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ORGANIC MOLECULES AND THE ORIGIN OF THE SOLAR SYSTEM

by

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Introduction

The ubiquitous nature of organic molecules, in so-called molecular clouds, throughout our galaxy has been a source of mystery and excitement since their discovery about two decades ago. What is their message? Where do they come from, how are they produced, do they have any possible relation to life? These are some of the questions that are being asked. Speculations by theorists abound.

Taking a cue from the "unified" approach to science, I wish to explore the mystery from our local vantage point, the solar system. After all, the sun and its retinue of diverse objects constitutes part of the galaxy. In the sun's local environment there are in fact four distinct places where organic molecules are found: the earth, the comets, the carbonaceous chondrites and then the interstellar medium. Is there a connection between these diverse objects? I believe the answer is not only in the affirmative but in fact will guide us in finding the required relationships.

The Challenge

First, we shall challenge the present, unproven paradigm of astronomy: The solar system is the end product of the collapse of one such molecular cloud. Let us enumerate the many problems of the theory: (1) Dynamical (a) the distribution of the angular momentum in the solar system, with the sun retaining 2% and the major planets 98%. (b) The retrograde motion of 7 members of the solar system: 4 satellites of Jupiter, one of Neptune and one of Saturn; and Halley's comet. (c) The peculiar rotation axis of Uranus. (2) The whereabouts of a "giant vacuum cleaner" to remove the intervening dust and gas in the solar system, subsequent to its formation. (3) A rhetorical question: why would nature first create a so-called molecular cloud, then destroy it in the process of solar system building and then recreate it in special locations? (4) The origin of the Oort cloud of comets. (5) The greatest embarrassment, of course, is the lack of direct observational astronomical evidence of cloud implosion. The overwhelming observational evidence points to explosions, not implosions. Here are some other important considerations: (1) The atomic abundances or "fingerprints". viz. the one to one correspondence on a log-log plot of the atomic abundances of the elements on the sun versus abundances on the earth and the chondrites. The evidence clearly points to a common origin. Now nucleosynthesis can only be done inside the hot furnace of a star. Our present sun is not hot enough to accomplish this. So the argument is made that our solar starting material was ejected via a supernova explosion. But this is clearly an explosion, not implosion. The usual answer out of this dilemma is to invoke two simultaneous supernova explosions, in close proximity of course! This requires two rather rare miracles!

Let us consider another model: My hypothesis is (1) our sun was far different four and one-half billion years ago; a heavy super giant (capable of nucleosynthesis) that underwent nova like explosions. (2) that all the material constituting our solar system was once indeed inside the sun (hence the common abundances). (3) By postulating a simple model for successive proto planet orbital velocity on the surface of the sun prior to each nova explosion, Bode's law can be derived, by merely invoking conservation of orbital angular momentum.

The gamut of organic molecules are postulated to be produced in secondary processes via smaller hot bodies by the "Hodgson" laboratory demonstrated process of plasma jets. I believe the comets are such sites, and that the carbonaceous chondrites are comet nucleus fragments. Our main thrust in the model is to bring most of the observational evidence into a cohesive whole, rather than having a fragmented store of unrelated facts.

The assumption is made that our sun and its planetary and chemical evolution is not a unique event in the long history of our galaxy but undergoes a rather normal kind of development process. From the vantage point of seeing the end result, we hope to infer in part the intermediate steps by astronomical observations of (1) interstellar molecules and related clues (2) so-called dark companions of nearby stars, suggesting other planetary systems (3) study of recurrent nova. (4) the incredible evidence of highly complex organic molecules in carbonaceous chondrites. These include six biological amino acids as well as porphyrins. (5) The strong evidence for a specific non-biological porphyrin in the interstellar medium (first postulated by the author in 1969).

<u>The Origin of the Solar System (Johnson's Hypothesis)</u>

This new model involves the following assumptions:

1. It is assumed that the original sun developed from a small, massive, neutron-star-type-core, whose mass was approximately a hundred times the present solar mass. it will be shown that this initial mass can be deduced from information about the planets. The message of how the solar system originated is written in Bode's Law.

