

A Biologist's View of Creation

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Abstract

A model of the Universe is proposed in which three-dimensional space consists of positive and negative charges which are exactly equal and opposite. The charges are separated by a distance d , which is a random variable of the order of 0.1 nm. The charges are produced by continuous creation from nothing and the Universe doubles in volume every 2 to 3 billion years. Vast tracts of space move relative to each other and they meet whirlpools that are produced in which the charges are forced together producing protons and neutrons. Each proton and each neutron consume a pair of charges every 917 seconds and this creates the force of gravity in which space physically contracts around large objects. This concept of gravity is consistent with Newton's and Einstein's equations and allows one to visualize curved space and space-time. Focal areas in which the charges are ordered create information and energy. Electromagnetic radiation is a wave of energy in which order forms at the front and dissolves at the rear. Large objects move in a straight line because their electrons order adjacent space and the object moves with a surrounding wave. The quantum world and the world of large objects are not dissimilar and we can construct physical models of the Universe that all intelligent humans can understand. This includes a physical understanding of Schrodinger's equation and its parameters. Everything in the Universe is composed ultimately of positive and negative charges, which can be combined in an infinite number of ways. This applies to abstract concepts as well as concrete objects. The only difference is that the former is four dimensional and involves complex information flow. Thus human consciousness, behavior, religious beliefs and spiritual experience are just as real and susceptible to scientific study as are anatomy and physiology.

Keywords

Gravity, Strong Force, Big Bang, Information, Uncertainty, Dark Matter, Consciousness, Religious Belief, Spiritualism

1. Introduction

This is the century of biology. It is highly likely that, within this century, we will come to understand human behavior and human disease in molecular terms. It is also possible that we will come to grasp the nature of consciousness, the last big question in biology (Crick, 1994; Rose, 1998; Gribben, 2002; Lewin, 2008; Morris, 2011). We will then understand how an assembly of molecules can be self-aware and experience the full gamut of human emotions. But achieving these goals will depend on biologists, chemists, physicists, engineers and mathematicians working together. They must speak the same language and use physical concepts that are comprehensible and mutually comprehended.

The current problem is that biologists and physicists, in particular, do not speak the same language. Indeed physics has become something akin to medieval theology; only a privileged few can understand the concepts and participate in the debate (Feynman, Leighton, & Sands 1964; Sears et al., 1982; Kaufmann, 1994; Gribben, 2002; Penrose, 2004). The barriers and problems that I perceive are as follows:

1) Rutherford said that “these fundamental things must be simple”; but modern physics is far from simple. We must develop concepts about the origin of the Universe, the nature of matter and the forces of nature in terms of physical concepts that all intelligent people can understand. If the fundamentals of physics are incomprehensible there is little hope of understanding the nature of human consciousness.

2) Physicists use abstruse mathematics to develop equations which become the laws of nature (Rees, 1999; Kragh, 2002; Penrose, 2004; Gowers, Barrow-Green & Leader, 2008). These equations cannot be understood in a physical sense and often cannot be solved in a practical way. When biologists use mathematics it is as part of models. The models are only approximations to the truth. The mathematical model is useful if it preserves the essence of the problem under investigation and will be discarded if it does not. There are no mathematical laws in biology.

3) The big bang theory of the origin of the Universe is a major barrier (Rees, 1999). This concept is widely held in physics and if true it means that the Universe appears by an act of magic. It acts as a barrier to understanding. The central question in creation is: “how can something emerge from nothing?” The big bang theory avoids this question. Evolution is the key idea in biology (Maynard-Smith, 1978; Bell, 1982; Nei, 1987; Maynard-Smith, 1998): we start simple; complexity gradually develops and new physical concepts emerge as properties of complexity. We will never understand consciousness in biology while the big bang origin of the Universe holds sway in physics.

4) The twin pillars of modern physics are energy and uncertainty but they are not easy bedfellows. Energy is conserved and this does not fit easily with the uncertainty principle. Information and uncertainty are the key ideas in biology; they are two sides of the same coin; information is the reduction of uncertainty; uncertainty is the reduction of information (Shannon & Weaver, 1949; Green &

Swets, 1966; Morris, 1987; Morris, 2001).

Physics must be de-mystified if we are to reap the benefits of the age of biology. Specifically we need a model of the origin of the Universe expressed in terms of simple physical concepts.

2. A Model of Creation

2.1. The Act of Creation

In the beginning there was nothing but uncertainty. Nothing is no space and no time. The primary postulate of the model proposed in this paper is that the act of creation is continuous and nothing differentiates into a positive and a negative something. These are the familiar positive and negative charges of the electron and positron but existing in isolation without mass or energy. The charges are exactly equal and opposite and sum to nothing. They are separated by a distance, d , which is a random variable. The mean value of d is of the order of 0.1 nm (see calculations below). The minimum value of d is closer to 0.01 nm. In practice the charges do not come together by random movement and are held apart by a strong force (note: this is a strong force not the strong force) acting over a short distance. The force of attraction is much weaker but acts over larger distances. It is the familiar electrostatic attraction between charges (Sears, Zemansky, & Young, 1982);

$$F = kq^2 \div d^2$$

F = force of attraction, k is the electrical constant = $8.987 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$, q is the charge of the electron and positron = $1.602 \times 10^{-19} \text{ C}$.

The charges formed by creation form a three dimensional lattice. The charges are not static, they move relative to each other so that the distance d is a random variable with the lower limit more strongly fixed than the upper limit, reflecting the fact that over a short distance the force of repulsion is much stronger than the force of attraction.

