Dark Energy Mystery Solved by Big Breed Theory!

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Cosmologists posit Dark Energy as a mysterious 'something' that permeates the universe to explain an unexpected finding by astronomers. They discovered in 1998 that the expansion of the universe is speeding up when all cosmologists thought it was slowing down. A unique approach provides a solution to the mystery that has baffled theorists, worldwide, ever since.

The solution starts from the established Big Bang theory that purports to explain the origin of the universe from the void of nothing. Unfortunately that theory makes a hopelessly wrong prediction for the rate of expansion of the universe that is many billions of times too high. The reason was lost expertise that had caused flawed logic to be used. The hope is that, by providing a sound solution, lost expertise will be returned to its original source. Amazingly the 'opposed energy dynamics' that provided a solution to this major so-called 'problem of the cosmological constant' also predicted the accelerating expansion. It had solved the Dark Energy Mystery as a spin-off extra! (And nobody else has provided a solution to even the main problem as yet!)

Expansion adds a new massive extra red shift of starlight resulting in greatly reduced estimates for velocities of recession. For the first time this also enables the size of the universe to be predicted. One of the proposals for new research is of Nobel Prize potential. It is a super-computer study expected to confirm the self-organizing power of energy-fed chaos in a mix of positive and negative energies.

1. Introduction

An online book publisher www.Lulu.com has 132 books listed concerning theories of quantum gravity but this number is dwarfed by the 416 books it lists on Dark Energy with some priced at over £100!. This illustrates the emphasis now being given to the latter problem but a study of the abstracts has shown that not one of these addresses the real problem: one that arises from a false prediction of the Big Bang theory. Furthermore five space probes are studying the CMB (a cosmic background radiation that fills the whole sky). A major aim is just to find clues that could lead to an understanding of Dark Energy. Furthermore a European space probe dedicated to this is being prepared.

Theorists say they have already shown Dark Energy makes up 74% of all the energy in the universe by looking at the CMB.

The last statement suggests theorists are searching without any guiding principle. This article aims to fill the gap by showing that a satisfactory solution emerges when Dark Energy is regarded as the ultimate building substance of all parallel universes inclusive of our own. This means Dark Energy is 100% of everything!

The hope is that this paper will be accepted as providing that guiding principle.

Note that when 'the book' appears it refers to one at the end of References.

2. Flaws in the Big Bang Theory and the Origin of Dark Energy

The Big Bang theory is based on the universe emerging from the void of zero energy. It was posited that a huge quantum fluctuation triggered its beginning followed by 'inflation' lasting only a split second. During this time all the energy needed to create the universe of matter appeared. Simultaneously space, also known as the 'quantum vacuum', emerged. This consisted of 'virtual particles' whose energy density dwarfed that of matter and required energy to be supplied as long as the universe continued to expand. To satisfy the law of conservation of energy Guth (1989) had in 1980 posited an 'intrinsic negative pressure of the vacuum' that cancelled the positive energy of space, whilst that of matter was cancelled, according to Tryon (1984), by 'negative gravitational potential energy'. Both these concepts jarred with the author's understanding of classical mechanics and thermodynamics that still had to apply. He was therefore not surprised, when reading Guth's theory, sent him by Paul Davies in 1987 and later published by Davies (1989), that the theory made a hopelessly false prediction.

This is known as 'The problem of the cosmological constant' since it predicts a rate of expansion of the universe 10^{120} times greater than astronomers can allow! It arises consequent upon inability of the theory to provide an adequate means for switching-off the postulated inflation.

Cosmologists proceeded to develop the theory as if hoping this problem would be resolved. It then followed that the universe of matter would expand due to its inertia though slowing continually owing to the mutually attractive force of gravity.

Then Schwarzschild, B. (1998) published a paper showing astronomers studying remote 1A type supernovae found that, instead of slowing, the expansion is actually speeding up! This took all cosmologists by surprise but soon they invented 'Dark Energy'. This was posited as some kind of substance having the unexplained and mysterious property of producing a repulsive force at long range. This expedient patched up the Big Bang theory and so permitted it to match observation.

What, however, is the point of this when the major problem remains that dwarfs to insignificance anything that Dark Energy could do?