The neutron core surface would emit neutrons which would become, via the well-known neutron decay mechanism, protons, electrons, and neutrinos, and build up a gas cloud around a massive, fast rotating core. The radius of the protosun would roughly correspond to the span of Mercury's orbit. From afar, the sun would appear as a super giant whose luminosity would be slightly more than a million times the present luminosity of the sun. This protosun would now proceed to develop in stages. All the stages that the sun would go through are exhibited by some of the many stellar phenomena. These include a variable star, recurrent nova, and, finally the sun would end up as a G2 spectral class on the Main Sequence. Its initial spectral class could presumably be all the way in the top left hand corner of the H-R diagram. Stars in that region of the H-R diagram are presently recognized as O type or Wolf-Rayet stars, which are rare stars, for reasons which we are now beginning to understand. These hot stars also have very high rotational speeds, as exhibited by broadened Doppler lines originating from their surface atoms. The initial protosun was certainly spinning very rapidly. The rapid outside surface rotation is a strong indication of the inner-neutron star core spinning at an enormously high speed. Possible stages in the development of the core: namely its fission, then the breakup of one of the fission components possibly a multi-ring type structure composed of very tiny components. Each component, or DEB, is tightly bound and also spinning, being stable enough to survive as its own entity. We shall call each of these tiny spinning objects a DEB, which is an acronym for developing bodies. We presume that there are millions of these DEBs rotating about the stellar core. These DEBs have densities corresponding to nuclear matter. They, too, have opportunities to develop. During this phase of the core development, one larger DEB would spin out and spiral toward the surface of the protosun. There are two possible mechanisms for this spin out. One is a type of plasma interaction that can be duplicated in the laboratory. These plasma type interactions result from proton and electron emissions and core magnetic fields. This protoplanet DEB would achieve orbital velocity at the surface of the protosun; i.e., at a distance of about 0.4 A.U. The other spinout mechanism results from the kinetic energy released by the successive fissioning of DEBs.

2. Next, comes a rather dramatic development whereby the inner core DEBs revolving around the central core no longer maintain stability in their orbits and are suddenly ejected (Nova). We will have to come back to the process that allows them to do this, however, their speeds have to be high enough to allow them to escape in all directions. As soon as these DEBs have passed the outer surface of the protosun, the first protoplanet already on the surface, would increase its orbit, actually double the size of its orbit. Since half of the central mass has disappeared, only half of the force is acting to hold it in gravitationally. To see why the distance would be doubled, consider the equation below:

$$J = m\,[G(M + m) \cdot d \cdot (1-e^2)]^{\frac{1}{2}}$$

This equation gives the angular momentum of the system. Note that it contains the distance d as well as the mass of the central core M and the mass of the orbiting planet m. Since the mass of the orbiting planet is much smaller than the core's mass, one can ignore it for present purposes. For simplicity, we shall also ignore the eccentricity factor, e, and assume that e is close to zero (circular motion), which would simplify the equation somewhat. For purposes of completeness, one can easily consider those factors as well, later on. The equation reduces to a simpler form:

$$J = (\text{const})\ (M\ d)^{1/2}$$

It now becomes apparent that as soon as the mass of the core is halved, in order to maintain the same angular momentum, the distance, d, has to be doubled. The physical principle which is used here is the principle of conservation of angular momentum. Since the angular momentum of each planet has to be conserved, one can readily see that, by successively changing the mass of the core, the distances of each planet will increase in stages in proportion to the fractional change in stellar mass.

3. So far, the discussion demonstrated the launching of one typical planet. The complete sequence of planet launchings is merely a repetition of the above steps. At every intermediate resting stage of the core, a protoplanet leaves the core region and spirals out, achieving orbital velocity on the protosun surface. This is followed by the fission (division) of the stellar core and its subsequent explosion in a process very similar to the one described for the first explosion. The nova explosion comprises the leaving of hundreds of millions of DEBs from the sun. When the DEBs pass the orbital position of each planet, their distances increase from the core in proportion to the fractional change in stellar mass. Let's postulate that the core fissioned and divided exactly in two equal parts, so that one-half the mass is lost at each nova explosion. The

planetary distances are approximately doubled, correspondingly, subsequent to each nova. This process also implies that when three planets are already in various orbits, the distances for all these 3 planets are doubled as soon as the DEBs pass the farthest planet. In actual practice, each planet begins to move out as soon as the swarm of DEBs have passed the planet's position in orbit.

The overall process is controlled of course, by the gravitational attraction of the protosun. The motion of the planets in orbit is governed by the total stellar mass *inside* the planet's orbit. Any mass that is outside their orbit does not gravitationally effect the planets anymore, and can be ignored.

This is the basic principle by which, in successive stages, all the planets were launched and also, in successive stages, made to move out into more distant orbits.