The Universe grows exponentially. The current rate of expansion is given by the Hubble constant which is between 50 and 100 km per sec per Mpc. (Kaufmann, 1994).

$$1 \text{ mega parsec (Mpc)} = 3.09 \times 10^{19} \text{ km} = 3.09 \times 10^{22} \text{ m}$$

Thus linear dimensions will double in approximately 3×10^{17} seconds which is approximately 10^{10} years and the volume will double in approximately 2×10^9 years. Consider a sphere of radius 10^{26} m . which is expanding at 100 km per sec per Mpc. The edge of the sphere will recede from the centre at the speed of light.

$$\begin{aligned} &\text{Edge of the observable Universe in meters} \\ &= 3.09 \times 10^{22} \times 2.99 \times 10^8 \div 10^5 = 9.24 \times 10^{25} \text{ m} \end{aligned}$$

$$\text{Speed of light (} c \text{)} = 2.99 \times 10^8 \text{ m} \cdot \text{per sec}$$

The best estimate for d is 10^{-10} m . (see below).

The number of pairs of particles in a Universe of radius 10^{26} m . is approx-

imately $(10^{26} \times 10^{10})^3 = 2^{360}$.

360 doublings will occur in approximately 1000 billion years and is sufficient time to produce a Universe bigger than the current observable Universe.

2.2. Information and Uncertainty

In this model the Universe consists only of positive and negative charges separated by a distance d , which is a random variable. The charges are in constant motion relative to each other and this means that in most of the Universe there is a maximum degree of uncertainty. If in a small area of the Universe the charges become organized so that there is less variance in the distance between them, then uncertainty is reduced and information is produced. This is based on Shannon's concept that information is the reduction of uncertainty. Energy is a closely related concept because order (information) leads to disorder (uncertainty) and energy is released in the process (Shannon & Weaver, 1949; Cherry, 1978).

Consider a local area in which a large number of charges are organized such that they form a three dimensional lattice with cubic symmetry. In this structure the distance d is fixed and the positive and negative charges form straight lines. Indeed this is the only situation in which straight lines can form in this model of the Universe. It is suggested that electromagnetic radiation is such an occurrence of cubic symmetry which forms in front of the advancing wave and dissolves into uncertainty at the rear. The wave moves at the speed of light in a straight line defined by its own cubic symmetry. The wave conveys information and possesses energy. In this example energy is conserved because the change from disorder to order at the front of the advancing wave is exactly equal to the change from order to disorder at the rear.

In this model it takes energy to bring positive and negative charges closer together and when they come together they possess energy. The less the separation, the more fixed the distance, the more energy they possess.

2.3. Currents in the Universe

The aether, the stuff of space in which stars and planets moved and electromagnetic waves were propagated was banished from theoretical physics at the turn of the twentieth century (Feynman, Leighton, & Sands, 1964; Sears, Zemansky, & Young, 1982; D'Inverno, 1992; Kaufmann, 1994). The speed of light is constant relative to the observer and therefore there is no universal frame of reference with which to compute absolute speed. This means that space is not composed of a universal motionless medium through which the stars move.

In the current model the aether has been re-introduced, but it cannot be stationary. The positive and negative charges move at random relative to each other but they do not drift in relation to a local frame of reference. There is no net movement in any direction from the local frame of reference. But local frames of reference will move relative to each other; otherwise there would be a universal frame of reference with which to compute absolute speed of motion.

Thus there are currents in the Universe, vast tracts of space moving relative to each other. Where the currents converge whirlpools will form and the positive and negative charges will be pressed together, overcoming the local force that keeps them apart.

Protons and neutrons are approximately 10^{-15} m. diameter. If the positive and negative charges are pushed to within 10^{-18} m. then the energy to pull them apart exceeds the energy of the neutron. Instead the particles will come together and disappear from the Universe. The neutron will have consumed two particles. Neutrons are not stable and their mean life is 917 seconds (Sears, Zemansky, & Young, 1982).

The hypothesis is that when positive and negative charges are pushed together they form either a neutron or a proton. The neutron consists of just two charges and exists for a short time. The proton, however, has an additional positive charge and is stable. When the positive and negative come together and fuse they cease to exist but the proton has the energy to pull in another two and the cycle repeats. Thus protons consume space at the average rate of two charges every 917 seconds.

We can picture a neutron as a sphere of diameter 10^{-15} m. with positive and negative charges in the centre separated by a distance of 10^{-18} m. If we consider the electrostatic force of attraction between a positive and negative charge then it would take the energy of the neutron to force them apart from the distance of 10^{-18} m. The energy to bring them together is equal to the energy they possess and in turn is equal to the energy to force them apart. This is the reason for postulating a separation of 10^{-18} m. The neutron is not stable and after mean life of 917 seconds the positive and negative charges fall together to oblivion. The energy, however, is conserved and appears as radiation.

The proton has two positive charges and one negative charge. The diameter of the proton is 10^{-15} m. One positive charge and one negative charge are close together as in the neutron but the other positive is further away. The positive and negative separated by 10^{-18} m. fuse and disappear after 917 seconds (mean). But the energy that it took to bring them together is conserved and is used to bring in another two opposite charges. A possible reason why the proton is stable but the neutron is not is as follows: a proton always has a net positive charge and can occupy a positive node in the three dimensional lattice of the Universe. A neutron has no net charge and therefore has no place to reside.