3. The Big Breed Theory in Brief

At present two levels of reality are recognized. What we see and feel is the 'macroscopic level' of ordinary experience. The other level is sub-microscopic and is called the 'quantum level'. At this level all seems unreal and mystifying. Particles move in apparently impossible ways as if controlled by unknown kinds of waves. Wave-particle duality is the strange basis of mechanics at this level.

To solve the creation problem I therefore postulated the existence of an even deeper level that was truly real to be called 'i-ther'. It had to work on a mechanics similar to that of the macroscopic level. The fact that a high flying physicist, Stephen Adler (2004), has followed this lead suggests this is not considered by theorists to be an unreasonable proposition.

As in the Big Bang Theory everything had to emerge from nothing and that is known as the 'void'. To provide a solution to its problems, however, a totally different approach had to be adopted. In this two opposite yet complementary kinds of energy had to be regarded as existing to provide the energies and waves required for organizing matter. One kind is positive energy but the other is negative simply obtained by reversing the forces of 'action' and 'reaction' in Newton's laws of motion.

These energies had to exist in the form of particles to be called 'primaries' – the ultimate kinds out of which everything else is made.

Just two laws of physics had to be obeyed. The first is the law of conservation of energy. Then since the void has zero energy it followed that only two kinds of energy could emerge and had to do so simultaneously since when added together their sum had to be zero. It was like adding +1 to -1 to get nothing. Indeed this could also happen so that the two could mutually annihilate as well.

So what could determine which case would occur? The answer was that another law of physics called the 'conservation of momentum' had also to be satisfied.

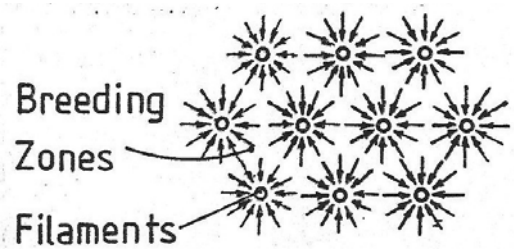

Fig. 6. Annihilation in Cells

Energy and momentum are two quite different things. Energy is the substance out of which all matter and its motion are made. Momentum is the mass of an object, such as that obtained by weighing it out on scales, multiplied by its velocity. Momentum, unlike energy, needs the direction of motion to be specified and in effect can be considered to control the dynamics of energy.

The subsequent study showed that when only two opposite kinds of primary collide at a time, momentum forces energy gains to occur. Both sets of primaries grow bigger at each collision and then at a limiting size, split in two. In this way collision breeding occurs. Analysis showed this to be about 10^{43} times too high – much better than the 10^{120} figure from Big Bang theory and now within a handle-able range. Fortunately it was then found that when large numbers collided from all directions the need to conserve momentum dictated mutual annihilation – something that cannot happen in the Big Bang theory.

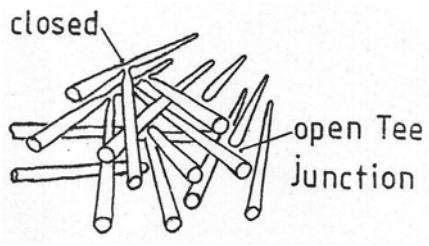

Fig. 7. Annihilation Cores as a Tangle of Filaments

This solved the major problem by reducing the net rate of creation to an acceptable level. What happens is illustrated in FIG.6 and is due to the i-ther becoming unstable. All systems in nature try to fall to the level of lowest energy and such a state arises when flow patterns form spontaneously. This is permitted since a condition has arisen when the net momentum of the entire imploding flow in any cell is zero even before impact – the same value as the void. Then since both positive and negative energies exist the conditions for mutual annihilation are present.

The entire mass of i-ther self-organizes into myriads of flow cells, minute even as compared to the size of quarks. In each of these primaries converge from all directions and form a solid little ball or filament at the centre of each cell where both kinds exist in the state of squeezing each other out of existence. In FIG.7 these 'annihilation cores' are shown as a tangled filamentous structure.