To illustrate this launching process in detail, let's observe what happened when Venus was about to emerge. At the time when Venus is ready in orbital velocity at 0.4 A.U., the remaining core mass is only 1/128 of the original stellar core's mass Mo. Proto- Venus had spiraled to the surface of the protosun. At this pint,we shall postulate that substantially most of the remaining core will disappear. Incidentally, there is never an exact doubling of distance because of the (M/n + 1) factor, $(1 + M_o/128)$ for the case of Venus. The 1 in the factor is proportional to the remaining mass of the sun, including its gaseous envelope. Each planetary distance subsequent to Venus' Nova increased in proportion of[1 + M/128]to 1, which corresponds to 1.75. To repeat, distances at each explosion do not double, but for Venus increased by a factor of 1.75.

Finally, when the last remaining protoplanet,Mercury, spiraled onto the protosun surface, there were no more nova explosions necessary (or possible). Mercury launched itself at the protosun surface. That's all.

Since the main core now had essentially disappeared (only a vestigal core remained) and the temperature that was generated from the inside nuclear core was no longer sufficiently hot to maintain the giant size stellar radius, the protosun stellar orbit shrank to the present size of the sun. Mercury, however, remained in orbit.

One of the proofs for this theory would be that of the inclination of Mercury's orbit. It is 7°0'; the inclination of the sun's equator to the ecliptic is 7° 15'. This result is to be expected if there was no explosive event (Nova) for Mercury's launching, which would have slightly altered the orbital plane of the planet. Orbital planes of the planets can be easily altered as a result of an unsymmetric type of explosion or if a sufficient number of DEBs were to hit a planet to alter its path. With the exception of Pluto,all planet orbits are indeed almost in the same plane. The fact that Mercury's orbit and the sun's equatorial plane are coplanar is good evidence for the (Johnson) hypothesis.

Table 1 shows the results of applying the above analysis (equations) in a systematic fashion.

TABLE 1

Assumed Protoplanet Mass m	Actual Distance	Calcul. Distance	% Error
Pluto	39.44	38.1	+3.3
Uranus	19.18	19.2	0
Saturn	9.54	9.8	-2.7
Jupiter (0.2)	5.20	5.2	0
Ceres	2.77	2.75	0.6
Mars (0.1 return)	1.523	1.52	0.2
Earth	1.00	1.00	0
Venus	0.723	0.73	-1
Mercury	0.387	0.393	-1.5

Note that Bode's Law can be obtained easily from this theory. Table 1 also lists the actual planetary distances. The theoretical analysis requires the following assumptions: (1) There were eight nova explosions, (2) the protosun maintained its initial giant radius at 0.4 A.U. during all the nova phases, and (3) the protoplanets achieved orbital velocity prior to each nova. This provides eight equations with only two unknowns, namely the initial size of the orbit and the initial protosuns core mass. There are, therefore, 8 over determined equations. Consequently (in principle), one can extract much more information from them. The final results are that the sun's original mass was 96 times the present mass; its initial radius was essentially that as given by the present orbit of Mercury.

The cause for the large number of meteor craters becomes apparent. See the planets for which pictures are available: the moon, Mercury, and, to a lesser extent, Mars. Mars and the Earth, however, have been substantially altered by weathering effects, not so the moon or Mercury.

Cratering would have occurred by the outgoing DEBs, as well as by those DEBs that never quite "made it" and eventually came back. "Those that made it," refer to the DEBs that actually left the solar system entirely, or achieved orbital velocity at distances between 50,000 to 100,000 A.U. from the sun.

Let's follow the life story of the DEBs a little further. Each planetary object launched in orbit, as well as each of the DEBs, proceeds with its own life and its own development phase. There may be as many as a billion DEBs. Each ejects gases, atoms, and molecules. It develops, eventually ending up as an object that we recognize as a comet.

Jupiter, Saturn, Neptune, and Uranus require further discussion. Jupiter, prior to its evolution, actually had sufficient mass to be characterized as a star. Its mass was roughly 2/10 (to 4/10) of a solar mass. The sun, at that point, was in fact, a multiple system, particularly if one includes Saturn, Uranus,and Neptune prior to their development. The other outmost protoplanets were not as brilliant in their stellar radiation as Jupiter undoubtedly was. In the meantime, Saturn, Jupiter, etc., went through development stages similar to those of the protosun. They each, also, ejected their own DEBs, and launched a complete satellite system. These satellites can be used to reconstruct (backwards in time) the original mass of the sun, as well as Jupiter. Indeed, using the initial masses of Jupiter and Saturn, one can reexamine the original equations which were used to describe the angular momentum of the planets associated with the protosun. The next refinement involved the mass of the core plus the mass of the planet. It turns out that the mass of some of the protoplanets, particularly Jupiter, was not inconsequential in comparison with the original core mass (about 0.2M.). Consequently, we can improve on the precision of predicting distances. Once this is done, one achieves good agreement with the positions of all the planetary orbits!! A very convincing argument in favor of this theory is shown in Table 1.