The hydrogen atom has one proton and will consume two charges every 917 seconds. The helium nucleus has two protons and two neutrons therefore it will consume 8 charges in 917 seconds. In the helium nucleus the neutrons and the protons are stable. It is suggested that the helium nucleus has the sequence PNP in a circle so that each proton is adjacent to two neutrons. The positive and negative charges at a distance of 10^{-18} m. are positioned across the junction between adjacent particles. Thus the charges are the strong force which holds the nucleus together and prevents the two positive charges of the protons from pushing the nucleus apart.

The whirlpools, where the currents converge, are the galaxies. Matter is created in these whirlpools and then condenses to form generations of stars and planets. This process has been going on for billions of years and matter is still being formed today. Some of the cosmic rays that rain down on the earth are produced in this way. Many exotic short lived particles will be formed by collisions in the whirlpools but the stable elements that survive are hydrogen and a small amount of helium. Other elements are produced later during star formation (Kaufmann, 1994). Alternating proton and neutrons in a circle will explain many of the larger elements but some have more neutrons than protons so we must postulate sequences such as PNPNNPN for the common isotope of lithium, and PNPNNPNPN for beryllium. Thus protons are always adjacent to two neutrons but neutrons can be adjacent to one proton and one neutron.

2.4. The Nature of the Electron

The nucleus of the hydrogen atom has one net positive charge. Around the nucleus is a cloud of positive and negative charges. Since the total number of positive and negative charges in the Universe is exactly equal there must be one more negative charge in the cloud than there are positive charges. The energy and mass of the electron is dispersed in the order of the cloud i.e. the distance between the positive and negative charges in the cloud is reduced and less variable than in the rest of the Universe.

Thus in this model there isn't a point particle. The charge and the energy of the electron are dispersed in the cloud. Consider a lithium nucleus with three positive charges in the nucleus. The surrounding cloud contains three more negatives than there are positives. The question "which of the three negative charges in the cloud are electrons?" has no meaning. All negative charges are the same; the energy and mass of the electrons is in the order. If an electron is transferred from one cloud to another then one negative charge is transferred and for a brief period that negative is different than the others. In that period the electron exists as a point particle but its energy and mass is still dispersed.

2.5. Motion in Space

An object in deep space will travel in a straight line at a constant speed unless acted upon by an external force. It has kinetic energy ($0.5 mv^2$). Why do objects travel in a straight line? And what is the nature of the energy?

The proposal is that space around a stationary object has cubic symmetry due to the energy of its electrons. When the object moves, however, it has additional energy which means that the charges around it are closer together and the distance between them is less variable. The faster the object moves the higher the energy level and the more tightly defined the straight line becomes. With motion, ordered space forms a wave travelling at the same speed as the object. The order forms in front of the wave and dissolves behind it.

There is a maximum rate at which order can form in front of a wave and dis-

solve behind it. The maximum is the speed of light or the speed at which electromagnetic radiation travels. Thus no object can travel faster than the speed of light relative to the surrounding aether.

2.6. Gravity

Protons and neutrons consume the stuff of space and produce the force of gravity. A volume of space immediately around the surface of the earth is consumed each second by the protons and neutrons that make up the earth. Thus the space around the earth contracts and any objects above the earth will be pushed down to the surface.

The rate at which space flows towards the earth will fall off as the inverse of the square of distance from the earth.

The volume of space consumed per second at the surface of the earth = $V = 4\pi R^2 l$, given that R = the radius of the earth and l is the speed of contraction of space at the surface.

The speed at which space flows towards the earth at a distance $2R$ from the centre of the earth = $V \div 4\pi (2R)^2 = l \div 4$.

Gravitational acceleration at the surface of the earth is approximately 9.8 m·per sec·per sec. This can be used to calculate the speed at which space is consumed at the earth surface.

$4\pi R^2 x = 4\pi (R + x)^2 y$, where x is the speed at the surface of the earth and y is the speed at x meters above the surface of the earth.

Radius of the earth = 6.378×10^6 m.

$$y = R^2 x \div (R + x)^2$$

When x is 0.56×10^4 , y is 0.559018×10^4 and $x - y = 9.82$.

The value 0.56×10^4 m. per sec is exactly half the escape velocity, calculated using Newton's laws.

The volume of space consumed per second by the earth is $4\pi R^2 x = 2.86 \times 10^{18}$ cubic m.

Mass of the earth = $M = 5.976 \times 10^{24}$ kg.

Proton mass = 1.673×10^{-27} kg.

Number of protons and neutrons in the earth = 3.572×10^{51} .

Number of pairs of charges consumed per second = $3.572 \times 10^{51} \div 917 = 3.895 \times 10^{48}$.

Number of pairs of charges per cubic m. of space = $3.895 \times 10^{48} \div 2.86 \times 10^{18} = 1.361 \times 10^{30}$.

Number of single charges per cubic m. of space = 2.722×10^{30} .

Number of charges per m. = 1.396×10^{10} .

Mean value of $d = 0.72 \times 10^{-10}$ m.