Further self-organization will arise since conditions are ideal for this. It is known from 'chaos theory' as described by the physicist John Gribbin (2005) that an originally random arrangement will spontaneously self-organize when continuously fed by energy. And filaments are fed from the breeding going on around them. Waves will be generated and the hope is that by further advancement the Big Breed theory will be shown able to provide the energies and organizing waves needed for the quantum level of reality.

This might be achievable by analysis using a super-computer. Even if this proves impossible, however, it has been shown that a net small creation will remain that produces an accelerating i-theric growth. In this way a solution to the major problem has provided the acceleration needed to explain Dark Energy as well.

Quite simple maths derives what is known as the 'Hubble Law' that so far has only been found from astronomical observation. The astronomer Hubble showed in 1929 that remote galaxies of stars are receding from us at speeds proportional to their distance from us. The law is written as:

$$v = H_0 D \tag{3.1}$$

The velocity of recession is v given in km/s

D is distance that cosmologists insist on measuring in rather strange units called 'megaparsecs'or M_{PC} and H_0 is the Hubble constant that is presently quoted as 71 km/s/Mpc. To make life easier there are 3.26 million light years to an M_{PC}. Distances need to be given in metres (m) and the M_{PC} needs conversion to basic units before it can be used in equations involving acceleration:

$1M_{PC} = 3.242\times10^{-20}$ s^{-1}. In the next section time is given in billions of years (BY) with distances given in billions of light years (BLY).

There are 3.156×10^{16} seconds in one BY and $3\times10^{8}\times3.156\times10^{16}$ m in one BLY.

The theoretical derivation of equation (3.1), however, also gives an additional equation that defines the acceleration f as:

$$f = H_0{}^2 D \tag{3.2}$$

This means that if the i-ther is imagined as an onion existing as an assembly of thin spherical shells then the pressure inside each shell must be greater than that opposing from outside in order to produce the acceleration. Hence pressure has to fall from a maximum at the centre to the lowest value at the shock-fronted edge.

Cosmologists' base evaluation using Einstein's theories of relativity in which light is regarded as moving independently of any background medium but is locked to the observer instead. Consequently an alternative had to be derived in which light propagates at speed c relative to i-ther. This ECM theory, as it is now called, matches experiments just as well as Einstein's theories. The theory was first published in Russia by Pearson (1991) and is now available in the book, **Quantum Gravity**. The change makes a huge difference at long range. Then followed the publication, again in Russia Pearson (1994), of what is now the Big Breed theory. A publication in America followed, Pearson (1997).

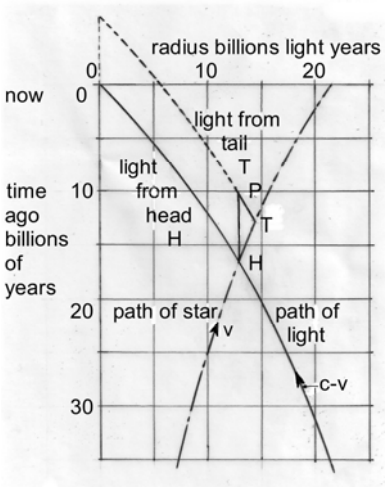

Fig. 9. Starlight Speeding Up as it Approaches the Centre of the Universe

$H_0 = 30$ km/s/Mpc, $Z = 1.75$, $v/c = 0.4$ at star

4. The Impact on Cosmology

The cosmologist Ned Wright (2005) bases evaluation of red-shift and luminosity-distance data on special relativity by having light from a remote galaxy pass through an infinite row of hypothetical observers stretching from that galaxy to Earth. The light travels through a 90 degree turn on its way.

Such an evaluation is incompatible with one derived using ECM theory in which light propagates through an expanding background medium of recession speed v.

Fig. 9, taken from the book, illustrates the problem. It is drawn to scale for a constant value of the speed of light denoted c except that it represents a supernova whose life has been exaggerated many thousands of times. The head of the flash is at H and the tail is at T with the star moving at speed v as measured from the origin.