We shall now derive a law which was on the books for 200 years without anyone appreciating its physical significance. in fact, it was recently denied its official "law" status (shades of astronomical star chamber disbarment procedure!). The argument for denigrating it to the lower status was: "We have not the foggiest idea of its significance, hence, it must be unimportant." Feeble rebuttal voices by some who argued that this so-called law at least does predict the mean distances of planets quite well, were drowned out by shouts of:

1. "It's all just accidental coincidences" (8 of them!!
2. "Any half-baked theory will come up with a logarithm type sequence." (But not this exact one!)

3. "It does not explain Neptune and Pluto." (That's because the law was not adequately used -- see Table 2. It works well for Pluto, if you skip Neptune.)

The basic physics behind this law is the conservation of angular momentum. Each protoplanet in orbit at the protosun surface is assumed to have orbital velocity appropriate to the stellar mass. We shall assume that Pluto and Neptune are launched simultaneously as the first planets.

We shall now develop a set of simple equations which contain only two unknowns. (1) The initial mass of the protosun's core, M_o, and (2) the size of the orbit from which all the planets were launched, a_o. For simplicity, we shall assume that the size of the protosun did not change subsequent to each nova explosion. using this analysis, we can write down eight simultaneous equations with two unknowns which are as follows (using the fact that the expression for the angular momentum is given thus):

$$J = m\sqrt{a(1 - e^2)\,G\,(M + m)}$$

Where m = mass of plant

a = mean orbital distance

e = eccentricity

M = total mass of protosun

Instead of writing all 8 equations, we shall write 3 of them only, which will illustrate the pattern of the equations. Note that after each nova, the increase in distance corresponds to the ratio of $\frac{\text{solar mass before nova}}{\text{solar mass after nova}}$.

For a succession of such novas, cancellation of factors in numerator and denominator result, which finally results in a set of very simple equations.

Let M_o (M_{Sun}) = mass original core = M_o

a_o = orbit at launch

We assume that every protoplanet, in turn, has achieved orbital velocity at the protosun surface (radius a_o)

e.g.,MARS

$$\frac{\left(1+\frac{M_o}{32}\right)}{\left(1+\frac{M_o}{64}\right)} \cdot \frac{\left(1+\frac{M_o}{64}\right)}{\left(1+\frac{M_o}{128}\right)} \cdot \frac{\left(1+\frac{M_o}{128}\right)}{(1+0)} \cdot a_o = 1.523$$

Earth

$$\left(1+\frac{M_o}{64}\right)a_o = 1$$

Venus

$$\left(1+\frac{M_o}{128}\right)a_o = 0.723$$

(Note the cancelation of factors in numerator and denominator.)

The right hand side is the present distance of the planet. All eight equations, with only 2 unknowns are consistent with $M_o = 96\ M_o$ and $a_o = 0.393$ A.U.

The logic behind the equation is as follows: We shall assume that a basic quantity of matter is always associated with the sun, comparable to the present mass of the sun, and, by the principle of conservation of angular momentum, whenever the total protosolar mass is diminished, a corresponding increase in the orbital radius results. Subsequent to each nova explosion, we multiply the distance of each planetary orbit by the appropriate ratio of protosun masses (involving its initial mass) divided by its final mass. This ratio is directly proportional to the distance which the planet moves, subsequent to each nova explosion.

Note, e.g., when the earth was launched from the protosun surface (following solar nova No. 7) its distance increased from a_o to

$$\frac{\left(1 + \frac{M_o}{64}\right) a_o}{\left(1 + \frac{M_o}{128}\right)} = \frac{\left(1 + \frac{6}{4}\right) a_o}{\left(1 + \frac{3}{4}\right)} = \frac{10}{7} a_o$$

At Pluto's launch the initial change in core mass is large so that the additional mass of the outside gas (which is close to unity) is insignificant, compared to M_o. However, when one gets closer to the final nova states, the final mass of the sun shows up very dramatically, and, in fact, provides the *exact* coefficients in Bode's law.

Thus, proceeding with each planet, the previously discussed equations are written down, where a_o is the orbital protosun radius and M_o the initial mass of the core in units of solar masses. Note that when the earth is launched, it increases its distance by factor (10/7). It does not actually double its distance from the protosun radius, because the factor of one is already significantly large in comparison to remnant solar core. Its fractional increase in distance is an additional 7/4 when Venus is finally launched. At the time of Venus' nova, it is assumed that almost the whole stellar core disappears.

