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from

Solaria Binaria

THE SOLAR SYSTEM AS ELECTRICAL

The Sun, as star, radiates energy into the space surrounding it. Stars can be conceived to have originated from electrical cavities in the structure of space. Space, to our mind, is an infinite electrical medium. It is electrical in that it is everywhere occupied by a charge, which, when it moves, assumes the character of electrons, that is, "negative" charge (see Technical Note below *On Cosmic Electrical Charges*). The movement energizes and carries material into the cavities which become and are the stars.

Such electrical cavities or stars are observed in the millions, and inferred in the billions, in a fairly random distribution about the Sun. They form a lagoon of stars that is called the Galaxy, through which the Sun moves in a manner, and with consequences, to be described in the Chapter Three of *Solaria Binaria.* Materially, a star is an agglomeration of all that has accompanied the inflow of electrical charges from surrounding space. The cosmic dust which astronomers see throughout the galaxies is matter yet to be forced into stellar cavities, or matter that has been expelled after a star dies. This dust is detected in greatest amounts in the vicinity of the most highly active stars.[1]

Once in the cavity, the material cannot readily escape; it acquires increasing density because of electro-chemical binding and electrical accumulation. A cavity or star is increasingly charged but during its lifetime it cannot be more charged than the medium around it.[2] The Sun is highly charged, as some scientists have lately concluded (Bailey, 1960).

The life history of any new star may normally proceed as its cavity acquires first matter, and then charges continuously until its charge density reaches equilibrium with the surrounding medium, which is to say that the cavity has then been filled. Thereupon the star releases or mixes its material with the medium until it no longer possesses distinction as a body. This "normal" procedure is conditional upon the star's transacting with the space around it in a uniform manner. The majority of stars seem to transact quietly with their surrounding space, whether they are small red stars, or giant red stars. They end their existences as they lived, quietly, passing their accumulated material into the medium of space, eventually becoming indistinguishable from the medium itself.

However, the fact that the star is in motion within the galactic medium poses an occasional problem. It may journey into regions of the Galaxy which present it with greater or lesser electrical differences than it has been used to. Then quantavolution occurs. The star becomes

[1] To be considered is whether this may result from the dust in near stars being more observable.

[2] The consequences of the temporary overcharging are described later when we consider stellar novae (Chapter Thirteen of *Solaria Binaria*).

one of the types to which astronomers pay the most attention - the variable stars, the highly luminous stars, the binary stars, the exploding stars.

It was in one such adventure in space that the original Super Sun lost its steady state, fissioned, and became Solaria Binaria. The system then consisted of a number of bodies, acting first as small "suns" with a primary partner.[3]

In recent times, according to the central theme of this book, this Solaria Binaria encountered a galactic region whose characteristics rendered the lesser stellar partner of the system unstable. In a series of quick changes the binary was transformed into today's Solar System.

Bruce (1944, p9)[4] sees the process of stellar evolution as a cyclic build-up of an electrically charged atmosphere above the star. As we see it, galactic potentials will determine the nature of the "surface" presented to the outside observer. As the star journeys through galactic space, its surface nature changes in response to differences in galactic potential. A change in the local galactic environment can lead to an instability which results in catastrophic electrical redistribution of the whole stellar atmosphere and sometimes of material found well beneath the star's surface layers.[5] In short, the star becomes a nova.

In his cosmogony Bruce argues that binary stars form by division of an original stellar nucleus. When the star becomes a nova, the returning nova discharge, transacting electrically with the normal outward flow of => *stellar wind* off the star, induces the outbursting star to rotate. A possible reverse jet blast from the explosion might also cause the rotation to occur. Stars then, should have maximum rotation during the nova outburst. Fission of the star into a binary would then logically happen most frequently by rotational fission (Kopal, 1938, p657)[6] immediately after a nova outburst. Close-binary pairs should be found among the post-nova stars (Clark *et al.,* 1975, p674-6; Cowley *et al.*, 1975, p413).[7]

The Solar System is probably the descendant of a Super Sun, a body containing at least eleven percent more material than the existing Sun, which became electrically unstable and underwent a nova explosion.