We imagine a post fixed at H that does not move relative to Earth so that space flows round it at speed v. Light from the tail has to move back to the post before it can travel the same distance to Earth as that from the head. This makes the flash seem to last longer in the ratio of time H to P divided by the time H to T. This represents the 'Doppler Effect' that stretches the wavelength of light to cause a 'red shift'. But notice how the light now has to speed up by exactly the same amount for both head and tail as it approaches the centre point 0. As will now be shown this results in an extra red shift that has so far never been considered.

The light, moving at speed c, relative to space, has to travel against the recession velocity v and so, relative to Earth, will be moving at speed c_0 where:

$$c_0 = c - v = c - H_0 D \tag{4.1}$$

where D is the separating distance, so as D reduces light has to speed up. In ECM theory light has a kinetic mass m_K but no rest mass as required to both produce radiation pressure and couple with gravity. The momentum of a photon therefore becomes $m_K c_0$ and has to be conserved. So as c_0 increases m_K reduces. But we know that relative to space light travels at speed c, and so the following established expressions still apply (in which h is Planck's constant) with only m_K reducing from emitter to observer:

$$E = m_K c^2 = hc/\lambda \text{ and } Z_{SU} = \lambda_O/\lambda_e - 1 \tag{4.2}$$

where Z_{SU} is red-shift due to light speed-up, λ is wavelength, $_O$ observed and $_e$ emitted (after light has returned to the post). Re-arranging we have:

$$\lambda_e = \frac{h}{m_{Ke}c} \quad \& \quad \lambda_0 = \frac{h}{m_{K0}c} \quad \text{and so} \quad Z_{SU} = \frac{m_{Ke}}{m_{K0}} - 1 \tag{4.3}$$

This means that an extra red shift is involved that cannot be included when analysis is relativity based. It is more than twice the Doppler shift and the two 1 + Z values are multiplied together. Consequently the Hubble constant, derived from the same data, is greatly reduced.

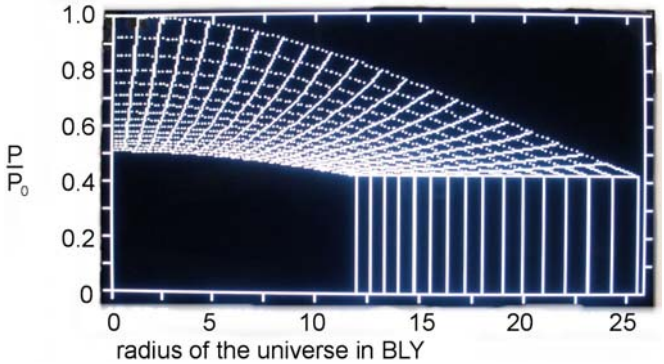

Fig. 10.4. Pressure/Radius Profiles with Path Lines Added. Same Case as Fig. 10.3

To use a computer code based on the Big Breed theory one has to guess a value for the Hubble constant and starting shock front radius at a time 15 billion years ago. The accelerating

growth evolves in billion year time steps to provide 16 pressure/radius profiles. Then, starting from the present, a beam of light is traced back in time almost to the shock front working out red shifts as it goes back. If the result disagrees with observed red shifts then iteration has to be carried out with different input data until a match with observation is achieved. Indeed this is the way observation needs to be analyzed by the new approach.

I now summarize detailed computations from the theory presented as plots photographed from my computer screen but first a little more information has to be imparted.

As the pressure of the i-ther increases the packing density will also increase until primaries have little room to move. This is to be called the 'i-theric liquidus state' at pressure P_L where annihilation exactly cancels the creation still going on.

At a lower pressure P a net small creation will remain; its value controlled by the acceleration produced. Pressures are best given in terms P/P_L.

In Fig. 10.4 showing a pressure/radius plot, however, the scale is P/P_0 where P_0 is pressure at the origin. For all cases P_{SH}/P_L = 0.15 where P_{SH} is pressure at the shock front. FIG.10.4 is based on the best fit so far and uses input data of H_0 = 45 km/s/MPC, r_1 = 12 BLY (10^9LY) i.e. 12 billion light years and E_x = 0.05. The latter gives the speed of the shock front in excess of that of primary particles from the equation $E_x v_p$.

