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Winds of Change in the Cosmos

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This note summarises my recent analyses of the Solar System, and brings to the argument the conclusions of recent papers in the literature which suggest that the current model of the cosmos may be far too simplistic.

A Universe which expands from a point in all directions, with stuff receding from stuff, creating time and space as it goes, implies a symmetry or balance over the entire space of the cosmos at each instant of its evolution. There must be a balance, because the Universe cannot be lopsided; lopsided with respect to what? Not the Earth surely! The only variable is the time which has elapsed since the beginning of the expansion. If you took a slice through the diagram of the cosmos by rotating its diameter at a specific time, you would find it to be symmetrical in any direction from its centre.

This symmetry is the fundamental hypothesis of the model. It allows it to be expressed in mathematical equations which apply to the whole cosmos. It does not specify where particular phenomena occur during the process of expansion, but only when. Thus inflation, for instance, occurs at a particular stage of the expansion process for the entire Universe, and in the long term the lights go out and all that is left is waste and void, because there is no end.

By contrast, my model proposes a Universe which has time and space, time for alignments to form, time for redistribution by the perpetual movement of stars and by stochastic collisions and explosions, and time for regeneration by nuclear fusion and fission, all driven by the perpetual force of gravitational attraction (1). Gravity is a Universal given, from which no stuff is immune. This is a model based on measurements of specific observed processes, rather than cosmic mathematical formulations.

My previous paper suggests that the solar system is like a giant capacitor (2). The Sun is perpetually blowing stuff out into space as from a nuclear cauldron. This material continually falls back under the influence of gravity. Some at least of the ejected stuff consists of charged particles, which are accelerated by the magnetic fields seen to cover the Sun's entire surface. Charged particles have been found travelling in the Earth's atmosphere and in the space beyond by practical measurements, both from satellites and on the ground. These particles have been identified as protons and electrons. Protons will be accelerated radially far out into space, slowing all the time because of the pull of the Sun's gravity, before falling back into the Sun. (If not, why not?). Electrons will also be accelerated into space. These will reach velocities close to the speed of light, because an electron can reach such a speed after only a few metres along experimental accelerators on Earth. This is what simple mechanics suggests must be occurring naturally.

Such a process is a dynamic equilibrium (3), quite different from the conventional model of a star which burns straight down to a cinder, and it makes a nonsense of the 'law' of entropy as applied to the Universe. There is certainly local change of entropy in parts of the system, but none in the Universal system as a whole, because the input of the forces of gravitational attraction, which is given or exogenous, maintains the system in a steady-state indefinitely. There is no creation or destruction of stuff; it is all given. Stuff that falls back into the Sun, including particles, is then absorbed into the plasma and formed into nuclei. It becomes engaged in both fusion and fission reactions which are the cause the heat of the Sun. There is no reason to suppose that nuclear fission does not also take place in the Sun through collisions etc. This too has been achieved experimentally on Earth.

What is conserved in this model is the mass embodied in particles of stuff. The equilibrium is akin to the law of mass action which occurs in chemical equilibria. The star is in effect an island from which nothing is lost except electromagnetic radiation. This is generated by the acceleration of electrons, and so it is replenished continuously by the action of gravitational attraction as it pulls particles together and increases temperature and pressure.

Change certainly occurs because stars come in all sizes and colours, and new stars are continually being formed from clouds of hydrogen under the force of gravitational attraction. The law of mass action suggests that this diversity arises from the exchange of stuff between stars, mass gained either from actual deposition or by one star stripping matter off another in near collisions, because it is an observation that stars are continually moving with respect to each other. The colour of a star then depends on the mass which it has been able to collect or lose at a particular time. The Hertzsprung-Russell diagram is the record of a star's collision history rather than its consumption of fuel. In the extreme, of course, supernovae explosions occur when enough mass has been accumulated by a star to cause it to explode and redistribute its stuff. This is a matter of observation.

