*, William Morrow p. 27

# SCIENCE IN THE REALM OF SPIRIT

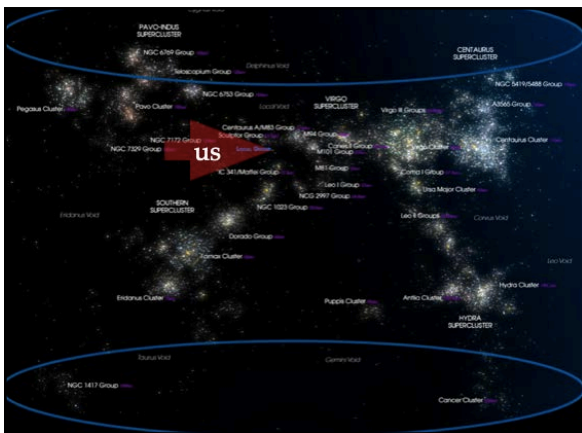
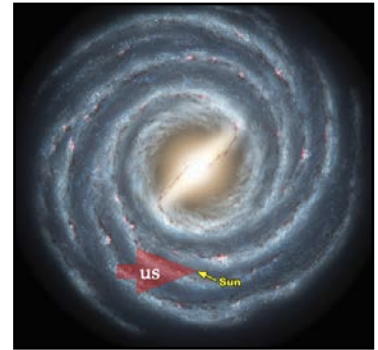
For the longest time, humanity’s intellectuals thought that the Earth was the main event at the center of all things, the Sun was there for illumination, the Moon to count time, and the planets and fixed stars in the furthest shell to foretell the future.



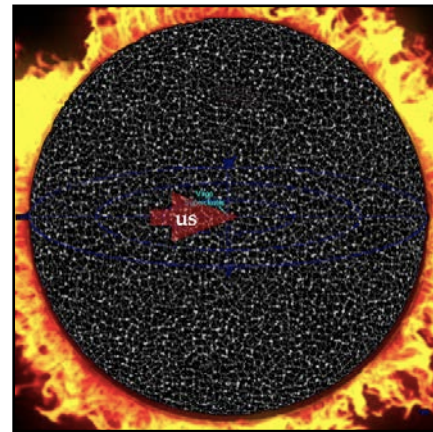
**EARTH CENTERED**



**SUN CENTERED**



**LANIAKEA**



**THE UNIVERSE**

This Ptolemaic view was reorganized by Copernicus who made an excellent case for the Sun being at the center, but other than that the Solar System was still paramount.

It was only in the 20<sup>th</sup> century that it became clear that the Solar System was a tiny part of a spiral galaxy of billions of suns that, to human eyes, looked like milk splashed in the heavens, hence the Milky Way. The Solar System was not at the center of the spiral—where a massive Black Hole reigns and is horribly hostile—but halfway to the periphery.

It did not take long before the astronomers found that our beloved home galaxy was just one of billions of others, and that our Local Group of galaxies inhabited the suburbs of the mighty Laniakea Supercluster of 100,000 galaxies.

Finally, with the discovery of the Cosmic Microwave Background, we found ourselves at the very center of the Visible Universe, a sphere with a radius of 13.5 billion light years. The CMB is the boundary, and is the wall of fire that emerged from the Big Bang, a blaze now faded into the microwave spectrum. Ptolemy, ignoring questions of scale, was correct in placing the Earth at the

center of the Universe. More correctly, putting humans at the center of the visible universe, for wherever you go in the universe, you will always be at the center of a 13.5 billion lightyear sphere.

That was the apogee of our sense of understanding the universe. The first sense that there was more going on came from understanding the two types of rotation. *Synchronous rotation*, exemplified by points on a vinyl record all rotating together. *Asynchronous rotation*, exemplified by the planets rotating about a central mass, the Sun, each having a different period of rotation—Mercury 88 days, and Neptune 165 years.

The Sun is the pivot for the asynchronous solar system, and it was expected that the Black Hole at the center of the Milky Way—with a mass of 4,000,000 Suns—would be the pivot for an asynchronous rotation of the galaxy. This expectation was incorrect, the galaxy is more synchronous than asynchronous, and without enough mass to hold it together.

*Dark matter was first hypothesized in order to account for the rotation of galaxies, which didn't seem to have enough conventional matter to keep them from flying apart like a smoothie in a lidless blender.<sup>1</sup>*

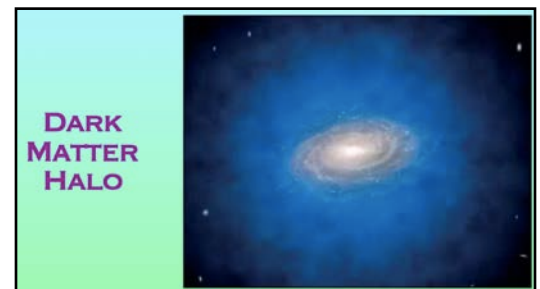
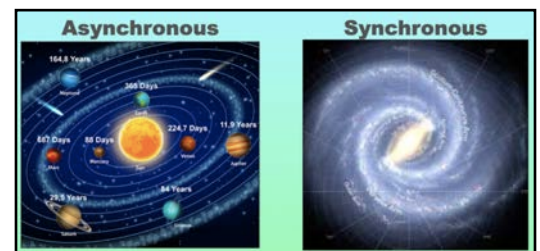
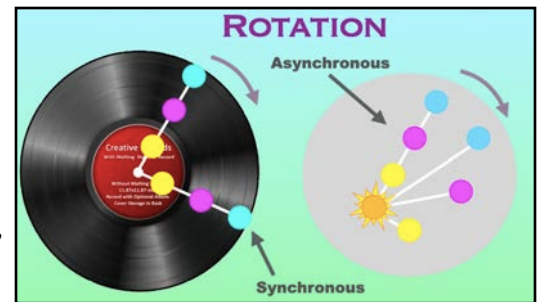
The explanation for this, and for many other puzzlements, was that the galaxy is imbedded in a vast and massive halo of stuff, called Dark Matter—because we could not see it and still do not know what this stuff is—that is rotating and carrying the galaxy along with it.

Measurements have shown that Dark Matter is ubiquitous, and that there is five times as much of it as there is regular matter in the universe. Science went from the hubristic sense of knowing it all to a humble admission that 80% of the universe was a known unknown. The indignity did not stop there.

The huge amount of matter—regular and dark—that emerged from the hot Big Bang had an enormous gravitational pull that was opposing the expansion of the universe. It was generally assumed, naturally, that the expansion of the universe was decelerating, it was getting slower. There was even a possibility that the expansion would stop, and that the universe would then start contracting and end up in a Big Crunch.

With this potential doomsday in mind, scientists started a series of observations to measure the rate of deceleration.