The output gives P_0/P_L = .357 at the origin centre falling gently to P_{SH}/P_L = .15 at the edge where the radius is 25.5 BLY. Pressures near the centre where r = 0 rise as time proceeds far more rapidly than the radius, proportionately, so that before about 20 BY ago the profile is almost flat. Path lines are also plotted showing how, for any primary or galaxy, the i-theric pressure it experiences rises at an accelerating rate as time proceeds.

An important feature is that the theory gives a prediction of the size of the universe: something quite new.

The same data is used to provide the red shifts shown at the bottom of Fig.10.6.

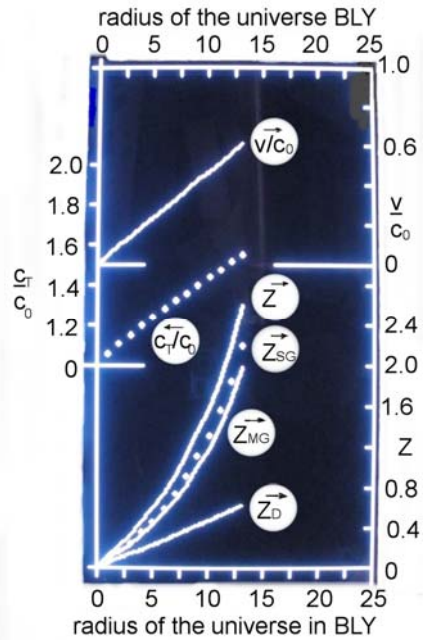

Fig. 10.6. Red Shifts Z Light Speed Ration c_t/c_0 & Regression Speed Ratio v/c_0

Z_D, the lowest curve, is the Doppler shift and the highest curve marked Z is the shift due to the Doppler shift plus that due to light speeding up as it approaches the observer. These curves assume the observer at the origin centre of the universe which is not quite true but near enough as will be argued shortly. There are, however, two blue shifts to take into account. One is caused by the Hubble acceleration having a gravity effect and this drops the red shift to the dotted curve marked Z_{SG}. Then there is a matter gravity shift to Z_{MG} based on an average density of 10^{-26} kg/m^3. The latter gives the value the observer should see.

It is worth noting that Wright (2005) gives 1.755 as the maximum red shift observed so far. He gives this a luminosity distance that converts to between 30 and 45 BLY after processing by relativity theory to give the distance it would be now. However, Aspden (1984) has shown that free electrons in space will reduce light intensity. This would have to be by deflecting photons so red-shifts would not be affected. Any dust would have a similar effect. This suggests Wright's distances are likely to be too great. Even these do not refer to the radius of the universe, however, which most cosmologists consider to be greater by an indeterminate amount.

For total consistency it can be argued, for reasons given in the book, that the two blue shifts are disallowed. In this case an even smaller Hubble constant needs to be input to bring the predicted red shifts down a little. A run of "Un150710" with input H_0 = 33, r_1 = 16 & E_x = .05 yielded r_{SH} = 28 BLY now, bringing it nearer Wright's value. Then
Z = 1.82 at .88 of the distance to the final path line nearest the shock front at r = 14.1 BLY and 15 BY ago. This is the limit of the computation since it is the first profile computed.

Returning to FIG.10.6 the speed of light relative to space actually increases as pressure falls as shown by the curve c_T/c_0 where c_T is that speed divided by the value c_0 at the origin. The huge red shift $Z - Z_D$ arises despite this fact as shown in the book.

The next most important output is the speed v of particles and galaxies moving with space. The value of v/c_0 at the edge 13 BY ago is only .606. This means there is no horizon and that we are potentially able to see right to the edge of the universe. Furthermore since it seems the same size in all directions this means that, although we have no special location we cannot be far from the origin centre. This conclusion is also supported by the near uniformity of the CMB that shows our speed as 400 km/s. The value at the edge is .606×300,000 km/s and 400 km/s is only 0.22% of this value. Therefore we must be well within 1% of the centre as compared to the edge.

This, we consider, justifies the plot given in Fig. 10.6.