When the Super Sun erupted as a nova it divided into a close binary pair, whose primary became our present Sun; and its companion was a body about ten percent the size of the Sun (see Lyttleton, 1953, pp137ff),[8] henceforth to be called Super Uranus. Enveloping the binary was a cloud of solar material constituting at least one percent of the Sun's material. Also

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[3] See *Solaria Binaria,* Chap. 4.

[4] Bruce, Charles E.R., *A New Approach to Astrophysics and Cosmogony* London: Unwin, 1944.

[5] See Bruce (1966b) for a discussion which compares a lightning discharges to the light curve for Nova Herculis 1934. Bruce (1944) mentions a discharge of the order of 10 20 coulombs in the nova outburst. We see this atmospheric discharge as an electrical readjustment required after the star has responded to its changed environment.

[6] Kopal, Zdenek, "On the Evolution of Eclipsing Binaries," *Roy. As. Soc. Mon. Not.* n°8.

[7] Clark, D.H., *et al.* « Is Cir X-1 a Runaway Binary ? » *Nature* 254, 1975, 24 April; Cowley, Ann P., *et al.,* "TT Arietis: an evolved, very short period binary," *Ap. J.* 1975, 15 Jan., 413-21.

[8] Lyttleton (1938) has argued that rotational fission cannot result in the formation of a stable binary system, but his arguments are probably invalid if the bodies at fission are highly charged (and of the same sign) but in different amounts (Note C). In this instance, immediate electrical transaction between the stars may allow non-collisional orbits to be stable, where they otherwise would not. Later criticism and support are well summarized by Batten (1973b). The arguments they're about the stability of binary orbits over long times are in question because of the work of Bass. Likewise, the claim that fission cannot occur because stellar cores cannot remain uncoupled from stellar envelopes once rotational distortion becomes appreciable is also in question if the process producing the rotation begins in the envelope rather than in the core.

created in the fission were the seeds which grew into the so-called "inner or terrestrial planets", probably Mars, the Earth, Mercury, and one that will be called Apollo.

Turning our attention to the Sun itself, we observe an opaque layer called the photosphere. This layer is regarded ordinarily as the Sun's surface. Above the photosphere lies the transparent solar atmosphere, which is difficult to observe. First comes the => *chromosphere* and then the corona. Perhaps the key to star behavior is the distinction between the photosphere and chromosphere. Each is examined and known by means of spectroscopy, that is, by observing and measuring its spectrum of => *radiation.*

The spectrum of the photosphere shows radiation produced when the atoms, => *ions*, and electrons of the photosphere collide, and therefore the spectrum reflects the state of atomic collisions there. The light is emitted during the collisions. It appears that the photosphere is a region of => *plasma* and atoms where the motion of the material is chaotic, randomized. Collisions occur after short journeys, after short mean free paths of electrical accumulation. The electrical field is small. A high kinetic energy of collision is registered in the temperature of several thousands of degrees. Energy is transmitted with some, but not great, amounts of conversion of energy into internal atomic structures (excitation).

By contrast, the spectrum of the chromosphere represents the release of the internal energy of excited atoms and ions. Light is emitted not so much at the moment of collision among atoms, but it is cast off by rapidly accelerating atoms moving to and from collisions, that is, between rather than during collisions. The chromosphere is a region of directed, vertically moving electrons descending into the photosphere, and atoms and ions escaping into the corona and the => *solar wind.* The mean free path is long, not short. The electrical field is large, not small as in the photosphere.

The photosphere, thus, is a region where the transmission of energy is observed. The chromosphere is a region where the => *transmutation* of energy is what is observed. The temperature "measurements" of the two regions are not helpful in understanding the dynamics, because in one case, temperature is "low" where short paths lead to frequent collisions, and in the other, temperature is high because of infrequent long-path collisions. What is important is the contribution of each region to the electrical system of the Sun.

The photosphere glows brightly with a silver color (Menzel, 1959, p24).[9] Blemishing this visible face of the Sun are dark, slightly cooler regions called sunspots, the average spot lasts less than a day (Abell, 1975, p527).[10] Viewed by telescope, the whole photosphere, except where sunspots obscure it, shows a granular appearance. These => *granules* are bright patches, hot tufts of gas that live for only a few minutes (Juergens, 1979b, p36).