2.7. The Sun and Planetary Motion

The orbits of the planets around the sun are ellipses, but the orbit of the earth is roughly circular. Consider a planet in a circular orbit around the sun with radius

R . The velocity (v) is $2\pi R \div T$, where T is the time to complete one orbit. The acceleration, according to Newton's laws, is $v^2 \div R$.

$$M(\text{earth}) \times \text{acceleration} = G \times M(\text{earth}) \times M(\text{sun}) \div R^2$$

G is the gravitational constant

$$\text{Acceleration} = G \times M(\text{sun}) \div R^2 = v^2 \div R = 4\pi^2 R^2 \div T^2 R$$

$$\text{Therefore, } T^2 = 4\pi^2 R^3 \div GM(\text{sun}).$$

This is Kepler's law; the square of the period of the orbit is proportional to the cube of the radius of the orbit. Newton's interpretation is that there is a force of attraction between the sun and the earth which follows an inverse square law. Einstein's interpretation is that the sun's gravitational field distorts space around the sun and the earth follows a straight line in space time (D'Inverno, 1992; Kaufmann, 1994).

In the model proposed here the rate of contraction of space around the sun is inversely related to the square of the distance. In addition one can visualize how space is distorted in three dimensions. In deep space, far from any stars, there is a random three dimensional lattice of positive and negative charges and there are no straight lines. Straight lines only form when the charges are organized into a cubic lattice as in electromagnetic radiation. Around the sun the charges are moving towards the sun in an ordered way with circumferential contours and this will influence the path of any object in the vicinity. Electromagnetic radiation, travelling in a straight line, will be influenced by the contraction of space around the sun. Einstein's equations show that a straight line in four dimensions gives the same results as Newton's laws other than when space is markedly curved close to the sun (D'Inverno; 1992). Moving bodies in the gravitational field, according to both theories, follow conic sections such as a parabola or an ellipse. The advantage of the current theory is that it allows one to visualize how space is distorted by matter so that straight lines become curved. It also predicts that the contraction of space follows an inverse square law; but acceleration does not.

2.8. The Extent of the Sun's Gravitational Field

It is possible to calculate the number of positive and negative charges consumed by the sun each second from its known weight. We can then calculate the volume of space in which an equal number of positive and negative charges will be produced per second using Hubble's constant. This then indicates the extent of the sun's gravitational field. The calculations are given below:

Hubble's constant is between 50 and 100 kms per sec per Mpc.

$$1 \text{ Parsec (pc)} = 3.09 \times 10^{13} \text{ km}$$

$$1 \text{ mega parsec (Mpc)} = 3.09 \times 10^{19} \text{ km}$$

Fractional expansion of linear dimensions assuming the lower figure is $50 \div (3.09 \times 10^{19}) = 16.18 \times 10^{-19}$ per sec.

Mass of sun = 1.99×10^{30} kg.

Mass of proton = 1.673×10^{-27} kg.

Number of protons in sun = 1.19×10^{57} .

Mean life of neutron = 917 sec.

Number of positive and negative pairs consumed per sec = 1.29×10^{54} .

Consider a sphere of radius 1×10^{14} meters with the sun at its centre. The expansion in volume in one second = $16.18 \times 10^{-19} \times 10^{14} \times 4\pi \times 10^{28}$ cubic meters = 2.03×10^{25} cubic meters.

The number of positive and negative pairs produced per second (assuming $d = 0.72 \times 10^{-10}$ meters) is 2.76×10^{55} .

Thus there is no gravitational force acting on a planet which is more than 1×10^{14} meters from the sun because the creation of new positive and negative pairs exceeds the rate of consumption by the sun. The planets in the solar system are less than 1×10^{14} meters from the sun and therefore gravitational forces do apply.

It is possible to do a similar calculation in which we work out the number of positive and negative charges consumed by the vast number of suns in the centre of our galaxy and then the number of charges produced per second by a sphere with a radius equal to the distance of our sun from the centre of the galaxy. This calculation is shown below:

Now consider the sun orbiting the centre of our galaxy at a distance of 2.4×10^{20} meters.

The expansion of a sphere of radius 2.4×10^{20} in one sec = $(2.4 \times 10^{20} \times 16.18 \times 10^{-19} \times 4\pi) \times (2.4 \times 10^{20})^2 = 2.810 \times 10^{44}$ cubic meters.

The number of new positive and negative pairs created = 3.82×10^{74} .

The number consumed by the 10^{11} suns within our galaxy in one sec = 1.29×10^{65} .

Thus the vast majority of matter in our galaxy is too far away from the sun to have any gravitational effect.

The nearest star to the sun is 4×10^{16} meters which is outside the sun's gravitational attraction.

In the model proposed the matter in the galaxies is not held together by gravity. The galaxies are whirlpools in which matter is formed by the convergence of universal currents in the aether. The mythical dark matter of modern physics is not needed (Kaufmann, 1994).

2.9. The Big Bang

Fred Hoyle dismissed the idea that all the matter and energy of the Universe appeared in an instant with the pejorative term—"the big bang". Ironically this idea described using Hoyle's term is now one of the cornerstones of modern physics (Hoyle, 1983; Rees, 1999).

The strongest evidence in support of the big bang is the microwave background radiation. The idea is that the Universe was initially hot and dense. It

then stretched to become cold and much less dense. The current Universe is a black body which is just a few degrees above absolute zero; as a black body it radiates microwave radiation with a distribution and mean appropriate to the current temperature of the Universe. When the microwave background radiation was discovered it seemed to confirm predictions of the big bang model. Since then all the measurements that have been made are consistent with the big bang theory.

The Universe described in the model proposed herein is also a black body. Moreover it contains energy and the overall temperature of the Universe is a few degrees above absolute zero. Therefore it will radiate in the microwave region. The radiation will be the same whether the Universe cooled down or warmed up to its current temperature.