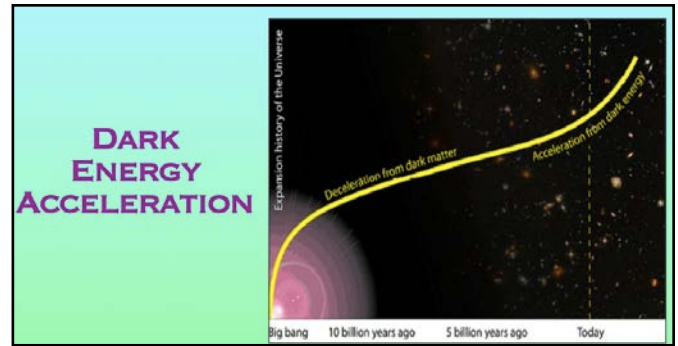
*Then came 1998 and the Hubble Space Telescope (HST) observations of very distant supernovae that showed that, a long time ago, the universe was actually expanding more slowly than it is today.*



<sup>1</sup> <https://www.space.com/39577-rotating-galaxy-group-raises-questions.html>

*So the expansion of the universe has not been slowing due to gravity, as everyone thought, it has been accelerating.<sup>2</sup>*

The results were unexpected: for the first 8 billion years or so, the expansion was decelerating as expected. But about 5 billion years ago—coincidentally about the time the Earth and Sun were forming—the deceleration turned into an acceleration and the expansion started speeding up.



Whatever the cause—and no one has yet come up with a convincing explanation—it was powerful enough to, not only overcome the inward gravitation of all the matter, but surpass it with an outward energetic push. This anti-gravitational vigor is called Dark Energy, and there is 250% more of this anti-gravitational energy than all the gravitating matter in the universe. Another known unknown, and a further blow to science’s claim to omniscience. Currently, the score is:

- 71.4% Dark Energy**
- 24% Dark Matter**
- 4.6% Regular Matter**

There are many explanations circulating in the science world, we shall explore one here that has the advantage of being compatible both in the science realm and in the religious realm.

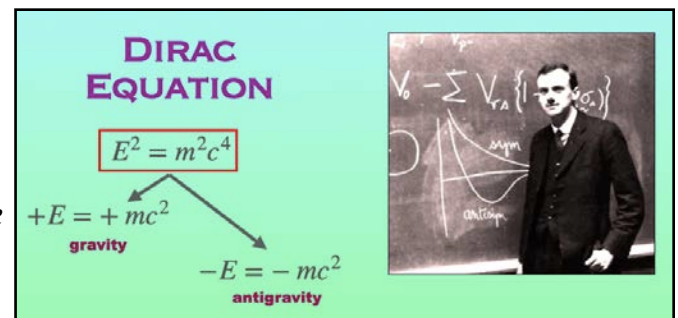
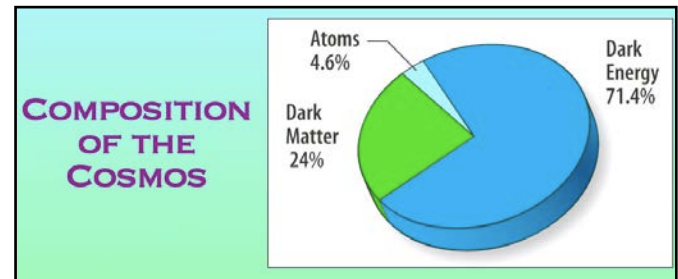
## Another Realm

A clue to what this anti-gravitational energy might be was uncovered by Dr. Dirac, a quantum pioneer, in his effort to unite quantum physics with relativity.

He came up with an equation that had two solutions. One was the familiar Einstein relation of mass and energy. The other was similar, but introduced the concept of negative energy and negative mass.

When antimatter was discovered, it was thought that Dirac had predicted it with his negative solution. This is a mistake, however, because antimatter is as much gravitating positive mass as is regular matter. When matter and antimatter combine, they do not neutralize each other but convert into a burst of positive energy. When an electron with 0.5 MeV mass meets a positron with 0.5 MeV mass they annihilate into photons with 1 MeV of energy.

*Dirac’s equation calls for both positive and negative energy... negative energy would merely be a vibration of charges at right angles to ordinary*



<sup>2</sup> <https://science.nasa.gov/astrophysics/focus-areas/what-is-dark-energy>



*dimensions in an imaginary direction.*<sup>3</sup>

Exploring the concept of negative mass-energy, theoreticians came up with the concept of Tachyons. Tachyons are distinguished from regular matter—the tardyons—by the following properties;

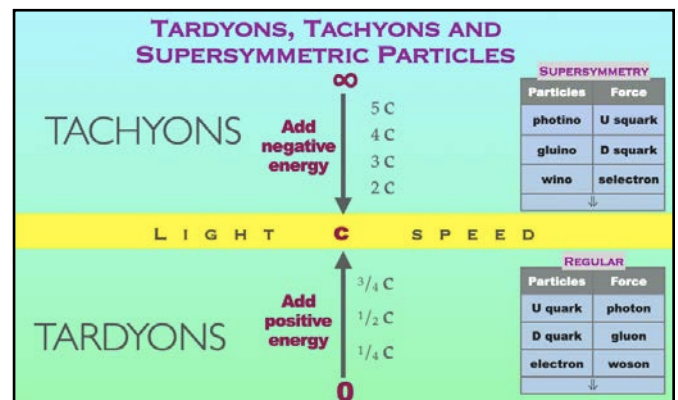
- Tardyons have positive mass-energy . ▶ Tachyons have negative mass-energy
- For tardyons, the speed of light is an upper limit which can be approached asymptotically, but never reached. ▶ For tachyons. the speed of light is a lower limit which can be approached asymptotically, but never reached.
- Adding positive energy to a tardyon increased its speed ▶ Adding negative energy to a tachyon decreased its speed
- For tardyons, the lowest speed is asymptotically Absolute Zero ▶ for tachyons the lowest speed is asymptotically the speed of light.
- For tardyons, the never-to-be-reached upper limit is light speed ▶ for tachyons, the never-to-be-reached upper limit is infinite.

*You can now deduce many interesting properties of tachyons. For example, they accelerate... if they lose energy.... Furthermore, a zero-energy tachyon is "transcendent", or moves infinitely fast. This has profound consequences.... the problem is that we can get spontaneous creation of tachyon-anti-tachyon pairs, then do a runaway reaction, making the vacuum unstable.*<sup>4</sup>

We will discuss this instability problem shortly. Just as the tardyons in the physical world are of different varieties, we might expect that the tachyons also have varieties. There is a powerful area of math called group theory that has great success in predicting and organizing the particle zoo of the last century. One aspect of this discipline, called supersymmetry, SUSY predicts that all the fundamental particles in the physical world, have a super symmetric partner.

*The big idea of SUSY is that there could be an additional symmetry present — between fermions and bosons — that similarly protects the properties of matter and enables the particle masses to be so small ...Sure, you have to double the number of known fundamental particles, creating a super-partner particle counterpart (a super-fermion for each Standard Model boson; a super-boson for each Standard Model fermion) for every one that's known.*<sup>5</sup>

There are two problems: 1) If tachyons were to zip through our physical universe, like a speedboat on a lake, it would leave a wake of evidence that would be unmistakable, let alone going back in time. 2) For all



<sup>3</sup> [https://ethw.org/w/images/7/72/PVB\\_Dirac%27s-sea-of-negative-energy-%28part\\_2%29.pdf](https://ethw.org/w/images/7/72/PVB_Dirac%27s-sea-of-negative-energy-%28part_2%29.pdf)

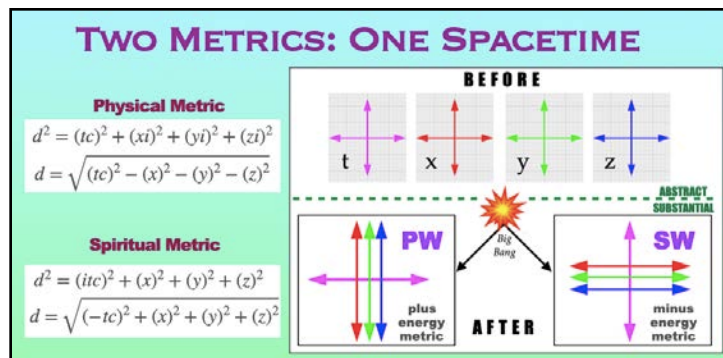
<sup>4</sup> <http://math.ucr.edu/home/baez/physics/ParticleAndNuclear/tachyons.html>

<sup>5</sup> <https://www.forbes.com/sites/startswithabang/2019/02/12/why-supersymmetry-may-be-the-greatest-failed-prediction-in-particle-physics-history/#14bdb45869e6>

the efforts of experimentalists, not a single one of this mirror image particles has been found in the physical universe.