The photosphere and the behavior of the solar atmosphere which lies above it can best be explained using a model based upon electrical processes. Bruce (1944, p6), and later Juergens (1972, pp9ff)[11] and Crew (1974, p539)[12] have shown that photosphere granules have the properties of a large number of parallel electrical arcs. Further, Juergens maintains that highly energetic electrons are transmitted from the Galaxy down through the solar atmosphere to the

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[9] Menzel, Donald H., *Our Sun,* rev. ed., Harvard, Cambridge, 1959.

[10] Abell, George D., *Exploration of the Universe,* N.Y.: Holt, Rhinehart & Winston, 1975.

[11] Juergens, Ralph, "Plasma in Interplanetary Space: reconciling Celestial Mechanics with Velikovskian Catastrophism," *Pensée* 2, n°3, Fall, 1972.

[12] Crew, Eric W., "Lightning in Astronomy," *Nature,* 252, Dec. 13, 1974.

photosphere. As in the Earth's atmosphere, the gas density and pressure in the solar atmosphere decrease with height above the photosphere. Where the atmospheric pressure falls to a value equal to one percent of the atmospheric pressure measured at the Earth's surface, collisions between gas atoms can no longer dominate the exchange of energy between the atoms. Instead it is the electrical processes that govern the energy exchanges in the solar gas. We see this transition as the hot chromosphere. The bladed or spiculed structure of the chromosphere consists of jets of gas moving upwards at about 30 kilometers per second. These spicules rise some 5000 to 20 000 kilometers above the photosphere (Abell, 1975, pp531ff).[13]

Instabilities in the arc discharges lead to a build-up of charged regions in the solar atmosphere. These eventually produce electrical breakdown; sudden discharges occur, causing bright => *faculae*[14] and the temporary extinction of some photosphere arcs. The result is a sunspot (Bruce, 1944, p6).

The upper atmosphere of the Sun is the apparently intensely hot corona.[15] The gas atoms of the corona have been stripped of several electrons[16] by collisions with in-flowing energetic cosmic electrons. The removed electrons are drawn towards the Sun, so other ions can flow outwards into the corona allowing the coronal ions to recede into the solar wind. The spectrum of the lower corona shows the atoms stripped of several electrons emitting light between collisions, and the emission from the energetic electrons during collision.

The corona seems to be constantly ejecting its contents into space as the solar wind. The fraction of the solar output represented by the solar wind is about one-millionth. Haymes states that the whole corona is lost and replaced in about one day.[17]

Some of this material flows past the Earth's orbit as a cloud of energetic protons and helium nuclei, accompanied by electrons, known as the solar wind. In every second, 100 million solar ions arrive above each square centimeter of the Earth's atmosphere.

The more luminous the star, the faster its stellar wind carries away mass, and, in general, the more rapidly the gases flow away from the star. Stellar wind flows of 10^{-10} to 10^{-5} Sun masses per year have been inferred with measured velocities from 550 to 3800 kilometers per second respectively (Lamers *et al.*, Table 1, p328).

Sudden explosive eruptions, called flares, occur above the solar surface. Energy in the form of light, atoms, and ions, is accelerated away from the Sun. The energy in a single flare could

[13] Juergens (1979b) believes the spicule is a fountain pumping electrons from the solar surface high into the corona. If he is correct, the upward motions detected spectroscopically in the spicules are produced by atoms bombarded by the electron flow. The electrons supplied by the spicules are necessary to allow ions to travel away from the solar surface.(See also Milton, 1979.)

[14] A facula (Lat : "torch") is a bright region seen best near the limb of the Sun where the underlying photosphere appears less bright.

[15] The temperature deduced from the spectrum is millions Kelvin.

[16] Specifically, atoms heavier than helium which have lost several electrons are detected. In the corona, hydrogen and helium are present too, but cannot be detected since they have lost all of their electrons.

[17] 11. Replacement of the corona in one day produces a loss of about 10 -10 . Sun's mass each year. Haymes' estimate for the loss of solar corona is much higher than the loss expected using measurements of the solar wind flux. One such solar wind measurement cited by Marti et al. would produce a corona loss which is 1/ 10000 the value in Haymes.

supply the Earth's population with electrical power for millions of years. A large flare releases in an instant about one-fortieth of the continuous solar output.