The result of this dynamic equilibrium will be a proton shell around the Sun, where protons finally come to a halt and accumulate before they begin to fall back into the Sun again. This shell would be much further out than the larger agglomerations of stuff which telescopes detect. Electrons too will be ejected into space in the same way but further still, because an electron's mass is only one 1840th of that of a proton. These will be not 'cosmic' particles or 'rays', but particles of solar origin. Thus electrons will form an electron shell much further out into space, before falling back through the proton shell into the Sun. The result will then be that the Solar System will have the form of a giant capacitor, a negative electron shell outside a positive proton shell.

Ejected electrons and protons could, of course, associate to form hydrogen atoms when they are closer to the Sun and to each other i.e. their 'gaseous' densities are high, but their combined masses would mean that the atoms would not travel as far.

There seems to be no reason why the same model should not apply to all active stars, and perhaps some other forms of stars too. If the electron-rich space extended far enough, it might interact with the electron shells of other stars in the 'vicinity'. This

could supplement or even account for the interactions between stars which give rise to the phenomenon of galaxy formation.

If this seems to be extremely speculative, it should be noted that all the processes which are proposed so far are based on observations and known elementary mechanics, but there are recent papers which add weight to the argument for a change of paradigm. For example, with my comments in brackets:

- ESA's Planck satellite has detected the interaction between interstellar dust in the Milky Way and the structure of our Galaxy's magnetic field (December 2014). Interstellar clouds of gas and dust are threaded by the Galaxy's magnetic field, and dust grains tend to align their longest axis at right angles to the direction of the field. As a result, the light emitted by dust grains is partly 'polarised'. (So the Galaxy has a magnetic field. An even bigger capacitor structure? What is clear is the there are links between stars in the Galaxy.)

- Physics News of the IOP November 2014 reported a new study of background light which suggested that a large proportion of stars, perhaps up to a half, were not in galaxies at all. They were in intergalactic space. (This is pattern differentiation which seems difficult to explain in a single mathematical model of the Big Bang process with stuff emerging from a sort of Universal plasma).

- A dark flow of galaxies was reported in October 2014. When the cosmic microwave background and the Milky Way were removed from a synoptic view of the sky, what was left revealed galaxies which all seemed to be flowing away to a point. (This might suggest some sort of co-ordination, gravitational or electromagnetic).

- New observations November 2014 with the European Southern Observatory's Very Large Telescope (VLT) in Chile have revealed alignments of the largest structures ever discovered in the Universe.

- A European research team with the VLT found that the rotation axes of the supermassive black holes in a sample of quasars are parallel to each other over distances of billions of light years. The rotation axes of these quasars tend to be aligned with these vast structures in the cosmic web in which they reside. (Some kind of electromagnetic interaction? This is in a Universe alleged to be only 14 billion years old!).

- The mass of dark matter, which is spread along the arms of galaxies, has been found to be proportional to the mass of their central black holes. (What does this mean for the significant proportion of stars which appear to be quite separate from galaxies. Do they not have dark matter, and if not, why not?)

- A paper by the Rensselaer Polytechnic Institute 12 March 2015 using the Sloan Digital Sky Survey 2002 finds that the Milky Way galactic disc is contoured in several concentric ripples. The proposal seems to be that a very large mass, possibly another galaxy, passed through the disc at an angle some distance from the centre, pulling stars up towards it as it approached, and then pulled other stars down towards it as it left. This must have occurred after the

galaxies had formed. They then travelled the distance towards each other through space on a 'collision' path (all of which would have taken a time which was long even by astronomical standards).

- This is reminiscent of the origin of the heaviest metallic chemical species on Earth. These are thought to have been formed in distant supernovae explosions, and they travelled through great distances to become involved in the formation of Earth (a time which is by definition much longer than the age of the Solar System).

If substantiated, all these observations, and undoubtedly others, suggest the existence of much larger structures in the Universe than a single event and the process which follows from it could account for, even with the imposition of alleged ripples in space-time. Such structures must certainly require the interaction of systems over periods of time which are long even by astronomical standards.