5. Conclusion

A solution for the problem of the cosmological constant has been presented that also spins off an explanation for Dark Energy. This depends on an opposed energy dynamics showing how primaries of opposite energies can both emerge from the void and mutually annihilate to vanish again. A net gain predicts a universe in a state of slowly accelerating expansion by deriving Hubble's law and showing the acceleration is $H_0^2 r$. Also when a theory is provided that explains the acceleration the potential for

calculating the size of the universe is available. This makes the radius of the universe, which has to be spherical in shape, about 25 billion light years and with Earth within 1% of the distance to a shock fronted ever-accelerating edge. The latter is colonizing the void.

However, we also realize that further development, which provides a new way of analyzing astronomical red shift and luminosity distance data will be highly controversial. An extra and dominant red-shift has been introduced as consequence of light having to speed up as it approaches. This is not considered when analysis is carried out by relativity theory. It appears, however, as a dominant factor when light is considered to propagate through expanding space and has to move counter to the speed of recession.

In consequence existing methods, based on special relativity, return far higher values for the Hubble constant. Then again established physics regards the universe as finite yet unbounded without a centre and with the position of the Earth anywhere and undefined.

Consequently our theory is likely to meet with considerable opposition.

6. Appendix I - Explaining Collision Breeding

What first needs considering is 'impulse'. Impulse is defined as force multiplied by the time of action of that force and is readily shown to equal change of momentum. Both interacting primaries are subject to the same duration and the same magnitude of the forces acting. Then since the impulse on each is equal to their change in momentum it follows that momentum must be conserved when opposites collide. The momentum of a positive primary, its mass multiplied by its velocity, can be represented by an arrow pointing in the direction of motion. The momentum arrow of a negative primary has the same direction as its force of action: it points opposite motion.

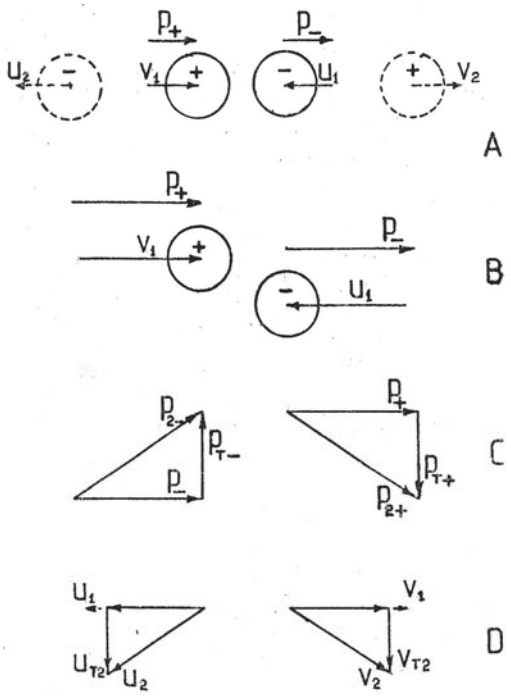

Fig. 5. Breeding Collisions. v,u = velocity, +ve, -ve = energy

Let us now consider two primaries of opposite energies in head–on collision as shown at **A** in FIG.5. The positive mass is moving left to right at velocity v_1. The negative mass moving right to left at velocity u_1 has its momentum arrow p_- pointing left to right and this is the same direction as the momentum arrow of the positive mass p_+: they add up.

There is no way even any partial mutual annihilation could occur since the momentum of both would also reduce. Then momentum would not be conserved. Indeed neither primary could change its energy at all. So they are forced to go right through each other to emerge unchanged. Temporary mutual annihilation followed by reconstitution has to happen as they go.

Next consider the scattering collision shown at **B**. The lines of action are now offset so that each has an extra impulse added that need to be equal and opposite each other so that again momentum is conserved. Then each gains extra momentum. If the collision of a pair is considered in which a component of the added momentum is parallel to the incident lines of motion then it is easy to show that one primary will gain, numerically, more energy than the other. It follows that the momentum added by scattering has to be in a direction perpendicular to the incident relative velocity.

Just as at **A** no change in momentum in the original direction can occur for either primary and so the addition of the scattering momentum vectors increases the momentum of each collision partner.

The transverse momenta imparted need to cancel to zero to satisfy momentum conservation in the transverse direction.