Flares start near sunspots, with associated *faculae,* and develop over hours. They move as if driven by an electrical potential difference between the Sun's surface and the higher atmosphere (Zirin, pp479ff, Obayashi, pp224ff).[18] Once accelerated, the flare gases escape the Sun and modify the solar wind significantly. The cause of flares is baffling to conventional theories, which underplay electrical forces in cosmic processes. Most flare models involve some kind of magnetic driver to blow the gases from the Sun with great force (Babcock, p420, p422-4).[19] The presence of magnetism implies an electric source. As we shall show in Chapter Six,[20] the Sun once had an electrical connection to its companion, within which energy was released that created and sustained life within the binary system. Today's flares represent an undirected remnant of the inter-companion arc of yesteryear.

The solar wind consists of coronal gases which have been boiled away from the hot solar atmospheric discharges. It conducts the Sun's electrical transaction with the Galaxy. It is the Sun's connection to the Galaxy. The electron-deficient atoms (ions), by escaping from the Solar System, increase the negative charge on the Sun. This brings the Sun towards => *galactic neutral* and thus, in time, would end the Sun's life as a star.

It follows that in the past, when the Sun was less negatively charged, more current flowed from the Sun to the Galaxy. Thus the present flow of solar wind is less than the flow in ages past when the Sun was more out of equilibrium than it is now. The Solar wind varies with the ongoing "evolution" and "quantavolution" of the Sun.

In the past, the solar wind flow was very complex because we believe that the Sun was a binary star and its companion, Super Uranus, was not in electrical equilibrium with it. The system eventually approached => *internal neutrality* because a large solar wind, electrically driven, flowed directly between the two principals.

In this connection we may explain the origin of the heavier elements in the Solar System. They were not built up from primordial hydrogen and helium, which show up so prominently in spectroscopic observation, but rather represents an accumulation in a period measurable in thousands of years of the fragments of heavy materials scattered initially near the Sun, near its binary partner, and along the electrified axis between the two.

The theory that heavier elements are sparse in the interior of the Sun is probably incorrect. Spectroscopy cannot penetrate to beyond the photosphere; therefore it must show only a cloud of hydrogen admixed with metal and molecular vapors (Ross and Aller, Table 1, p1226)[21] at low density.[22]

The mass of the Sun is calculated as a function of the orbital motion of the planets. Probably here, too, a methodological error is occurring that serves to produce the illusion of a light

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[18] Zirin, Harold, *The Solar Atmosphere,* Blaisdell: Waldam, 1966; Obayashi, Tatsuko, "Energy BuildUps and Release Mechanisms in Solar and Auroral Flares," *Solar Physics,* 40, 1975.

[19] Babcock, H.W., "The Solar Magnetic Cycle," in *Int. As. U., Proc. 11th Gen. Ass.,* N.Y.: Academic, 1962.

[20] Of *Solaria Binaria.*

[21] Ross, John E. and Aller, Lawrence H., "The Chemical Composition of the Sun," *Science,* 191, 1976, 26 Mar.

[22] Compared with the Earth's atmosphere, which at the surface has 1390 times the number of atoms per cubic centimeter as does the Sun's atmosphere at the photosphere.

mass. Thus the model of the composition of the Sun depends upon the assumed structure of the solar interior and then the Sun's mass is probably incorrectly known.

Both incorrect theories - regarding the elements and mass - contribute to the major error of conventional Solar System theory, which is that the Sun is powered by thermonuclear processes, specifically the fusion of hydrogen atoms, in its interior.

Regarding the processes which power the Sun, most astronomers believe that there is an energy source deep in the solar interior obscured from view behind the opaque photosphere. If this belief is correct, then the interior of the Sun must be hotter than the photosphere. Knowledge of the conditions within the Sun is inferred as the consequence of the physical forces *assumed* to be governing the stability of the Sun (Smith and Jacobs, pp223ff).[23] It is usually inferred that near the center of the Sun the gas is sufficiently hot and dense enough to bring about => *nuclear fusion* on a large scale.