At a more 'local' level, measurements show that the temperature of the Sun's corona is very much higher than the temperature of its surface according to the electromagnetic frequency of light emitted i.e. the 'light' is very much bluer. The light is correlated with the temperature scale by reference to radiation emitted by a black body over the range of temperatures. This indicates that there must be a process going on inside the region of the corona. My explanation is that particles are emitted from the surface of the Sun's plasma at a high velocity, and then accelerated into space. Acceleration from a high velocity would produce radiation of much higher electromagnetic frequency, according to my previous analysis of inertial resistance by the medium of space (4). In other words this confirms both the existence of particle accelerators on the surface of the Sun, as indicated by observed magnetic fields, and the existence of the medium of space itself with electromagnetic properties.

The backbone of the theory of the expanding Universe is redshift of light emitted by stars, defined as the proportional increase of wavelength compared with radiation produced by excited atoms on Earth in, say, the laboratory. Hubble discovered that the further away the star, the greater the redshift. This was immediately compared with the Doppler effect on sound waves, and construed as indicating that the stars must be moving away from us i.e. the light waves were being stretched out. Later, when it was pointed out that light and sound were different phenomena, this was reinterpreted to mean that they were being stretched out by the increasing distance between stars as the Universe expanded. Somewhat anomalously this applied between but not within galaxies.

Thus the argument became circular; redshift was proof that the Universe was expanding, and it was the expansion of the Universe which caused redshift. Believers point out that a graph of redshift versus distance is an absolutely straight line. This is not surprising because both the ordinate and the abscissa are the same: the proportional increase of wavelength. If you believe that the proportional increase of wavelength indicates distance, then the relationship between redshift and distance must be a straight line, and if you believe the application of Doppler to light, then the Universe must be expanding. Ratios such as used in the definition of redshift make reasoned mathematical analysis impossible.

Hubble himself did not believe that his measurements proved that the Universe was expanding, and Einstein never convinced himself that light was a wave. He won his Nobel prize for showing that it was in fact a particle. But he hedged his bets and compromised on 'wavicle', which has since become the more dignified 'photon'. Where we can agree is that the velocity of light *in vacuo* is constant.

My analysis showed that light was indeed a particle (5). Moreover, particles of light each travelled at the maximum attainable velocity, the constant velocity of light *in vacuo*. The consequence of this is that light particles on the same trajectory can never meet or communicate either with each other or their source, or obviously with their ultimate detector, which they do not know exists. Communication even at the speed of light would not work. Thus light particles cannot interact unless they happen to be on collision courses and deflect each other, which is the basis of diffraction. This is the difference from the Doppler effect in gases; gases consist of molecules that can impinge on and collide with each other in transit, which is how they exert pressure. When atoms at the source of sound are displaced, they collide with adjacent atoms in the direction of motion. These collide in their turn with the atoms adjacent to them, and so the movement travels through the gas giving the appearance of a wave, because of their co-ordinated emission at the source. Light particles on the same or even parallel paths can never interact.

The current interpretation of redshift is essentially anthropocentric; it starts with the observer on Earth. But stars do not know of our existence. Better to start at the source of the starlight rather than on the Earth, avoid ratios, and use electromagnetic frequencies rather than confusing wavelengths. So the star emits light which must have the same electromagnetic frequency as on Earth, because the Periodic Table of Elements is Universal. Otherwise energy levels and the whole of chemistry, which is the source of all natural phenomena, would be dependent on locality. Light particles have energy which is proportional to their electromagnetic frequency, according to Planck's equation. Light which arrives on Earth with a lower electromagnetic frequency must therefore have lost some energy on the way, probably by electromagnetic induction with the medium of space. It would lose most energy when it had most i.e. at the beginning of its journey, close to the star. Its loss at each stage would be proportional to its energy at that stage, which is in fact an exponential decrease in transit (6).

The constant of exponential decay can be calibrated against real distances measured trigonometrically. The same exponential decrease applies to all stars in all directions, not just those which shine on the Earth, because light of all colours was seen to travel at the same velocity through space in early astronomical observations. If their light starts at different electromagnetic frequencies, it simply begins its decline at a different point on the same Universal curve. One consequence of this process is that all light from stars which is not intercepted by a detector steadily degrades into microwaves, a cosmic microwave background.