If, however, tachyon super-symmetrical particles were of negative energy on the other side of spacetime, this absence would make sense.

As these phenomena have not been encountered, the question is are there aspects of the cosmos in which tachyons could exist without disturbing the natural order observed in the physical realm. We can suggest a solution. Modern science uses measurements which unify linear extension and angular rotation in *complex numbers*. The complex plane, a complex dimension, has two rectangular components: A *real* axis, which corresponds to the ordinary numbers, and the axis rotated by 90° called the *imaginary* axis. Measurements of spacetime use a metric with one real component, called temporal, and three imaginary axis, called spatial (at first, this metric was reversed until it was realized that the difference between plus and minus time was real, while plus and minus space was relative). There is little discussion about the fate of the missing components.



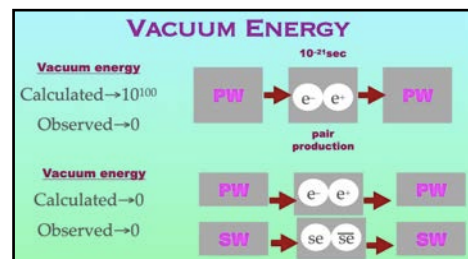
We can imagine, however, that the Creator took four complex dimensions with its eight components. He assigned four—one real and three imaginary—as the metric of the physical world, and assigned the remaining three real and one imaginary as the metric for the spirit world. As the square of an extension on the imaginary axis is a minus extension, the Pythagorean relations of separation in the two metrics are complimentary.

We have a complex spacetime in which the metric of the physical world is on one side, and the metric of the spirit world is on the other. (Note: there is no proof of this, it is just a suggestion.) If the negative energy tachyons are zipping along in the SW metric, they would not be expected to generate physical phenomena.

Postulating a four-dimensional complex spacetime with two complementary metrics provides a solution to one of the unsolved puzzles of quantum mechanics. In this well-tested theory, the empty vacuum has a tendency to transform into a pair production—say an electron-positron pair, a proton-antiproton pair, etc—and then transform back to empty vacuum.

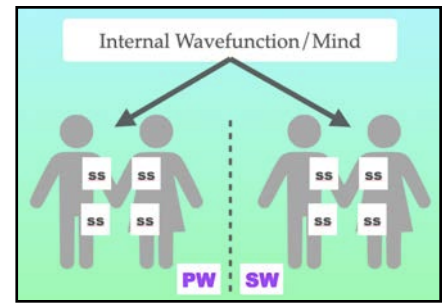
This creation of positive mass is so brief that it does not amount to a Planck's Constant, the scientific measure of existence. Therefore, they are not *real* and are called *virtual* particles. For a brief moment—on the order of a billion, trillionth of a second—there is extra mass-energy in the vacuum. A volume of the vacuum—e.g. a cubic millimeter—will have a small probability of having this extra energy in it. A cubic kilometer of vacuum— $10^{27}$  mm<sup>3</sup>—will on average contain 10,000 particle pairs of mass-energy.

A problem arises as there are a huge number of cubic kilometers in the universe, and all this virtual mass-energy adds up. Quantum



theory suggests that the energy density of the universe should be on the order of  $10^{100}$ ; but it is observed to have a zero energy density. This is a huge disparity between theory and observation.

With the proposed 2-sided 4-D complex dimensions, a solution would be that spacetime has a tendency to transform into a pair with positive energy as well as pair with negative energy. In this, the plus and minus neutralize and the calculated energy and observed energy match up.



As discussed in an earlier essay (available on request to [RICHARDDLLL@MAC.COM](mailto:RICHARDDLLL@MAC.COM)), it is the internal wavefunction-mind that organizes interacting physical subsystems into a unified system with emergent properties derived from the Logos-natural law.

*Those who have had spiritual experiences testify that the incorporeal world appears as real as the world in which we live. The incorporeal and corporeal worlds together form the cosmos.<sup>6</sup>*

The experience of both worlds is simple and familiar. An example is recorded in *Life in the World Unseen* as communicated to an earthly resident:

*We resumed our walk, and my friend said he would like to take me to visit a man who lived in a house which we were now approaching. We walked through some artistically laid out gardens, crossed a well-turfed lawn, and came upon a man seated at the outskirts of a large orchard. As we drew near he rose to meet us. My friend and he greeted one another in the most cordial fashion, and I was introduced as a new arrival.<sup>7</sup>*



The wavefunction-mind, being abstract, can equally organize the subsystems of the spirit realm into unified systems. From all accounts, the experience in the SW is similar to that in the PW.

*“If there is a parallel tachyonic universe, all velocities within that universe would be seen by us as greater than  $c$ , but would be seen as less than  $c$  by the inhabitants of that universe. Conversely, to the inhabitants of that universe, all velocities within our world would appear to be tachyonic.”<sup>8</sup>*

Support this concept of a spirit realm composed of negative energy, we can look at the teachings of the many religions inspired by God, where the altruistic outward flow of energy is promoted for spiritual elevation, for spiritual life; while the inward flow of selfish gain is admonished as leading to spiritual decline, to spiritual death.

The human physical body on Earth is a result of genetics, while the human spiritual body, reflecting the personality, is generated by life in the PW, a product of human



<sup>6</sup> Exposition of the Divine Principle, p. 53

<sup>7</sup> <http://www.ghostcircle.com/wp-content/uploads/2014/08/Anthony-Borgia-Life-In-The-World-Unseen.pdf>, p. 17

<sup>8</sup> Oleksa-Myron Bilaniuk, Journal of Physics: Conference Series 196 (2009) 012021

responsibility.

We conclude with the thought that modern science would be quite comfortable with a spirit realm:

- If it is 72% of the Cosmos
- If it has an antigravity effect
- If is composed of negative energy tachyons
- If it structured with supersymmetric entities
- If it inhabits the complementary metric
- If the wavefunction/mind organizes spirit-body subsystems.

# PRINCIPLED EVOLUTION

Many scientists in the physical sciences, as discussed in the earlier *Designed Universe*<sup>1</sup> presentation, are coming to accept the concept of an Intelligent Creator, convinced by the fine tuning of the fundamental forces and constants that allow for life to exist at all. The biological sciences, while dealing with the extravagance of life's burgeoning fecundity, have resisted this concept, and still cling to the contingent Darwinistic concept of random variation followed by natural selection.

In this essay, we will compare Darwin's concept with the one presented by *Unification Thought* where the Intelligent Creator's Logos is progressively expressed over time.

While Darwinists accept that the basic realms of physics, chemistry and biochemistry are ruled by Natural Law, the Origin of Life and the subsequent evolution of Life's complexity is not, in Darwinism it is ruled by random contingency.