A thermonuclear Sun is an attractive theory since the Sun seems to be composed mainly of hydrogen. By compressing itself into a nuclear-powered core, the Sun might radiate energy long enough to accommodate the gradual evolutionary processes believed necessary for the biological and geological developments that have occurred on the Earth.

However, thermonuclear fusion processes must dispose of large numbers of => *neutrinos*, and a vastly insufficient number of neutrinos have been detected on Earth in experiments specifically designed to capture the normally elusive solar neutrinos (Parker, p31).[24] Before the nuclear Sun theory was presented, several mechanisms were proposed to explain the Sun's output of radiant energy.[25] All of these led to a radiant lifetime that was too short to satisfy the excessive time needs of the evolutionists.

Fatal, furthermore, to all theories of an internally powered Sun is the minimal temperature of the photosphere. How can the "surface" of the Sun remain cool when it is blanketed by hotter regions below and above whose temperatures reach millions of degrees (Parker, p28)? The usual answer is that the Sun's atmosphere is heated by turbulence within the Sun's outermost interior layers below the photosphere (Wright, p123).[26] Somehow this process which, overleaping the photosphere, heats the Sun's atmosphere is supposedly divorced from the flow of radiant energy from the Sun's interior. Since such separation of processes is unknown elsewhere, this explanation is unacceptable.[27]

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[23] Smith, E.v.P. and Jacobs, K.C., *Introductory Astronomy and Astrophysics,* Philadelphia: Saunders, 1973.

[24] Parker, E.N., "The Sun," in *The Solar System,* San Francisco: Freeman, 1975.

[25] Thus, the Sun, primordially hot, gives out heat as it cools; such a Sun has a life of thousands of years. Then Mayer, in 1848, supposed that the Sun is heated by infalling meteorites. If they did the Sun would gain mass, affecting the size of planetary orbits. For his part, von Helmholtz, in 1854, showed that the Sun could radiate for tens of millions of years if it were contracting slowly. The reader is referred to the following sources for interesting and readable accounts of these mechanisms: Newcombe, Russell et al., 1927; Rudeaux and de Vaucouleurs.

[26] Wright, Kenneth D., "Observation of Solar Spectra Related to Extended Atmospheres" in *Extended Atmospheres and Circumstellar Matter in Spectroscopic Binary Systems,* ed. Alen Batten, Int. As. Symposium n°51, May, 1973.

[27] Parker argues that a man (with a body temperature of 37° => Celsius) can rub two sticks together to ignite them (producing a fire at several hundred degrees Celsius). He adds that there is no limit to the temperature which can be obtained by so rubbing the sticks. What he fails to recognize is that if the sticks are continuously rubbed together generating heat by friction, they will conduct heat from the region of the friction. This heat will eventually reach the stick-holder's hands. Even if the stick-holder wears asbestos gloves, the wood, which is slowly becoming hotter, will eventually catch fire. On the Sun the photosphere must likewise heat up, unless it is somehow cooled by the warmer regions surrounding it. Such cooling is not spontaneous in nature.

Lastly, the observed turbulence (the granules) on the photosphere and its opacity are not compatible with the properties of hot gas of solar composition and condition (Juergens, 1979b, pp33ff). Since Bruce has shown the Sun outside the photosphere behaves like an electrical discharge, the theory, originally by Juergens, that the origin of the Sun's energy is external and electrical, is accepted here.

Consistent with the electrical phenomena of the Sun's atmosphere, we propose an external source of solar power. The Sun's light and heat output arises from the energy released by a flow of highly energetic electrons arriving from the Galaxy.[28] This electron current is enhanced by the flow of energetic solar wind protons away from the Sun.[29] The detected plasma density near the Earth's orbit is 2 to 10 ions per cubic centimetre.[30] The ions flow outwards. Near Jupiter's orbit the Pioneer spacecraft measured no increase in the velocity of the solar ions over their velocity measured near the Earth.[31]