However, each adds momentum vectors of its own kind to its original momentum as shown at **C**. The momentum arrow p_{T+} is added for the positive primary and p_{T-} for negative one. This is not an arithmetic addition: it is called a 'vectorial' addition. This is because the momentum vectors that are being added have different directions from that of the incident momenta. The tail of one arrow is added to head of the other to leave resultant momentum vectors p_{2+} and p_{2-} in Fig. 5 at **C**.

Then at **D** both primaries deflect in the same transverse direction since u_{T2} is oppositely directed to p_{T-}.

Although energy and momentum are very different, since energy represents the amount of substance present and momentum controls the dynamics of that substance, when the momentum of an object is increased, speeds increase and so energy is increased as well. So the need to conserve momentum has forced a balanced energy gain to occur for both collision partners. If added together these gains would of course sum to zero so that energy is conserved. However, we have now found a way for two energies of the universe to self-create from the nothingness of the void without involving false logic and without internal contradiction.

Of course most primaries converge from some angle θ ranging from 0 to 180 degrees and the latter situation is the one so far described. However, by using the standard practice of adding an appropriate velocity to the whole field of interest all possibilities can be made to represent exactly what has been portrayed. The only difference is that the relative velocity of the two primaries represented is now smaller than the velocity with which they converged.

Furthermore hardly any primaries hit head-on or make glancing collisions. Most hit between 1/3 and 2/3 of the way between these limits and scattering occurs in every direction. A careful statistical analysis involving triple integration has shown that, although some collisions will actually lose energy, the gains more than compensate. Indeed if primaries move at not more than about 10% of their ultimate speed then the maths shows that the average gain is 20% of the initial kinetic energy of the participants added numerically (ignoring the negative sign). The gain ratio falls to about 11% when speeds have their ultimate value. Spinning motions have also been studied and found to add almost the same net energy gains.

These gains make the primaries move at ever faster speeds. However, spinning motion acts like rest mass and the tendency of equilibrium to arise between linear and kinetic energies provides a limit on the maximum speeds reached. This limitation has pinpointed the average speed of primaries to be about 70 percent of their ultimate speed: the speed they would have if travelling at the i-theric equivalent of our speed of light.

However, primaries are not matter and so are not limited to our speed of light. To fix their average speed resort to an experiment had to be made. This was the astronomical observation of close binary neutron stars made by Taylor and Hulse (1975) and as described by Will (1988). This showed an energy loss due to the radiation of gravity waves that Einstein assumed to move at the speed of light. ECM theory shows these must also be pressure waves propagating through the fluid component of i-ther. This requires the average speed v_p of primaries to be 1.464 times our speed of light.

It follows that, on average when opposites collide, both gain energy of their own kind and, since the energy density of primaries will not change, size will increase bump by bump. There has to be a limiting size. For example raindrops can grow up to a critical size; then they split into smaller drops. Similarly, primaries will grow until they split. In this way a collision breeding process will develop. This is the basis of the Big Breed theory.

From collision rate analysis based on the research of Jeans (1887) the calculated breeding rate worked out at about 10^{43} times that required for the expanding universe. This improves on the 10^{120} factor of the Big Bang and now brings the problem within handling range. Furthermore mutual annihilation can now arise to cancel the excess in our theory to provide a complete solution.

7. Appendix II – Hubble's Law Derived from Universal Net Creation

Primaries occupy a greater proportion of space as pressures increase but annihilation has the opposite effect. With perfect cancellation assumed the perfect gas law will apply given by:

$$PV = \tfrac{1}{3} n m_p v_p^2 = \tfrac{1}{3} v_p^2 m \quad \& \quad d(PV) = \tfrac{1}{3} m_p v_p^2 dn = \tfrac{1}{3} v_p^2 dm$$