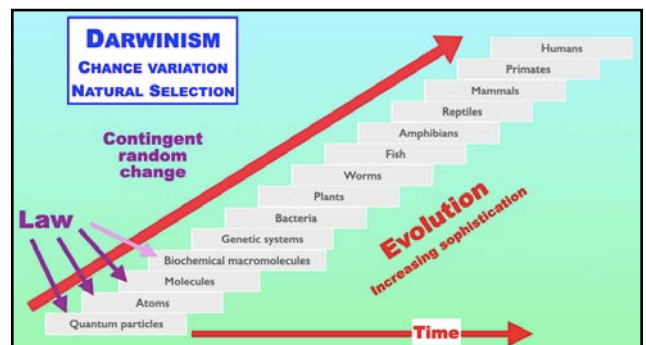
*The question of evolution's predictability was notably raised by the late paleontologist Stephen Jay Gould, who advocated the view that evolution is contingent and unrepeatable in his 1989 book Wonderful Life. "Replay the tape a million times ... and I doubt that anything like Homo sapiens would ever evolve again."*<sup>2</sup>

A specific example is that when the monomers of proteins and nucleic acids are chemically synthesized in the laboratory they are racemic—they are equal amounts of right- and left-handed molecules.

The fact is that all Earth's living systems are not racemic—all proteins are assembled from left-handed amino acids, while all nucleic acids are assembled from right-handed nucleotides. Gould's contingency suggests this was a contingent accident: life was not destined to be L-R, it could have been R-L, L-L, or R-R.

*Unification Thought* takes a different view. The Logos is hierarchical natural law that works on every level, from atoms to human. As discussed in an earlier presentation, all the sophisticated entities that emerge over time are in an abstract form in the Logos.<sup>3</sup> The Logos was generated by God before the Big Bang in which all the creative work was completed. The physical world was to develop under the direction of the Logos, and only this, during the indirect dominion of God.

*Unification Thought* suggests that if the tape of life's evolution was to be run again—such as on another planet—the result would be the same in fundamentals—proteins would all be L and DNA



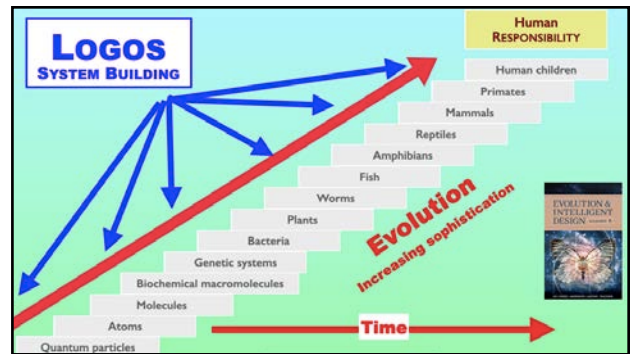
<sup>1</sup> YUM# *Designed Universe*: available on request to: RICHARDLLL@MAC.COM

<sup>2</sup> <https://www.sciencedaily.com/releases/2018/11/181108142323.htm>

<sup>3</sup> YUM#1 *Logos and Law*: available on request to: RICHARDLLL@MAC.COM

would all be R. The organisms could be as different as dinosaurs, lizards and birds are, but the fundamentals would be identical.

*Unification Thought* also states that the Logos only gets evolution as far as the human teenager: there is an extra portion of human responsibility to complete before we become the Children of God. This would be the Direct Dominion of God’s love.



The discipline known as Intelligent Design generates an excellent critique of the contingent accidental aspects of Darwinism and a strong case for a creative input along the course of evolution.

*Are life and the universe a mindless accident—the blind outworking of laws governing cosmic, chemical, and biological evolution? That’s the official story many of us were taught somewhere along the way. But what does the science actually say? Drawing on recent discoveries in astronomy, cosmology, chemistry, biology, and paleontology, Evolution and Intelligent Design in a Nutshell shows how the latest scientific evidence suggests a very different story.*<sup>4</sup>

Unfortunately, the discipline fails to suggest a way that this creative input arrives from God in the world in a scientifically acceptable manner. *Unification Thought* does not have this disadvantage and can supplement Intelligent Design with a scientifically acceptable mechanism.

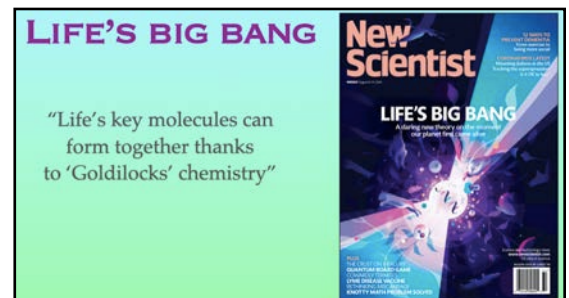
## Origin of Life

The Origin of Life has been disputed since Darwin suggested in a letter to J. D. Hooker in February 1871:

*“But if (and oh what a big if) we could conceive in some warm little pond with all sorts of ammonia and phosphoric salts, light, heat, electricity etcetera present, that a protein compound was chemically formed, ready to undergo still more complex changes...”*<sup>5</sup>

Many suggestions have arisen since to explain how life emerged:

*Most are based on the assumption that cells are too complex to have formed all at once, so life must have started with just one component that survived and somehow created the others around it. When put into practice in the lab, however, these ideas don’t produce anything particularly lifelike. It is, some researchers are starting to realize, like trying to build a car by making a chassis and hoping that wheels and an engine will*



<sup>4</sup> *Evolution and Intelligent Design in a Nutshell* (2020) Thomas Lo, Paul Chien, Eric Anderson, Robert Alston, Robert Waltzer; Discovery Institute, Seattle WA

<sup>5</sup> <https://www.darwinproject.ac.uk/letter/DCP-LETT-7471.xml>

spontaneously appear.<sup>6</sup>

In what can only be described as a revolutionary concept to emerge in the scientific press, the suggestion has emerged that:

*[The] team found that the same starting chemicals can also make the precursors of amino acids and lipids. All the cellular subsystem could have arisen through common chemistry, [they] concluded. The key is [called] 'Goldilocks chemistry': a mixture with enough variety for complete reactions to occur but not so much that it becomes a jumbled mess."<sup>7</sup>*

What is clear from the evidence, however, is that simple bacterial life was established in less than a million years after the molten Earth had cooled and that an ocean could be established.