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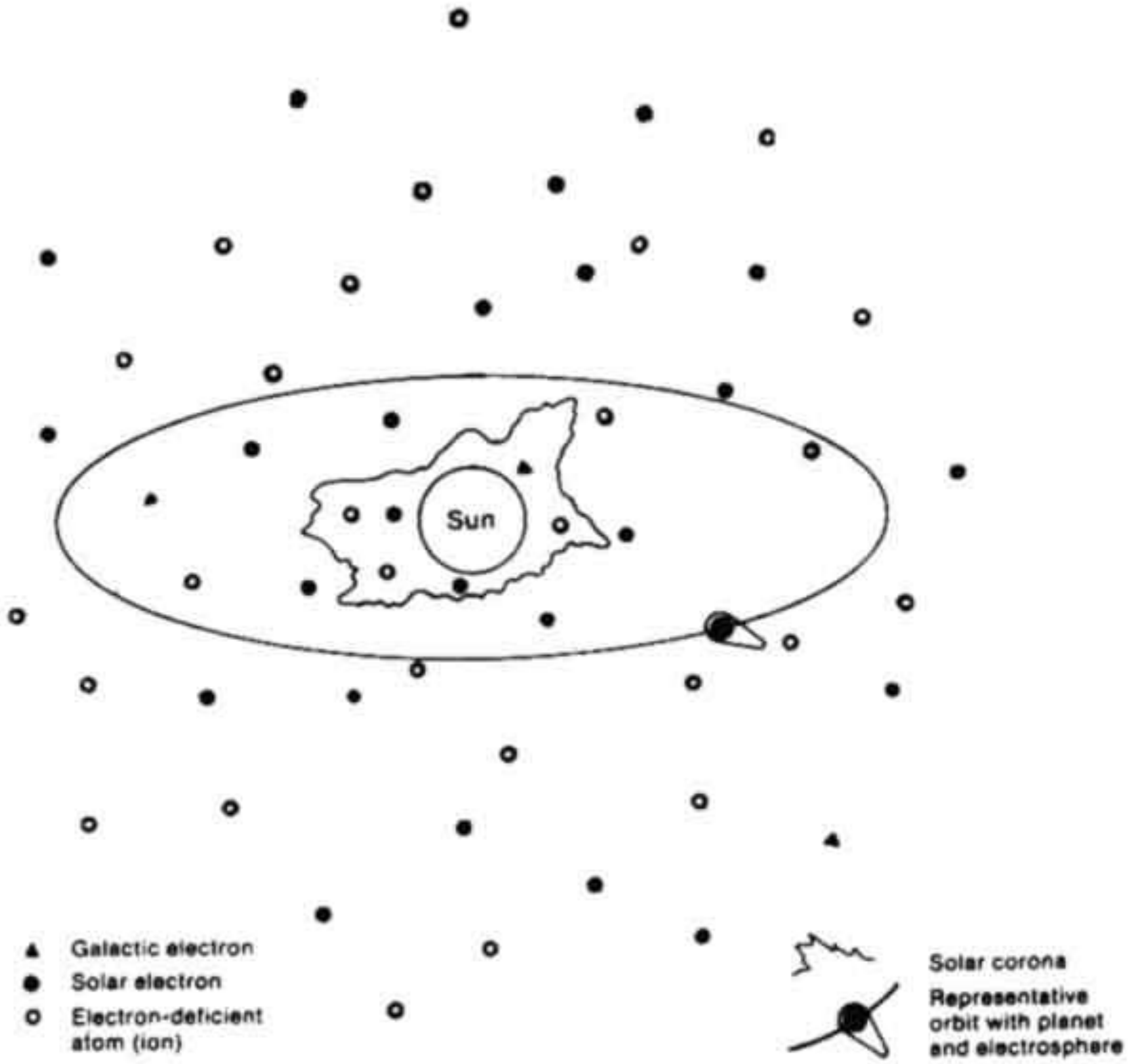
[28] The Sun's energy output is 4x10 26 watts. If the arriving electrons have the minimum energy for cosmic rays not modulated by the Sun (see below, p. 18), which is about 100 gigaelectron volts (100 GeV), the in flowing current density at the Sun's photosphere would be 6.5x10 -4 amperes per square meter. This value is a maximum; higher-energy electrons arriving lead to lower values for the electron current density.