The significance of the exponential curve is first, that it confirms the existence of a medium of space which has electromagnetic properties, and second, that it considerably reduces the estimated distances of stars from Earth because of the steep decline of electromagnetic frequency close to the star. This brings the furthest observed stars in from an estimate of about 14.7 bn light years to a distance and time

which is not much more than the age of the Solar System, if at all. The conclusion would be that the furthest observable stars and our Sun were more or less contemporaries. But there is no possibility that any occurrence at this distance like a Big Bang could create our star, and indeed all the stars which can we observe from Earth around us, at the same time at the event occurred. They cannot be simultaneous. The velocity of light *in vacuo* rules that out. Thus the calculation from conventional redshift ratios of wavelengths which gives rise to the Big Bang theory is null and void. The evidence is that the Universe is infinite in time and space; the part of it which we can observe is determined by our instrumentation, which is continually improving.

The further consequence of shorter distances is that all interpretations of measurements may need to be revised. For instance, the estimated quantity of dark matter in the Universe may be much less if curvatures of orbits of stuff and other parameters change. Of course, the need for dark energy disappears altogether, if the Universe is not expanding.

That is not to say that there are no Big Bangs. Explosions seem to be happening stochastically at the rate of several a day all over the part of the cosmos which we can observe with current instruments. They occur wherever a star accumulates enough mass to explode and spread its particles of stuff throughout the Universe to begin the process of accretion again.

The observations quoted here seem directly to contradict the basic axiom of astronomy that the Universe is isotropic. The hypothesis of isotropy is that the same phenomena are observed in every direction in space at a particular time, and the stars and galaxies which we see are features which just happen to occur in our locality. However, the structures which have been observed suggest a more differentiated cosmos. Within the limits of our observation, there might be individual stars in one direction, but a river of stars in another, which implies flow, or long highways of galaxies in some kind of formation in yet another. Other galaxies have apparently linked axes of rotation, and even in our own galaxy interstellar dust may form a magnetic bridge between its stars. All forms of structure show that the Universe is anisotropic in the part which we can observe, and there is no hope of a mathematical solution to encompass them all. Of course an infinite Universe must be isotropic at the very limit, or it would be lopsided, but that viewpoint is also an infinitely long way off.

What supplies the feedback which maintains this steady-state Universe is gravity. The bodies of the Universe are composed of particles of stuff in all their manifestations. The essential feature of a particle of stuff is that it is attracted to all other particles of stuff with a force which can be measured, namely, gravity. The origin of the force is the spins of the particles of stuff. It is the same force that pulls particles of stuff together to form stars. If enough come together, the pressures are such that the star explodes and the particles are thrown, separated but unchanged, all over the Universe. They are unchanged because there is nothing in which to decompose; they are the fundamental building blocks. This is the feedback which maintains the steady-state.

The origin of gravitational forces is the subject of much speculation and invention. Ultimately Einstein concluded that it was not a force at all; it was merely curvature of space-time, if you believe in space-time.

Space-time is not a feature of this paper. My analysis suggests that the medium of space must itself be particulate. My proposition is that space is composed entirely of microgranules that are much smaller than anything which physics observes, with axes which are randomly oriented but susceptible to alignment by electromagnetic induction. The process of aligning microgranules requires no energy, and changes of alignment travel through space at the speed of light (7). It is this alignment that conveys forces between spinning particles of stuff. When particles of stuff move with respect to each other e.g. under their own momentum, the forces between them change. Since all particles attract all other particles gravitationally, such changes must eventually permeate throughout the whole Universe.

However, this adjustment cannot reach every other particle of stuff in the Universe instantaneously. Hence my proposition that the rate at which it occurs is the speed of light. This would not be surprising, because my model of a particle of light is that of a disturbance travelling through the medium of space by electromagnetic induction. This velocity is the fundamental characteristic of the process of electromagnetic induction of the microgranules of space. On this basis it is possible to construct a theory of gravity (8, 9), but that has not been the purpose here.

The analysis and evidence of this note show that it is increasingly apparent that there are more things in heaven and earth than are dreamt of in the current, simplistic paradigm of the cosmos. The conclusion is that the more differentiated the cosmos predicted in the new model, the greater the opportunities for new measurements and new instruments to formulate the latest best provisional paradigm.

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