Here v_p is the average speed of primaries that remains constant everywhere, m_p is the average mass of a primary and n is the number of primaries. Then $m_p dn = dm$ the change in mass. It then follows that with a constant net creation rate C_{NA} assumed:

$$\frac{dm}{m} = \frac{d(PV)}{PV} = C_{NA}\, dt$$

Differentiating by parts $d(PV) = V\,dP + P\,dV$. Then dividing by PV we have:

$$\frac{dP}{P} + \frac{dV}{V} = C_{NA}\, dt \tag{5.1}$$

Now the only possible shape for any medium, such as i-ther, driven to expand by a net creation everywhere, is a sphere. This is because, as will soon be proved by the following derivation, the expansion must accelerate: it is like an explosion in very slow motion. In order to provide the pressure gradients needed to produce the acceleration, pressures will always maximize at the central origin point, and fall off toward the growing edge. For a spherical shape the volume of the sphere can be differentiated with respect to radius so that since:

$$\begin{aligned} &V = \tfrac{4}{3}\pi r^3 \quad \text{Then} \quad dV = 4\pi r^2 dr \\ &\therefore \quad dV/V = 3\,dr/r \end{aligned} \tag{5.2}$$

It follows that by substitution in (5.1) and presenting in integral form:

$$\int_{P1} \frac{dP}{P} + 3\int_{r1} \frac{dr}{r} = \int_0 C_{NA}\, dt$$

which, after dividing throughout by 3, integrates to yield:

$$\frac{1}{3}\ln\left(\frac{P}{P_1}\right) + \ln\left(\frac{r}{r_1}\right) = \frac{C_{NA}}{3} t$$

This can be re-arranged to yield:

$$r = r_1 \left(\frac{P}{P_1}\right)^{-\frac{1}{3}} \exp\left(\frac{C_{NA}}{3} t\right) \tag{5.3}$$

This is where a difficulty arose that was not resolved for many years as described in the book. It was found impossible to properly evaluate the pressure term. Not until 1st July 2010 did Eureka Day dawn when simplification appeared that resolved the matter completely. Briefly as pressure increases so does the number per unit volume increase with consequent increase in breeding rate: so $C_{NA} \propto P$ initially. But this is multiplied by a term $P_L - P$ since at liquidus pressure P_L, the net rate of creation reduces to zero. The result is a creation/pressure curve that is roughly an inverted parabola but the accurate result shows the peak to be at $P = .43\ P_L$. It was found the reason calculations had been going divergent was that with P/P_L around .01 the energy supplied by net creation exceeded that required. When $P/P_L = 0.3$ the converse was true and pressures had to reduce. Only at $P/P_L = 0.15$ did supply and demand match. This meant the i-ther would stabilize at this pressure and grow with a shock-like sharp fronted edge having pressure P_{SH} in which $P_{SH}/P_L = .15$. It then transpired from pressure gradient evaluation that up to the present era supply matched demand to better than 1% accuracy from the central origin point where $P = P_0$ to the edge, even though, as appeared from the theory, $P_0/P_{SH} = 2.5$ to 3.0.

This meant that the original first approximation that ignored the pressure term had been giving the correct prediction all along! In consequence an accurate equation that holds up to the present era and for about the next billion years is:

$$r = r_1 \exp\left(\frac{C_{NA}}{3}t\right) \tag{5.4}$$

Which yields velocity $v = dr/dt$ on differentiation to yield:

$$v = r_1 \frac{C_{NA}}{3}\exp\left(\frac{C_{NA}}{3}t\right) \tag{5.5}$$

Substituting from equation (5.4) in (5.5) yields:

$$v = \frac{C_{NA}}{3}r \tag{5.6}$$

This is Hubble's Law $v = H_0 r$ and so the 'Hubble constant' H_0 is related to the net volume creation rate by:

$$C_{NA} = 3H_0 \tag{5.7}$$

Differentiating (5.5) to obtain the acceleration $f = dv/dt$ yields:

$$\frac{dv}{dt} = r_1\left(\frac{C_{NA}}{3}\right)^2 \exp\left(\frac{C_{NA}}{3}t\right) \tag{5.8}$$

after substitution from (5.4) and (5.6) this yields:

$$f = H_0{}^2 r \tag{5.9}$$

Hence it appears that when continuous creation is involved Hubble's law is predicted in which the Hubble constant does not change with either time or distance. The theory also leads to the prediction of a universe in a state of ever-accelerating expansion. This will subsequently be called 'Hubble acceleration'. Then since the Big Breed theory is able to solve the major problem of the cosmological constant the accelerating nature of the expansion has appeared as a spin-off consequence.

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