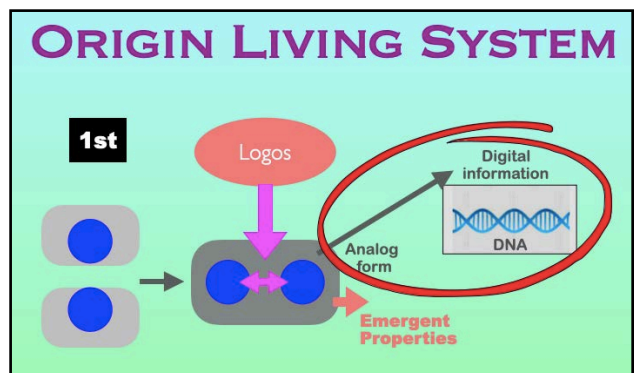
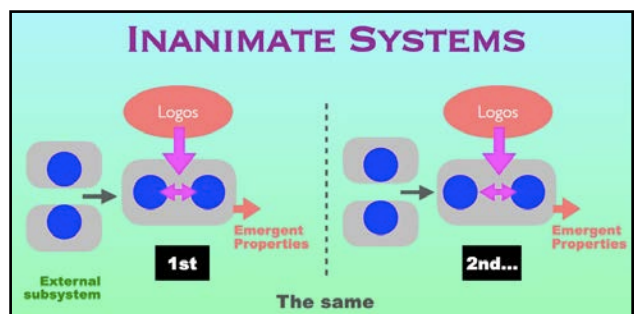
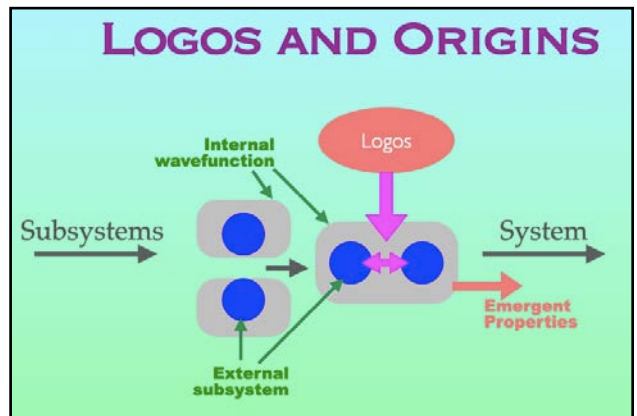
While the origin of life is still a subject of intensive debate, its rapid emergence is in total agreement with the concept of the Logos acting on the internal wavefunction aspect of matter to make the combinations highly probable.

## Systematic Origins

As discussed in an earlier presentation<sup>8</sup>, in modern science all physical entities have an intangible internal aspect as well as a tangible external aspect. For simple systems, such as atoms, the internal is called the wavefunction and the external is called the particle; for sophisticated systems, their names are mind and body.

The wavefunction determines the probability of coupling externally in an interaction, while interaction changes the wavefunction. The Logos (natural law) works directly to determine the wavefunction, and how it changes in an interaction. When subsystems interact to form a higher system their wavefunctions merge becoming the new system's wavefunction, along with a set of emergent properties from the Logos expressed.

The Universe just after the Big Bang was so hot that stable hydrogen atoms were impossible. Later, when the Universe had cooled by expansion, there were plenty of hydrogen atoms. Logically, there must have been the very first stable hydrogen atom in the Universe.



<sup>6</sup> Michael Marshall, *Life's Big Bang*, New Scientist, August 6, 2020, p. 31.

<sup>7</sup> Michael Marshall, *Life's Big Bang*, New Scientist, August 8, 2020, p. 37.

<sup>8</sup> YUM#2 *The Wavefunction*: available on request to: RICHARDLLL@MAC.COM

It is unheralded, however, as the zillions that followed originated in the same way. The 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> etc atoms all appeared in the same way, with natural law directing their origins.

The origin of the first of a living system is qualitatively the same as for inanimate systems: the Logos is directly involved in the new analog form taken up by the interacting subsystems. The great difference is that the information about this new analog form is recorded digitally in DNA, new information is written to DNA.<sup>9</sup> This 'writing to DNA' is anathema to the Fundamental Dogma of Darwinist Genetics where there is no writing of information, just reading of information that can only be altered by accident.

## Digital information, Analog Form

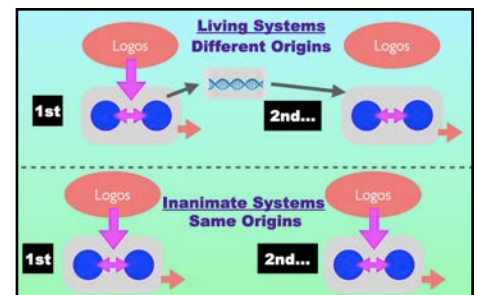
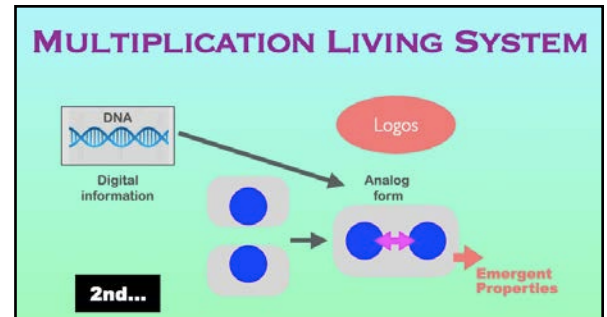
There is a relationship in nature that is found only in living organisms, that of Digital Information and Analog Form. In order to understand this duality in living systems, we will look at this well-established duality in computer science. First we will consider the great similarities between the two. Then we will look at the major difference between them.

In Darwin's day, there was no understanding of how a simple seed or egg could develop over time and transform into a mature organism such as a tree or a chicken. So there was no understanding of why offspring reflected their parents, or why there was variation between siblings.

It is the stored digital information, not the direct action of the Logos, that brings the subsystems together in the 2<sup>nd</sup>, 3<sup>rd</sup>, etc., generations. The resultant analog form resembles the form in the Logos, so the same emergent properties are present.

We find a qualitative difference between non-living systems—where the origin of every system directly involves the Logos—and living systems where the Logos is directly involved in the origin of the very first, but not in the subsequent generations where digital information plays a direct role.

Condensing a long history of exploration, scientists found that all the analog qualities—such as blue eyes— that were passed down a lineage (technically: the phenotype) were encoded as digital information encoded in the DNA content of chromosomes (the genotype). There are also analog qualities passed down a lineage that, while managed by DNA information, cannot be created de novo. Examples are the bi-lipid membrane, the ribosome and the centrosome. But it is digital information that must be decoded into analog form that is, by far, the most important aspect of inheritance.



<sup>9</sup> It is thought that in the beginning of life, it was RNA that was the information store. This is a minor point as DNA is waterproofed RNA, a few dabs of hydrophobic oil added to one of the bases, and the backbone stripped of hydrophilic hydroxyl groups.



The relation between digital information and analog form was unknown in Darwin's day, Now, however, we are in the Age of Computers, where the connection between these two is familiar.

We will start by noting the similarities between digital information manipulation in living and computer systems and conclude with the glaring difference in current thinking.

## Living and Computer systems

The flow, manipulation and decoding of digital information in the cell is similar to that in a computer. So we can use the insights of computer science to help us understand the vastly more sophisticated living systems. In computer systems, the digital information is stored in a binary code of complementary bits 0-1 whose most basic manipulation is NOT, where NOT 0 = 1 and NOT 1 = 0. The manipulation involves sets of 8 bits, called a byte. The external form of these can be magnetic poles, pits in aluminum, holes in paper type, radio waves, sound waves, etc., but the digital information is the same.