TABLE 2

The Bode-Titus Law of 1772

(Interpreted by F.M.Johnson 1972)

n	∞ Mercury	8 Venus	7 Earth	6 Mars	5 Asteroids	4 Jupiter	3 Saturn	2 Uranus	1b Neptune	1a Pluto
	0	3	6	12	24	48	96	192	–	384
Add 4	4	4	4	4	4	4	4	4	–	4
Divide by 10	0.4	0.7	1.0	1.6	2.8	5.2	10.0	19.6	–	38.8
Actual distance	0.387	0.723	1.0	1.523	(2.8)	5.202	9.540	19.18	30.0	39.44

$$d = 0.4 + (0.3)\,2^{8-n}$$

Where n = order of birth. Pluto and Neptune were launched simultaneously from slightly different original orbits. Mercury ($n = \infty$) signifies that it was left in original orbit from whence all its sister planets originated. No core fission or explosion were necessary to launch Mercury. Subsequently, the protosun gas cloud shrank to its present size.

Solving these equations, one obtains the initial radius for launching the planets as 0.393 A.U., and the initial solar mass M_o as 96 solar masses.

Table 1 is a summary of the calculated distances and the actual planetary mean distances. This first calculation had assumed that a_o did not change, and, more seriously, the mass of proto-Jupiter was neglected in the angular momentum equation. The improvement becomes apparent if one takes into account the mass of Jupiter (about $0.2M_o$) upon launching. The results, when this is done, are also indicated in Table 1. Essentially, one obtains good agreement with the actual planetary distances, with a very small error in Venus' orbit. Since Venus, in any event, was the last planet to be launched, one might check this out a little more carefully to see whether one can improve the calculation still further. It seems a unique opportunity since with eight equations and only two unknowns, more information can be extracted.

The Earth

Our planet earth represents an excellent test object for "solar system origin" analysis. It is after all close at hand. However, our state of ignorance about the earth's inside, particularly its internal heat source is enormous. In this section, we shall attempt some analyses of the heat flow and dynamical calculations, all to 1st order. The emphasis will be to identify the dominant effects and to derive some important conclusions. It is far too easy to get lost in minutia and details and lose sight of the big picture. At the conclusion of this section, we shall compare the earth with the other planets in our solar system, and derive an unambigious but startling result.

Our model of the earth is based on well documented seismic data. We shall consider the three regions as follows. The solid inner core (A) extending to 1391 km,the so-called liquid core (B) from 1391 km to 3471 km and the mantle (designated C) from its inner boundary at 3471 to the earth's surface at 6371 km. Let us adapt mean densities for A, B, and C of 12.7, 11 and 4.2 respectively. First let's consider the heat flow problem:

Given the average heat flow, H, of 1.4×10^{-6} cal cm $^{-2}$ sec $^{-1}$. Over the whole earths surface, this amounts to 3×10^{13} watts; the earth's "luminosity", albeit in the I.R. spectrum. Over the earth's lifetime of 4-1/2 billions years, this amounts to 4×10^{30}J, which must be considered as a lower bound.

The usual heat conduction equation, $H = -kA\frac{dT}{dx}$, is for a slab, area A, heat gradient $\frac{dT}{dx}$ and thermal conductivity k. In the spirit of this 1st order calculation, we shall adopt the average value for $k = 6 \times 10^{-3}$ cal cm^{-1} sec^{-1} $(°C)^{-1}$, which is the mean value for granite and basalt. The heat flow equation can be integrated for a sphere of inner radius a and outer radius b, such that

$$H_T = \frac{4\pi k a b}{b - a}(T_2 - T_1)$$

making the assumption that the "heat source" resides in the earth's core, we take a, and b as the inner and outer radius respectively of the earth's mantle. Using the above values, where H_T is the heat flow over the earth's surface (3×10^{13} watts), we can derive an estimate of $(T_2 - T_1) \simeq$ <u>10^5 K</u>. This remarkably large value is consistent with an extrapolation of the surface temperature gradient of 2×10^{-4} K/cm.

Viz. $(2 \times 10^{-4})(2.9 \times 10^{8}$ cm$) \simeq$ <u>60,000 K</u>

Such enormous temperatures would ordinarily be discarded since they exceed the melting points of rocks and metals. However, if the core were not a liquid but a high pressure gas or plasma and if these temperatures were to represent an "effective" energy source,perhaps we should give them a closer look. Incidentally, seismic data cannot distinguish between liquid or high pressure gas. neither medium would support a seismic shearwave.