The relative abundance of hydrogen and helium in the gas clouds is also cited in support of the big bang origin of the Universe. Most of the chemical elements larger than helium are thought to have been formed in the stars (Kaufmann, 1994). But the relative mixture of hydrogen and helium is consistent with formation when the Universe was hot and dense. But the explanation proposed in this model is that hydrogen and helium form when universal currents converge forcing together positive and negative charges and creating a range of possible particles including hydrogen, helium and cosmic rays.

2.10. The Structure of the Atom

Space, distant from a large mass, has a random distribution of charges with maximum uncertainty. But ordered space can have cubic symmetry in which the distance between positive and negative charges is d (along the edges of the cube) and $\sqrt{3} \times d$ (between the corners of the cube). The distance between like charges (positive and positive, and negative and negative) is $\sqrt{2} \times d$ (diagonal of cube face). Ordered space also has energy.

The hydrogen atom contains a single proton and a single electron. Let us assume that the proton occupies the position of a positive charge and it is surrounded by shells of positive and negative charges with cubic symmetry. The energy of the ordered charges with cubic symmetry is equal to the mass energy of the electron. Thus the energy of the electron is distributed around the central proton. In the first shell there are 26 charges, 14 are negative and 12 are positive. The distance between the proton and six of the negative charges is d . The distance to the other 8 negative charges at the corners of the cube is $\sqrt{3} \times d$. The electron has energy of position, as well as mass energy, and the lowest positional energy state is for the electron to be a distance d from the proton. There are six negative charges which are d meters from the proton. These six negative charges are equivalent, and therefore an electron must be formed from at least six negatives and at least five positives.

Let us now generalize from this observation to the following rule: the cubic shells around the positive nucleus of the atom can have no more than one elec-

tron for each set of 6 negative charges.

1) The first shell has $3^3 - 1 = 26$ charges. There are 14 negative and 12 positive charges in total. Thus this shell can accommodate no more than two electrons.

2) The second shell has $5^3 - 3^3 = 98$ charges. There are 48 negative charges and 50 positive charges. This shell can accommodate eight electrons.

3) The third shell has $7^3 - 5^3 = 218$ charges. There are 110 negative charges and 108 positive charges. This shell can accommodate 18 electrons.

4) The fourth shell has $9^3 - 7^3 = 386$ charges. There are 194 positive charges and 192 negative charges. This shell can hold up to 32 electrons.

5) The fifth shell has $11^3 - 9^3 = 602$ charges. There are 302 negative charges and 300 positive charges. This shell will hold up to 50 electrons.

The above corresponds to the full complement of electrons in the K, L, M, N and O shells of atomic nuclei (Sears, Zemansky, & Young, 1982).

According to the model proposed in this paper the numbers of positive and negative charges in the Universe are exactly equal. They are created together and they are consumed together. Thus the hydrogen atom has one proton occupying a positive position and one electron occupying a negative position. But the helium atom has two positives occupying the positive position and therefore one additional negative in the first shell. The problem is that it is not possible to accommodate one additional negative charge in the first shell and maintain cubic symmetry.

The next step is to convert the first shell into a sphere. The charges are now arranged to form equilateral triangles which will cover the surface of the sphere. In fact spheres can be covered by a mixture of hexagons (6 equilateral triangles) and pentagons (five nearly equilateral triangles). The length of the equilateral triangle is approximately $d\sqrt{2}$ because this is the least distance between like charges. If the radius of the sphere is $2d$ then the surface has sufficient area to accommodate at least 29 charges. The first shell had 28 charges and therefore there is room for one additional negative charge.

This process can be repeated for the other shells. If the radius of the L shell is $3d$ it is possible to accommodate 98 charges plus 8 additional negative charges. A radius of $4d$ for the M shell will accommodate 218 charges and the additional 18 negatives. A radius of $5d$ for the N shell will hold the 386 charges and an additional 32 negatives. A radius of $6d$ for the O shell will easily accommodate the 652 charges required.

The traditional concept of the atom, first developed by Bohr, subsequently modified by de Broglie and fully developed by Schrodinger, is that the electrons orbit the nucleus (Sears, Zemansky, & Young, 1982). The key difference in the model proposed here is that space spins and the electrons are carried around the nucleus. Furthermore all negative charges are equivalent and the mass energy is spread evenly in the cloud. But in the following discussion, in relation to angular momentum, we will initially assume, for simplicity of presentation, that the electrons are point particles with mass. This allows one to calculate the upper

and lower limit of the range, but it is an abstraction.

Consider first of all the K shell which contains a maximum of two electrons. The spherical shell rotates with one electron in the northern hemisphere and one in the southern hemisphere. The angular momentum of the electron will vary depending on its precise position, but this cannot be known, indeed the statement strictly has no meaning because all negative charges are equivalent. An electron at the northern or southern pole would have no angular momentum. For an electron at the equator the following relationship applies: $mvr = h \div 2\pi$, where m is the mass of the electron, v the speed of the electron, r the radius of the K shell and h is Planck's constant. In the specific model we are considering $r = 2d$, thus the radius of the orbit followed by the electrons will be between 0 and $2d$.

Consider now the L shell which contains 8 electrons in total, with 4 in the northern hemisphere and four in the southern hemisphere. As a thought experiment we take the triangles which make up the northern hemisphere of the K shell and then add a sufficient number of triangles to form the northern hemisphere of the L shell. We now have one electron around the northern pole and three electrons in a belt between the northern pole and the equator. The radius of the L shell in our model is $3d$, therefore the orbital radii of the electrons are as follows: the electron at the northern pole has an orbital radius between 0 and $2d\sqrt{2}$, and the other three electrons have orbital radii between $2d\sqrt{2}$ and $3d$. The same applies to the southern hemisphere. But if the electrons in the northern hemisphere are orbiting clockwise when viewed from above, the electrons in the southern hemisphere will be orbiting anti-clockwise when viewed from below.