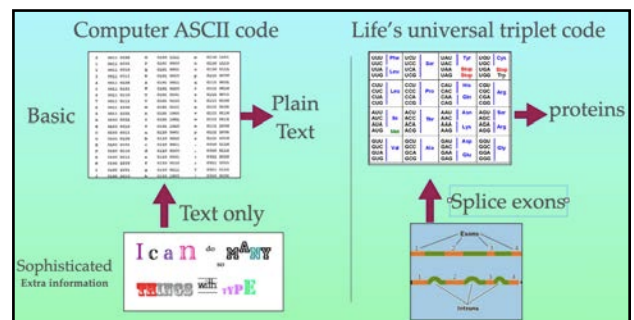
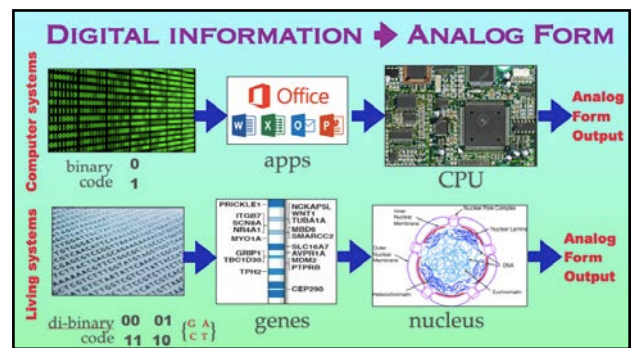
In living systems, the digital information is stored in a di-binary code, the two pairs of complementary 00-11 and 01-10 whose most basic manipulation is NOT, where NOT 00 = 11 and NOT 10 = 01 and vice versa. In genetics, the NOT form of a nucleic acid is called its complement. The manipulation involves dibits in sets of three, called triplets. The external form of these can be the chemical bases, guanine-cytosine (G-C) and, adenine-thymine / uracil (A-T/U) in DNA, mRNA, tRNA, etc., but the digital information is the same.

In computer systems, digital information is organized into *Apps* that perform a variety of tasks when called into action. The app is processed on the Central Processing Unit (CPU) which manipulates a variety of inputs and outputs an analog form, such as this article, a Netflix movie or a Beatle's song.

A similar situation occurs in living systems, where the digital information is organized into *Genes* that perform a variety of tasks when called into action. The gene is processed by the RNA-protein matrix of the nucleus (the cell's CPU) which manipulates a variety of inputs and sends an output to a ribosome which decodes it into a protein with a particular analog activity. A simple example is the **SDY** gene on the male Y chromosome. A few weeks into fetal development, the gene is activated for about an hour, generating a protein that starts processes

that cause a fetus to develop male gonads

I c a n d o s o M A N Y T H I N G s w i t h T Y P E .



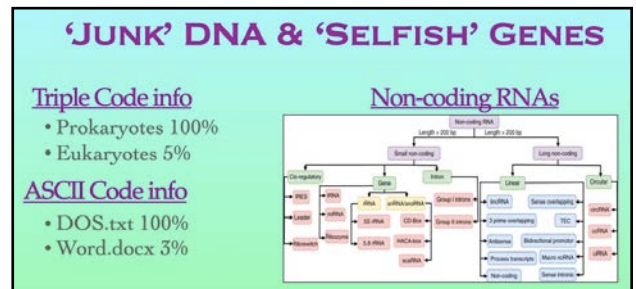
(testes) and prevent the development of female reproductive structures (uterus and fallopian tubes). The gene is never called upon again.

In early computer systems, such as the Apple II, the digital information was processed one byte at a time. The digital information was almost all in the ASCII code which assigned a particular byte to a particular alphanumeric character. Examples being: A = 01000001, B=01000010. The output was a stream of text sent to a printer having just one font, usually Courier.

The analog output of early computers looked like this.

In the simple, earliest forms of life, such as the bacteria, the digital information is also almost all in the Triplet Code which assigns a particular triplet to an amino acid. Examples: Glycine = GGU, Arginine=AGG. The information is passed directly to a ribosome for translation into an array of amino acids, which folds into a protein with an analog task to perform.

An example is the protein enzyme, catalase a common enzyme found in nearly all living organisms exposed to oxygen (such as bacteria, plants, and animals). It catalyzes the decomposition of hydrogen peroxide to water and oxygen. One catalase molecule can convert millions of hydrogen peroxide molecules to water and oxygen each second.



The modern MacBook Air I am writing on is a 64-bit computer, manipulating 8 bytes at a time. In this document the ASCII code is still in use by one of the eight bytes, but the other seven contain extra information in a different code allowing typographical idiocy such as:

I can strip away all that extra information, however, by choosing *Text Only* and the output is "I can do so many things with type."

In sophisticated living systems, eukaryotes such as humans and spinach, genes still contain islands of Triplet Code information, called Exons, surround by digital information in a different code, called Introns. Just like the *Text Only* command, the intron RNAs are excised and the exons RNAs spliced together for export for translation to protein by a ribosome. The intron RNA snippets join the dozens of different kinds of RNA at work in the nuclear matrix contributing, in an unknown way, to the functioning of the cell's CPU.

In the early days of genetics when only the simple and direct methods used in bacteria were understood, all the non-coding DNA that was not translated into protein was labeled as "Junk DNA" and genes that had no known function were labelled as "selfish" as their only purpose seemed to be propagating themselves.

Nowadays, the situation has radically changed. It is now understood that dozens of types of non-coding RNAs are transcribed from DNA to run the workings of the nucleus, the CPU for digital information. The RNAs can work directly with simple enzymatic activities (ribozymes) such as splicing exons. Or the RNA complex can order up proteins which are transported back to the nucleus with direct or assistant activities to the RNA complex activities.

Only 5% of the digital information on DNA codes for proteins, the rest is command and control functions that are now coming to light. This is similar to a sophisticated MS Word document where only 3% of the digital information is ASCII code.

## Reading and Writing

So far, we have illustrated the similarities between living and computer systems where the management of digital information is concerned. Now to discuss the great difference.

The combination of Darwinism and Genetics is called the Modern Synthesis. Its fundamental dogma is that information flow is one-way: DNA to RNA to Protein. This is where the Modern Synthesis departs from computer science.

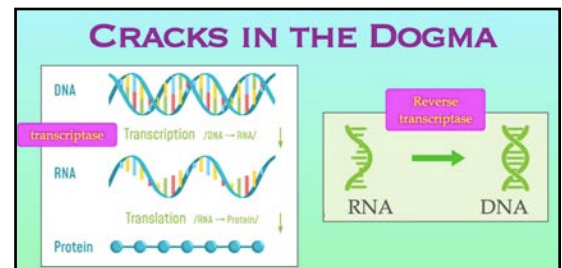
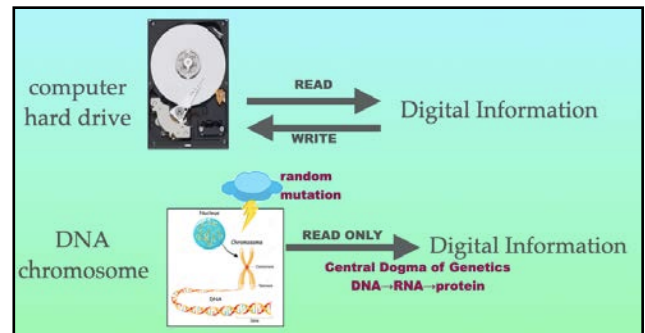
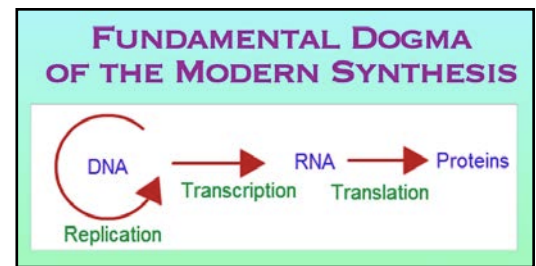
We take it for granted, that the Hard Drive, where the computer stores its digital information, allows for us to Read information from the disk, as well as Write information. Every time we buy a new app, it is written to the hard drive until we need it.