Next, we wish to point out a most amazing result: All the continents can be fitted together on a shrunken size earth, whose radius is 3471 km, i.e. the present inner radius of the mantle. (See the author's text Voyage into Astronomy, for pictures of such a model). This model can readily be checked by the same geologic criteria as was done e.g. for plate boundary simularities between the west coast of Africa and the east coast of South America. Now however, other adjacent boundaries become available for analysis of ancient "fits".

If we adopt this model and neglect earth-moon interactions, then using conservation of angular momentum considerations, we can calculate angular rotation speed, ω_o , 4-1/2 billion years ago.

$$I_o\omega_{\ddot{o}} = I_f\omega_f$$

Subscripts o and f refer to original and present values of the earth respectively. I_f is given by Frank Stacey

(<u>Physics of the Earth</u> p.26) as 0.33 Ma^2, where a is present radius. Now mass of earth M did not change, only its distribution in space. If we take original earth's moment of inertia I_o as 2/5 Ma_o^2 and since

$$a_f/a_o = 1.86 , \quad \omega_o = 2.85\ \omega_f$$

Then T = 8.42 hours

one solar day was about 8-1/2 hours! This implies our average slowing rate over 4-1/2 billion years of 1.25 x 10^{-5} sec/year, a value quite consistent with quoted measured rates.

According to an analysis by Runcorn of daily growth in Devonian corals, there were 397 ±7 solar days in a tropical year, 370 million years ago. This corresponds to a solar day of 22 hours and a slowing rate of 1.86 x 10^{-5} sec/year. A value slightly on the high side.

Next, we consider the dynamical implication of the model. Again, ignoring lunar tidal effects and in 1st approximation, conservation of angular momentum implies:

$$I_o \omega_o = I_A \omega_A + I_B \omega_B + I_c \omega_c$$

$$\frac{I_o}{T_o} = \frac{I_A}{T_A} + \frac{I_B}{T_B} + \frac{I_c}{T_c}$$

where T_o = 8.42 hours, T_c = 24 hours and T_A and T_B have to be determined. With two unknowns, we can only bracket values for T_B between 14.6 and 14.95 hours, with 14.9 the most probable. The important energy equation can now be examined:

$$U_o + \frac{1}{2} I_o \omega_o^2 = U_f + \frac{1}{2} I_A \omega_A^2 + \frac{1}{2} I_B \omega_B^2 + \frac{1}{2} I_C \omega_C^2 + $$

+Heat losses + work done to expand earth

Where U_o and U_f are the internal energies inside earth initially and finally respectively. The dominant term on the R.H.S. is the work done to expand the earth. A simple calculation yields <u>3×10^{32}J</u>. The change in rotational K.E. amounts to a decrease in energy of <u>4×10^{29}J</u>. Consequently $(U_o - U_f)$ is at least <u>3×10^{32}J</u>. Such an energy can be examined, using equipartition theorem to yield an equivalent effective temperature.

$3/2\ k\ T_{eff}N = 3 \times 10^{39}$ergs

If we assume an average molecular wt. of about 40, this yields a $T_{eff} \approx$ <u>10^5 K</u>

Now comes the clincher:

If we plot the known "luminosities" of the planets and the sun-like-stars on a mass -- luminosity log-log plot we observe a straight line over an enormous range in magnitudes. This is completely independent of any theoretical model. In fact it fits to a good approximation: $L = cM^2$ where c is a constant.