Consider now the M shell which has a complement of 18 electrons and a radius of $4d$. Again we take the northern hemisphere of the L shell and add enough triangles to make up the northern hemisphere of the M shell. In the process we add enough triangles to hold an additional 5 electrons. Thus the sub-shells going from north to south contain 1, 3, 5, 5, 3, and 1 electron. The sub-shells in the south are the mirror image of those in the north. The orbital radii lie between 0, $2d\sqrt{3}$, $d\sqrt{15}$ and $4d$.

The N shell contains 32 electrons and the sub-shells have the following sequence of electrons from north to south: 1, 3, 5, 7, 7, 5, 3, 1. The orbital radii lie between 0, $4d$, $d\sqrt{21}$, $2d\sqrt{6}$ and $5d$.

The O shell has 50 electrons in the sequence 1, 3, 5, 7, 9, 9, 7, 5, 3, 1. The radius at the equator is $6d$. The orbital radii of the sub-shells are between 0, $2d\sqrt{5}$, $d\sqrt{27}$, $4d\sqrt{2}$, $d\sqrt{35}$, and $6d$.

The above is a physical model which corresponds to the quantum numbers of the Schrodinger equation. The number of electrons in the major shells and the sub-shells are predicted by the physical model. There is uncertainty in the precise position of the electrons and their angular momentum. The angular momentum varies with the sub-shell and is not an integral multiple of $h \div 2\pi$. The

quantum numbers of the electrons in the northern hemisphere are the mirror image of those in the south.

The radii of atomic elements vary from 0.05 nm to 0.2 nm. In general elements with complete shells are smaller than elements with incomplete shells. If the minimum value of d is 0.025 nm then it would fit with what is observed. Using this model it might prove possible to compute the energy levels and size of each element precisely.

We must remember that although the additional negative charges are confined to the shells we cannot know which of the negative charges is additional. Furthermore the energy of the electrons might not be confined to the shells in which the additional charge lies. Indeed it is likely that cubic symmetry around objects is produced by the energy of the electrons they contain. It is this cubic symmetry which defines the straight lines along which objects travel (see above).

2.11. The Electric and Magnetic Field

Lines of force in the field have played an important part in physics since their introduction by Michael Faraday in the 19th century (Gribben, 2002). These lines of force can be described mathematically but cannot be visualized or understood in a physical sense. They are real but not tangible. In fact when first introduced they were regarded as existing in the aether; but when the aether lost its place in physics they became lines of force in nothing. This is another of the mysteries of modern physics; an idea beyond human comprehension.

The field, however, can be visualized in terms of the model presented in this paper. The lines of force are simply the alignment of positive and negative charges in space.

3. Philosophical Implications of the Model

3.1. Feynman's Quantum Mystery

In the first chapter of volume 3 of Feynman's lectures on physics (Feynman, Leighton, & Sands, 1964) the following statements are found on page one:

“Because atomic behaviour is so unlike ordinary everyday experience, it is very difficult to get used to, and appears peculiar and mysterious to everyone—both to the novice and to the experienced physicist. Even the experts do not understand it the way they would like to, and it is perfectly reasonable that they should not, because all of direct human experience and of human intuition applies to large objects. We know how large objects will act, but things on a small scale just do not act that way. So we have to learn about them in a sort of abstract or imaginative fashion and not by connection with our direct experience”.

“In this chapter we shall tackle immediately the basic element of the mysterious behavior in its most strange form. We choose to examine a phenomenon which is impossible, *absolutely* impossible, to explain in any classical way, and which has in it the heart of quantum mechanics. In reality, it

contains the *only* mystery. We cannot make the mystery go away by “explaining” how it works. We will just tell you how it works. In telling you how it works we will have told you about the basic peculiarities of all quantum mechanics”.

Feynman then goes on to describe the famous double slit experiment in which a stream of electrons behaves as though composed of discrete particles with a single slit and as waves which interfere with a double slit. The concept of the electron presented in this paper, however, goes some way to explaining this paradoxical behavior. The charge of the electron travels as a point particle but the energy travels as a wave and we should not be surprised that it shows interference in the double slit experiment. Furthermore large objects also travel as waves and therefore the difference between classical physics and quantum physics is not as fundamental as implied. With a large object most of the energy is in the mass of the object and only a small fraction in the wave; in practice this will not lead to interference. With the electron all the energy is in the wave and the point particle is just charge; therefore interference occurs. There is uncertainty in the position of the electron because there are many entirely equivalent negative charges in the wave and the electron is the net negative excess. There is nothing mysterious in the fact that we cannot know which one of the negative charges is the electron and that we are only able to consider the probability of its position and the probability of its trajectory.

Mysterious properties at the level of the electron led Roger Penrose (Penrose, 2004) to suggest that actions within the microtubules of cells could hold the secret of consciousness. But if the mystery is removed then we need to look elsewhere.

3.2. The Nature of Reality

In this model the Universe consists only of positive and negative charges. When the charges are ordered information and energy are created. An electron consists of an ordered array of at least 6 negative and at least five positive charges. A proton consists of two positives and one negative in close proximity. A neutron is one positive and one negative also in close proximity. Electromagnetic radiation is a wave formed by ordering of charges at the front and a reversal to disorder at the rear. The nucleus of atoms consists of protons and atoms held together by the strong force which is a result of the close proximity of positive and negative charges. The electron shells surrounding the nucleus consist of positive and negative charges in circular motion. Atoms combine to form molecules and these in turn form the structure of the world around us. Everything we see and touch and smell is made up of ordered positive and negative charges. That is the nature of reality.