The fundamental dogma of the Modern Synthesis is that DNA—the hard drive storage for the cell—is Read-Only, from digital DNA to analog form. In this view, there is no *Write to DNA* function. The only way the digital information stored in DNA can alter is by random chance-and-accident mutation along with errors in duplication. This is the central dogma of genetics: Information flows from DNA to RNA to Proteins to Analog Form in the cell. DNA digital Information is accumulated over time by random alterations, and the accidental analog forms it generates are selected for usefulness in survival and reproduction.

This is as weird as if Bill Gates explained how they created *Microsoft Windows*: “We subjected hard drives to X-rays and hammer blows. The random bits generated were then tested for usefulness in running a PC.” (Some at Apple still believe this rumor.)

As any computer programmer will assert: dogma or not, this is no way to write useful digital information. This Read-only dogma remained unchallenged until work with RNA viruses uncovered enzymes that could copy RNA onto DNA, the enzyme Reverse Transcriptase.

Most unexpectedly, the human genome was found to have ~600 reverse-transcriptase-like genes. These are currently considered remnants of RNA-viral infections in the pre-human lineage and, along with introns and other non-coding DNAs consigned to Selfish status. Some genes, like an esoteric app, are only needed



### LAMARCKISM

<p><b>Darwin:</b> Random chance Accidental genetic mutation</p>	<p><b>Who is Darwin and Lamarck?</b></p> <ul style="list-style-type: none"> <li>• Charles Darwin: Feb. 1809-April 1882</li> <li>• English Naturalist</li> <li>• Published his theory of evolution in his book <i>On the Origin of Species</i></li> <li>• Remembered for his theory of evolution called natural selection</li> </ul>
vs	<p><b>Jean-Baptiste Lamarck:</b> Aug. 1744-Dec. 1829</p> <ul style="list-style-type: none"> <li>• French Naturalist</li> <li>• Provided the first truly cohesive theory of evolution</li> <li>• Remembered for his use/disuse theory of evolution</li> </ul>

**Lamarck:**  
Learning mechanism  
Inherited wisdom ancestors

SEEKING  
**LAMARCK'S REVENGE**

occasionally, as illustrated by the *Sex Determining Gene* on the Y-chromosome which is only active in a fetus for an hour, and never again, yet its momentary transcription sends the fetus down the development path to male rather than the default female.

This was the first crack in the Read-only dogma. The next was the currently emerging science of Epigenetics stimulating the contemporary revival of Lamarckism.

Back in the mid-1800s, a major competitor to Darwin's view of random variation was Lamarck's idea of the inheritance of acquired characteristics. The key idea was that learnt wisdom about how to deal with the challenges of thriving in the current environment could be passed onto offspring. Basically, two competing ideas: random mutation or learnt wisdom.

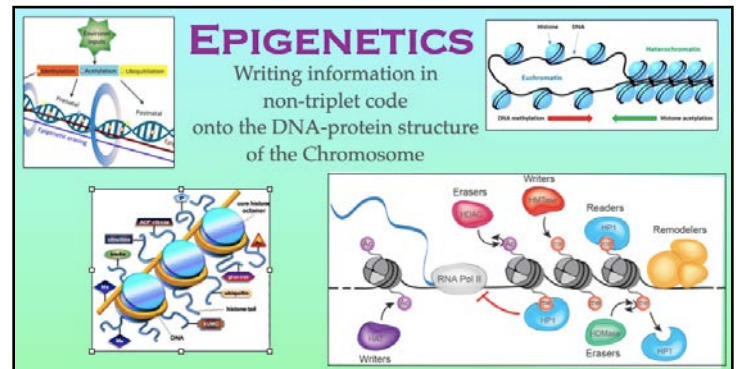
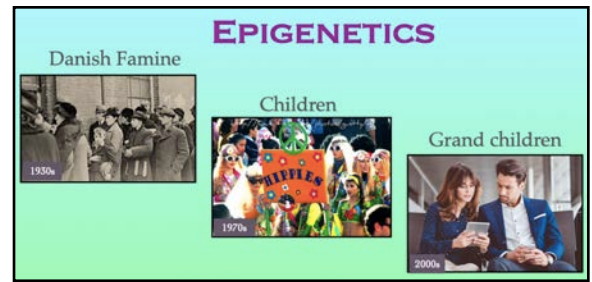
Lamarckism fell out of favor due, to my mind, a stupid experiment of cutting the tails off of mice for generations, and noting that they learnt nothing to pass on down their lineage.

Lamarck's basic idea reemerged in 2013 when researchers recorded effects on the grandchildren of survivors of a dreadful famine, the Nazi 'Dutch Hunger Winter' in which more than 20,000 people died of starvation.

*Because of the excellent health-care infrastructure and record-keeping in the Netherlands, epidemiologists have been able to follow the long-term effects of the famine. Their findings were completely unexpected.... some of these effects seem to be present in ... the grandchildren of the women who were malnourished during the first three months of their pregnancy. So something that happened in one pregnant population affected their children's children. That raised the really puzzling question of how those effects were passed on to subsequent generations.<sup>10</sup>*

Such findings initiated the new science of Epigenetics. This new science, still in its infancy, is researching the ways that gene expression can be altered in ways that can pass down the generations.

*Although the discipline of epigenetics is only decades old, it is already intimating that the random chance and accident mechanism driving evolutionary change in Darwinism will one day be replaced by the learning mechanisms postulated by Lamarck. Such insights are [epigenetically] passed down a lineage as ancestral*



<sup>10</sup> <http://www.naturalhistorymag.com/features/142195/beyond-dna-epigenetics>

wisdom about success in the created world, as suggested in a recent book on the potential impact of this new aspect of evolution.<sup>11</sup>

The chromosomes we see in pictures of cell division are where the DNA is tightly wound onto spools of alkaline histone proteins, called nucleosomes. These, in turn, are coiled, and supercoiled into the dense form of a chromosome. This is like wrapping ten miles of cotton thread onto tiny spools, coiling these into string, and these into ropes, and these into a foot-long braid!

The nuclear mechanisms can only access the DNA to transcribe its information onto RNA when it is liberated from this condensation. Control of this condensation is crucial. Access can be stimulated by adding acetyl groups to the histones, among other methods; access can be inhibited by adding methyl groups to the cytosine nucleotides, among other methods.

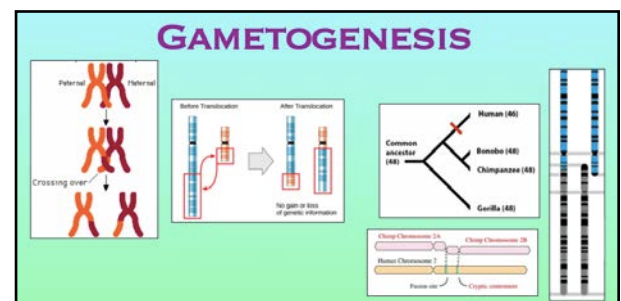
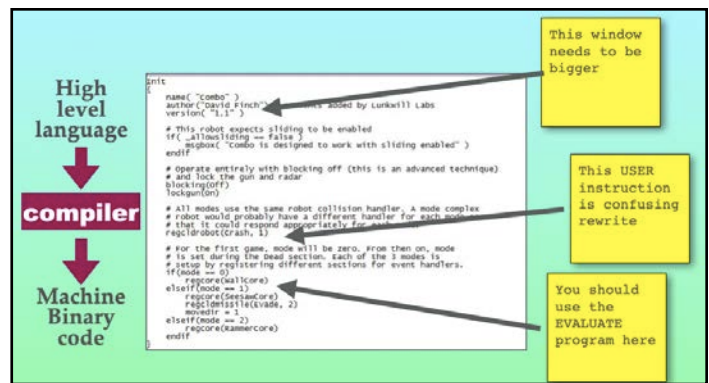
Epigenetics is currently detailing the writing, the reading and erasure of epigenetic information about how well the cell is doing in the current state of things. Just a few of the many mechanisms being explored currently are illustrated here.