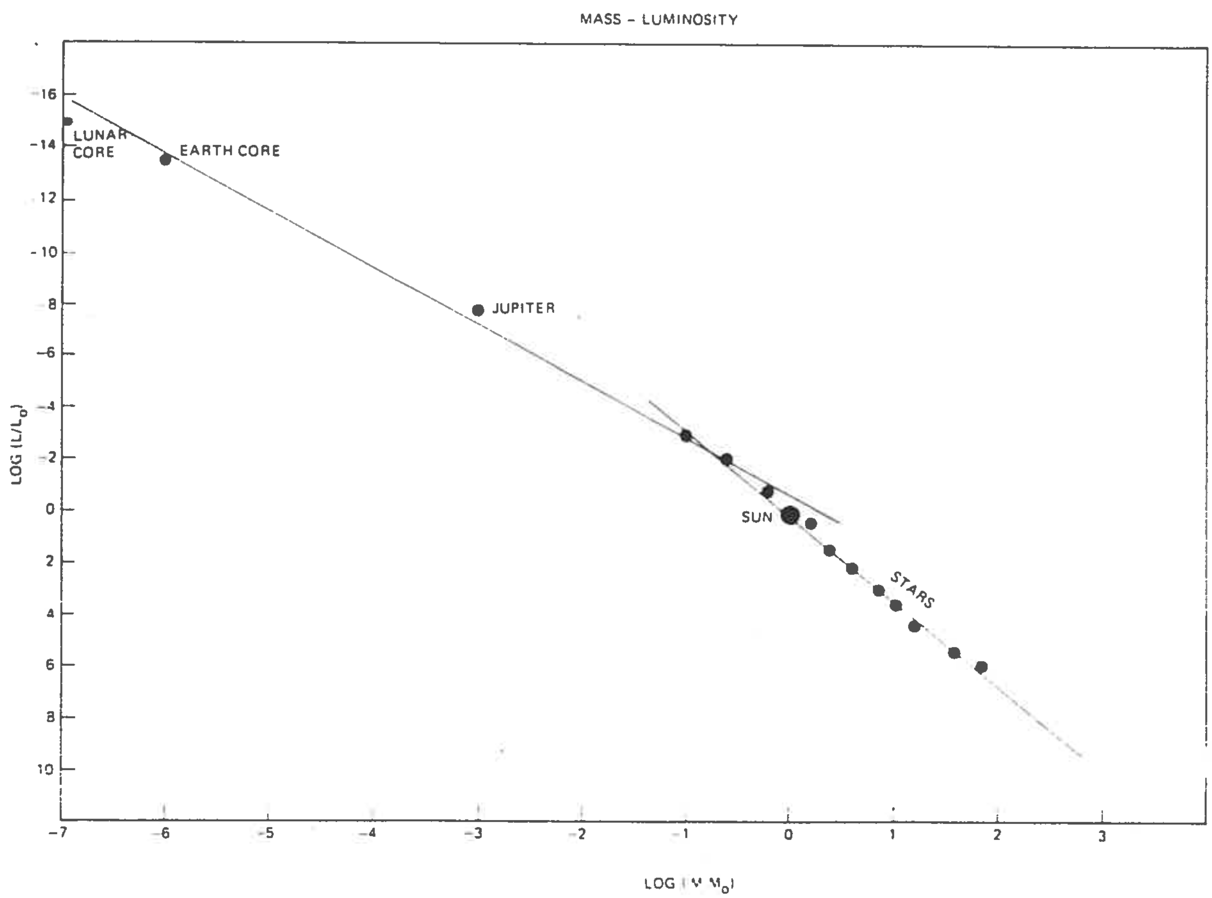
This is an incredible result: It somehow implies that most of the planets and the sun operate on the same energy-generation mechanism. Thus not only do all objects bear the same "atomic abundance" fingerprint, but they appear to have similar energy generation mechanisms!! I have been reluctant to come to this far reaching conclusion, but I see no alternative, unless such a relationship were purely accidental?? The observational data speaks loud and clear.

It was decided to list only the mass of the earths core, since it is the core which must be responsible for the present generation of its heat. In order to compare these four objects, the square of each mass was divided by the luminosity to see whether there is a mass-luminosity relationship. Such a relationship exists among stars. However, amongst stars it is postulated to be to the 3.5 power. That is, the $(mass)^{3.5}$ is supposedly proportional to the luminosity. Such a power law, however, for stars, is valid only over a very small range of values of stellar masses. The comparison shown in Table 3 has a far wider range, involving 15 orders of magnitude range for luminosities,and 7 orders of magnitude change for mass. Consequently, it would constitute a far more stringent test. The results shown in the table indicate that there is indeed a correlation between the luminosities of all four objects. A graphical plot, which includes these objects as well as stars gave a M^2 power law. This gives a very strong indication that the four objects are related;

And that indeed the planets do, in fact, originate from the sun. They still retain active central cores whose energy output is proportional to their $(masses)^2$. Similar results are expected for the other superior planets, Saturn, Uranus, and Neptune.

TABLE 3

	L (watts)	M (grams)	M^2	M^2/L	Density (average)
Sun	3.8×10^{26}	2×10^{33}	4×10^{66}	1.0×10^{40}	1.41
Jupiter	6.6×10^{18}	1.9×10^{30}	3.6×10^{60}	5.5×10^{41}	1.34
Earth's core	3×10^{13}	2×10^{27}	4×10^{54}	1.3×10^{41}	
Moon	3.8×10^{11}	7.35×10^{25}	5.4×10^{51}	1.4×10^{40}	