In living organisms both structure and function are ultimately a consequence of the ordering of positive and negative charges. A beating heart is importantly different than a static heart and the difference is related to flows of information

formed by movement of charges. The beating heart possesses vitality which the static heart lacks. The difference is caused by the precise way in which the positive and negative charges are ordered. The beating heart has a quality that the static heart lacks, and that quality is real.

A frog is vital, a stone is not. The difference lies in the extreme complexity of the frog (Morris, 2011). The information that specifies the frog is coded in DNA and there is a copy in every cell in the frog's body. The DNA is copied into RNA and then used to synthesize proteins (Lewin, 2008). Networks of proteins then form the structure and control the function of the body. To fully understand the nature of vitality, as it applies to the frog, we need to work out every detail of its structure and its function. It is a major problem for science but it is tractable and we can be confident of success.

The human brain and its connections with our body is probably the most complex system of which we are aware. Understanding the brain and the related concept of consciousness is the big challenge of this century. The structure is specified by the translation of genetic information into proteomic networks. The networks in the brain, neural networks, learn from the environment. The act of learning modifies the structure of the networks. It will take an enormous amount of painstaking scientific work before we have a full understanding of brain structure and function. Indeed the number of possible connections in the brain is so vast that we might have to settle for a more general appreciation of principles. But the problem is tractable and once again we can be confident of success.

That success includes understanding the nature of consciousness. It is an aspect of the functioning of our brain which is ultimately determined by the ordering of positive and negative charges. Thus consciousness is as real a phenomenon as any other. Once we have a fuller knowledge of the structure and function of the brain at a molecular level then we will understand the nature of being self-aware. We are also likely to discover different levels of consciousness and that different animals are conscious in different ways.

Let us now consider an orchestral performance; a large group of conscious human beings playing together in unison. The performance is a real entity; it is ultimately an extremely complicated ordering of positive and negative charges in four dimensions (three of space and one of time). Furthermore the players can experience being part of a bigger whole; it is a spiritual experience. But once again it is real; it exists as an entity in this Universe. The spiritual world is a real part of our world; it doesn't exist in another dimension or another place. The spiritual experience is also not just a product of our imagination; it is out there in the interaction between the players. We are aware of it, of course, just as we are aware of other objects in the world around us.

Let us also consider a group of individuals who follow a particular religion. As far as they are concerned their moral code is the word of god. Then the word of god is real and exists in this Universe. I have argued previously that moral beha-

avior is determined by neural networks that direct conscious decisions (Morris, 2011, 2012). But the neural networks learn by observing the behavior of others. Each individual has a flawed copy of the true code. The only way to get to the truth is for information to flow between individuals in order to iron out the flaws. That information flow places the word of god outside any one individual. It is a product of the group. My consciousness is within me, but the collective consciousness of the group lies outside.

3.3. The Eternal Universe

There is one Universe and it is eternal. It started a finite time ago from nothing but will continue into the infinite future. Most of the Universe consists of uncertainty but there are foci that are information rich. The surface of the earth is one such focus. Life has evolved on the earth and created the most complex structures we know. Human beings are at the summit of that progression. Individual humans must die because of the copy error problem (Morris, 1992, 1994, 2001). The information of life is stored in DNA which is copied into every cell in the body. The copying process is high fidelity but not perfect and errors occur. These errors (somatic mutations) degrade the function of cells so eventually they can no longer maintain life. However sexual reproduction distributes the mutant genes at random to the next generation of zygotes, so that some have more and some have less than their parents (Morris & Morris, 2003, 2004; Morris, 2005). The zygotes with most mutations die and therefore the number of mutations in zygotes does not rise from one generation to the next. The human race can therefore survive for thousands if not millions of generations; assuming of course that we develop a sustainable economy.

The solar system has a finite life and the human race will disappear. But life will evolve elsewhere in the Universe and therefore it will be eternal. Thus life is not an epiphenomenon, making a brief appearance on the earth in between the big bang and the cold dark future. Instead there will always be intelligent beings somewhere in the Universe probing the nature of biology and pondering the nature of vitality, consciousness, spiritualism and the word of god. Human beings are mortal, as is the human race. But the word of god is immortal and the battle between good and evil will be fought throughout eternity.

4. Discussion

A key idea in this model is that nothing is no space and no time. Space is made of stuff and it is stuff that separates the stars and the planets. The earth and the sun cannot be separated by nothing otherwise they would be next to each other. Electromagnetic waves cannot propagate in nothing, they cannot travel through nothing. Space made of nothing cannot stretch as suggested in the big bang theory. Indeed if objects and electromagnetic waves could travel through nothing the entire Universe would dissipate into the n dimensions of space which exist in theory but contain nothing in practice.

The positive and negative charges of the electron and positron are exactly equal and opposite (Sears, Zemansky, & Young, 1982). They are the obvious candidates for the stuff of space. They sum to nothing so that they can appear and disappear, indeed quantum theory assumes that space is permeated by virtual electrons and positrons. The model proposed herein is that there is a force which keeps them apart, it operates over a short distance, and thus once created they survive long term unless consumed by matter. The charges, however, are just pure charge; they are not electrons and positrons. In addition they are not virtual; they are real; they are not transitory, they are permanent.