Returning to our computer science analogy, the information epigenetically encoded—and the code has yet to be fully understood—can be likened to notes added to a printout of a program under development. Comments such as “this is not working well” or “the choices here can be simplified” cause the writer to adjust the program before it is sent to the compiler.

The Compiler converts the high-level language into the binary bits of machine code that is the app that will run on the CPU. In living systems, these epigenetic notes are accumulated down a lineage and help each individual prosper. As the information mounts up, eventually it is sufficient to cause a speciation event where the short term memory (epigenetic) is converted into long-term memory. The equivalent of the compiler adjusts the machine code, the genetic digital information stored in the DNA.

Life’s ‘compiler’ is the nuclear machinery that runs the creation of the sexual gametes and the recombination of chromosomes in Meiosis. A normal (somatic) cell has two copies (diploid) of each chromosome, one from dad, one from mum. In regular mitosis, the chromosomes are doubled, then segregated into two new diploid somatic cells.

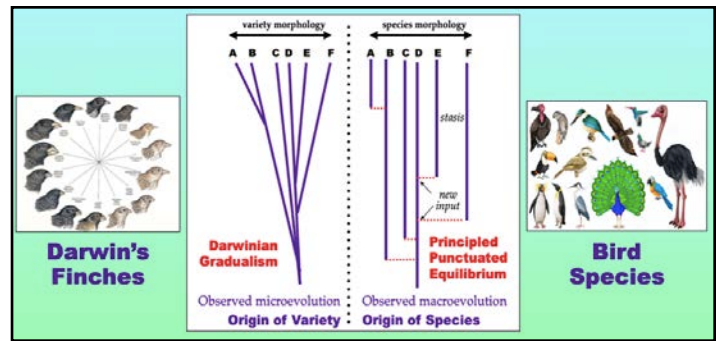
Meiosis starts similarly with duplication of the chromosomes in a diploid germ cell. The four copies of tetraploid DNA are now mixed and matched by the nuclear machinery in what is called recombinant crossing over. The four chromosomes are now segregated into four single copy (haploid)



<sup>11</sup> Peter Ward, *Lamarck's Revenge: How Epigenetics is Revolutionizing Our Understanding of Evolution's Past and Present*, Bloomsbury Publishing, NY, 2018

sex cells (gametes) with chromosomes where dad and mum's contributions have been mixed.

It is quite possible that the reverse transcriptase ability is called upon to copy RNA onto DNA at this time of transformation. What is now beginning to be explored is that epigenetic information influences these manipulations of tetraploid DNA:

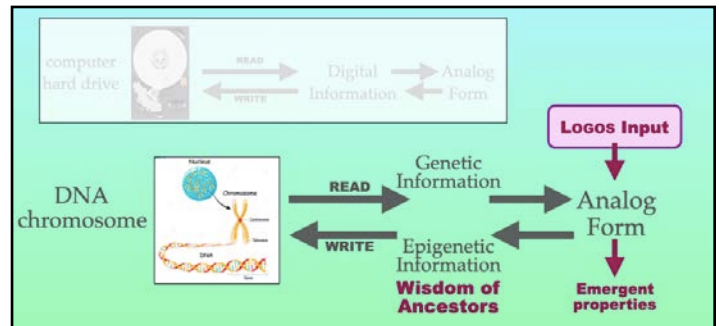


*The assembly of [tetraploid DNA] is driven by the combinatorial action of many factors including histones, their modifications, and [epigenetic] DNA methylation.<sup>12</sup>*

It is well established that a major manipulation of chromosomes occurred in the lineage leading to humans as the human #2 chromosome is clearly created by fusing two great ape chromosomes together. Somewhere in the lineage that led to humans the two chromosomes were fused together. The complex cellular mechanisms organizing and regulating the chromosome transformations in meiosis are currently being explored.

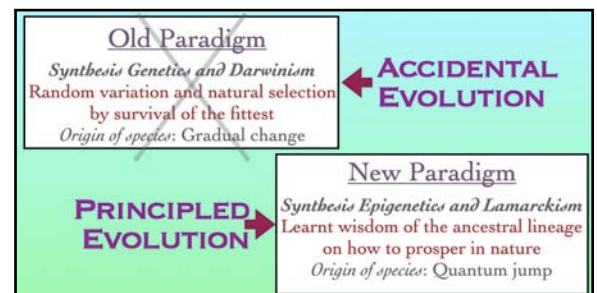
*Our understanding of the molecular mechanisms governing meiotic recombination has considerably progressed these last decades, benefiting from complementary approaches led on various model species.<sup>13</sup>*

Such epigenetic transformations are probably at work in the microevolution as observed by Darwin, such as the finches on the Galapagos Islands. He thought this microevolution—the origin of variety—was random, not directed, variation. When he extrapolated this to macroevolution, the origin of species, he also included his random variation.



The sudden changes in the stored genetic information that mark speciation, informed by epigenetic information, explains a fact that has bedeviled Darwinistic thinking. Darwin's theory states that the gradual accumulation of variation will eventually be so extreme that two species, not one, come to exist. Darwinism predicts there should be gradual changes between extant species, as well as in the fossil record. Gradualism should be the norm if Darwin is correct.

The science adage—many a great theory has been undone by facts—is exemplified here for Darwinism. Gradualism is prevalent in microevolution, as exemplified by Darwin's finches on the Galapagos Islands. Gradualism, however, is



<sup>12</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4830869/>

<sup>13</sup> <https://pubmed.ncbi.nlm.nih.gov/27180110/>

absent in both in extant species and the fossil record. There are, for instance, no Darwin's sparrows or blackbirds on the Galapagos, just finches.

This expectation was not realized; fossil species were found to be all distinct and appearing suddenly in the record. It took a great deal of nimble thinking to incorporate this fact into Darwin's theory.

In the 1970s, evolutionary scientists Gould and Eldredge proposed an explanation, which they called "punctuated equilibrium." That is, species are generally stable, changing little for millions of years. This leisurely pace is "punctuated" by a rapid burst of change that results in a new species and that leaves few fossils behind.<sup>14</sup>

While it was a good effort, they were accused of being 'anti-Darwinian.' Rather than relying on the rapid disappearance of intermediate forms, Principled Evolution suggests that the punctuation events are a result of a new input from the Logos without any intermediate forms.

We see that genetics is uncovering what our experience with computer science insists must exist: a *Write* as well as a *Read* process for stored digital information.

The natural environment, which is a reflection of the lawful Logos, has an input to the analog form. This is conveyed by epigenetic information written onto the DNA. This, in turn, controls the development of the genetic information.

We conclude with this thought: The Modern Synthesis, the combination of genetics and Darwinism, is a paradigm ripe for replacement by a Postmodern Synthesis of epigenetics and Lamarckism. What might be called Principled Evolution, replacing the old idea of evolution by random-chance-and-accident mutation and mistakes.

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<sup>14</sup> [https://en.wikipedia.org/wiki/Punctuated\\_equilibrium](https://en.wikipedia.org/wiki/Punctuated_equilibrium)