Implications of New Model

Let us reexamine the expanding earth once again. Since our analysis implied a distinctly different (slower) rotational speed for the mantle than for its inner core, certain previously anigmatic phenomena might now be accessible for plausible explanation. First, occasionally, the earth rotation experiences a minute glitch, or sudden speed-up. This could be a plausible manifestation if some small amount of coupling were to take place in the transfer of rotational energy from the inner core to the mantle. The more or less independent rotations of each of the three regions, allows for another existing possibility: Based on satellite "tumbling" experiences about 20 years ago,we learned the following: Heat generation due to flexing of satellite's antennas resulted in the satellite changing its rotation axis from a low moment of inertia to one with maximum moment of energy. All this comes about from the strict requirements to conserve simultaneously angular momentum and energy in an isolated system. Notice, the earth also dissipates heat energy and it now revolves about its maximum moment of inertia axis. Its equator axis has a moment of inertia which is about (1/305) less. This opens the tantalizing possibility that the earth could have changed its rotation axis in the past, perhaps several times in its developmental history. An axis flip in ancient times would certainly account for the rather enigmatic evidence of hot ancient climates in the arctic region and for so far unexplained rock glacier markings in the middle of now tropical Africa.

The time involved during the flip itself could be brief but probably hundreds or even thousands of years. It <u>is</u> a catastrophic event which would have dramatic impact on flora, fauna and all living creatures. Associated with it could also be an enormous world-wide flood, of extended duration. Whether such an event occurred during the communicative collective memory of men, say within the last 100,000 years or so and its survivors transmitted its impact, finally to be recorded in Sumerian writings (Gilgamesh epic) 4000 and in the Bible 3000 years ago, is pure conjecture at this point in time.

One should now also reexamine the mechanism for the earth's magnetic field, particularly its changes in magnitude as well as polarity. Let us consider the possibility that the so-called "fluid" core is perhaps a hot partially ionized plasma, whose <u>net</u> electric rotating charges generate the observed magnetic dipolar field. To cause a change in polarity would merely require a change in sign of the <u>net</u> electric charge in the plasma. One could speculate that the solid inner core be a constant supply source of charged particles via, say -- radioactive decay. Nature prefers charge neutrality. Could over compensation in charge neutralization cause net charge reversal? Perhaps charge changes occur as some of the high pressure plasma enters the fissures and cracks in the mantle? At present these are speculations.

Conclusions

It should be relatively easy to confirm the author's hypothesis of an original earth, whose size was about (1/1.86) smaller than the present, by matching the remaining continental margins. Once this is proven, beyond any doubt,then the elementary physics considerations, of work done in the expansion, leads to the inescapable conclusion of an enormous energy source inside the earth. The origin of such a source can only be the sun, there is no other reasonable possibility, whatsoever. Such a a substantial internal earth energy source would incidentally be of great help to virtually all geophysical considerations of this century, which in one way or another always seems to flounder when it came to energy considerations. Thus by searching for a common origin of complex organic molecules in interstellar space, carbonaceous chondrites, comets and the earth's crust one is led to reexamine the solar system origins. Organic and water molecules are copiously produced on comet like objects. Presumably, the major planets produce the important comets, which struck the earth in substantial numbers and at many past epochs, thus ensuring a good supply of the "prefabricated" life precursor molecules. The objects ejected by the sun were given the generic term DEBS. They were presumably far more massive in size during the early NOVA ejection phases. Mercury and our moon bear its eternal visible "imprints". The major planets, with their retinue of satellites bear testimony to a similar development as the sun. It is very likely that their Debs were the important complex-molecule-bearing comets. Saturn's rings are very likely the remnants of one or more comets that stayed closely bound within the gravitational field of its origin. Over aens of time, the cometry material would be spewed and spread out completely in orbit. Some small objects recently discovered (by fly-bys) circulating among the Saturn ring material might be the remnants of the comet nuclei.

A few remarks about the planetary rotation periods: Ignoring Mercury and Venus it is remarkable that despite largely different masses, the periods of the planets are similar to within an order of magnitude. In fact the original earth's period of 8-1/2 hours is closer to Jupiter and Saturn's.

The implications of the sun-planet mass -- luminosity relationship are enormous and far reaching: First, it implies very strongly their energy source is of some common mechanism. Secondly, it provides evidence for common origin of the planets (from the sun). Third, it unfortunately challenges the accepted fusion mechanism for the sun's energy source: luminosity is proportional to the square of the mass. Such a relationship applies to fission power. Could this be the case for the earth? There were the remarkable OKLO fission reactors in Africa, operating two billion years ago; the density of UO_2 is similar to that of the earth's core! It is very tentative and with much trepidation that these possibilities are discussed here. However, the evidence cannot be ignored.

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Please refer to references 1, 2 and 3 for photographs and additional material.