All motion is relative. This is the concept that led to the banning of the aether (D'Inverno, 1992). There is no absolute frame of reference against which absolute motion can be determined. Thus if space is formed by positive and negative charges there must be currents in space with vast tracts of space moving relative to other tracts in distant parts of the Universe. The place where the currents converge will create matter, form galaxies and hold the stars in a whirlpool. If this idea is correct there is no need to postulate dark matter.

The positive and negative charges form a random lattice with a mean separation of approximately 0.07 nm. An ordered lattice in which the separation is reduced and also less variable possesses energy and information. The energy of the proton and the neutron is due to the closeness of the positive and negative charges they contain. The mass energy of the electron, however, is distributed in the order of the positive and negative charges that surround the single net additional negative charge in that part of space. An electromagnetic wave is an ordered cubic lattice travelling at the speed of light. The order forms in front and dissolves behind. The energy is thus conserved. It travels in a straight line which is determined by the geometry of the cubic lattice. A large object in deep space is also surrounded by a cubic lattice, which depends on the energy of its electrons and its speed of motion relative to the aether. The object travels in a straight line because of cubic symmetry. It is literally carried through space by a wave travelling at less than the speed of light. Objects cannot exceed the speed of light, because that is the maximum rate at which the wave can form.

Protons and neutrons consume positive and negative charges. This creates the force of gravity and the strong force which holds the nucleus together. Newton's laws and Einstein's theory of general relativity can be understood in terms of this concept of gravity. In particular we can visualize the distortion of space in three dimensions and grasp more easily how space time can be distorted so that the path of an object follows a conic section.

The velocity at which space contracts around the earth can be calculated using the measured rate of acceleration at the earth's surface. The calculated value is very close to half the escape velocity which in turn is calculated using Newton's Laws. An estimate of the mean separation of positive and negatives charges can them be obtained based on the rate at which space is consumed by the earth. The estimate is close to what we expect from other sources. The distance between the

proton of the hydrogen atom and the position of the electron in the first shell is, according to the Bohr model, 0.53×10^{-10} m. (Sears, Zemansky, & Young, 1982). The mean separation of 0.72×10^{-10} m. is, therefore, of the right order.

Combining Hubble's constant with this model of gravity allows us to calculate the distance from the sun at which space will cease to contract due to gravity and start to expand. The distance is approximately 10^{14} meters. All the planets are within this distance as are the regular comets but not the long period comets.

The nucleus of helium and the larger elements could be held together by the strong force between positive and negative charges separated by less than 10^{-18} m. The proposal is that the nuclei are composed of a ring of protons and neutrons. The rule being that each proton is attached to two neutrons and each neutron is attached to two protons or to a proton and a neutron. Thus helium is PNP, and lithium is PNNPN, carbon is PNPNNPNPN and so on. Each proton has three charges, two positive and one negative. Each neutron has two charges, one positive and one negative. The positive and negative charges that are close together are arranged at the opposite sides of a junction. Thus a positive charge of the proton will combine with a negative of the neutron on one side. The negative charge of the proton will combine with the positive charge of the neutron on the other side.

The idea that the physical Universe is ruled by mathematical laws developed following the remarkable success of Newton's laws of motion. The supremacy of mathematics was further enhanced by the Schrodinger equation which seemed to indicate that the laws of physics could only be understood in terms of mathematics and there was no physical analogue of the abstruse rules written in the equation. Only the mathematically gifted could enquire into the nature of physics and even they would not be able to understand the rules that they discovered. This is a pernicious concept which is fortunately incorrect. There are no mathematical laws of nature. Mathematics, when applied in biology and physics is a tool which allows us to make predictions from physical models. In biology there are so many variables that the models are obviously mere approximations to the truth. In physics we can be seduced by the precision of the models into imagining that they reveal the truth, but they are still approximations and are no different in principle. Mathematicians understand this if physicists do not (Gowers, Barrow-Green, & Leader, 2008). Mathematicians pursue something different; not utility but beauty (Kragh, 2002).

The physical model of the atom described above provides visual analogues of the concepts hidden within the Schrodinger equation. The key idea is that the atom is spinning space composed of negative and positive charges and forming consecutive shells around the nucleus. The number of electrons in the shells and the number in each sub-shell arise naturally and easily from this model. The electrons have non-integral quantized angular momentum. The electrons on either side of the equator are mirror images of each other. The precise position of the electron is uncertain in that it is found within an area containing at least 6

negative charges and at least 5 positives. It might even be possible, using the physical model, to compute the energy levels of the shells and sub-shells for each element and relate these to size.

If this model is correct the Universe has evolved over a vast period of time. It is dominated by uncertainty but there are tiny areas that are information rich. The surface of the earth is one of the information rich areas. Life has evolved with all its complexity and consciousness has emerged as a new physical construct (Morris, 2011). Life is not an epi-phenomenon but the summit of a process of evolution that started many billions of years ago. Similar levels of complexity will have been reached elsewhere in the Universe and life in some form will always be present. Understanding life is the scientific challenge of this century, there is no reason to anticipate any permanent barriers to success.

There is nothing in the Universe except positive and negative charges. Thus all abstract concepts as well as concrete objects are a four dimensional arrangement of the charges. To understand consciousness, beauty, or religion we must define the precise form of that arrangement. It will be a major task but it is tractable. There are no intractable mysteries to frustrate the enquiry.

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There are no ethical issues.

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There is no separate data.

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