[29] The flow of the solar wind particles is consistent with a potential barrier located at infinity (Lemaire and Scherer). Moving through the potential, the protons gain energy; as they flow away from the Sun and past the Earth's orbit the protons double their velocity, increasing from 150 kilometers per second in the corona to 320 kilometers per second at the Earth. The electrons' behavior is consistent with electrons being repelled by the distant Galaxy but also being repelled by a nearby Sun carrying an excess negative electrical charge, as was postulated much earlier by Bailey (1960).

[30] Zirlin remarks that spacecraft measurements of the solar wind plasma refer to protons, "but considerations of electrical neutrality require that the number of electrons per cubic centimeter equal the number of protons (although the velocities need not necessarily be the same)". Exact => electric neutrality cannot be assumed if the Sun is electrically powered from the outside, and thus we do not know the electron density in the solar wind unless it is measured.

[31] At the rate of solar wind flow, a sphere 100 AU in radius could be filled with plasma to 5 protons per cubic centimeter in about 10 000 years. However, moving at 300 km/ s, a proton would travel about ten light years in this time, about 6300 times 100 AU. The material flow would be about 10 17 tons (1/ 35 000 of an Earth).

Figure 2. The Sun's Connection to the Galaxy



Outward-flowing solar wind ions carry an electric current between the negatively charged Sun and the more negatively charged galactic space that surrounds it. The solar wind flows through a "transactive matrix" (see Technical Note) of solar electrons, which permeate the interplanetary space but do not flow through it as do the ions. Inward-flowing galactic electrons, travelling at velocities close to the *speed of light*, carry energy from the Galaxy to the solar "surface" where it is released and radiated as light and other electromagnetic waves, which constitute the solar luminosity.

At the edge of the Solar System, escaping protons, accelerated to high energy by the drop in electrical potential between the Sun and the Galaxy, become galactic => *cosmic rays* and flow in all directions towards other stars. The protons expelled by other stars arrive in the Solar System as cosmic rays.[32] For energies above 100 GeV about six cosmic rays impinge upon each square meter of the Earth every second, but these few energetic particles carry inwards about one-twentieth of the energy flowing outwards with the solar wind at 1 AU.

That electron-deficient cosmic ray atoms continuously flow to Earth enhances the probability that the Earth is electrically charged. Juergens (1972) has argued that both the Earth and the Sun can have an excess (negative) charge.

At energies below 100 GeV the Sun somehow modulates the number of cosmic rays arriving in the inner Solar System (van Allen, p133).[33] This presumably represents the maximum driving potential between the Sun and galactic space, with which it is transacting electrically. Cosmic rays with energy greatly in excess of 100 GeV would not be impeded meaningfully by the Sun's opposing driving potential.

Where the solar wind ends is yet to be determined. It was once believed the wind stopped inside Jupiter's orbit, later near Pluto, but today the wind is deemed to flow well beyond Pluto (Haymes, p237).[34]

Somewhere the "galactic wind" meets the solar wind; there a boundary exists where the flow of incoming cosmic ray protons balances the out-flowing solar wind protons. This is the edge of the Sun's discharge region, the limit of the Solar System.

To conclude, a star is born when an electric cavity forms in the charged medium of space, and matter rushes along with the charged space to fill the cavity. Then, after the cavity fills, the star dissipates into charged space, spilling out its matter simultaneously. No tombstone marks its demise; no derelicts travel forever through space. Indeed, existence is an attempt to achieve nothingness. Pockets of lesser negativity become existence by seeking to accumulate enough electric charge to emulate universal space, at which time they are capable of disappearing into nothingness.

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[32] Conventionally, no origin other than "galactic" or "extragalactic" is ascribed to arriving cosmic rays not certainly identified with the Sun (Watson). The paucity of electrons in the cosmic ray flux is unconvincingly explained except by the notion of a star as an electron-deficient cavity in space.

[33] Van Allen, James, « Interplanetary Particles and Fields, » in *The Solar System,* San Francisco: Freeman, 1975.

[34] Haymes, Robert C., *Introduction to Space Science,* N.Y.: Wiley, 1971.

TECHNICAL NOTE

ON COSMIC ELECTRICAL CHARGES

In this work we forgo the concept of opposite charges, which has been in general use since Benjamin Franklin established it. Thus, we revert to a position being argued by other early electricians, who saw no need to introduce "plus" and "minus" charges (Heilbron, pp431-38, p481).[35] The one-charge idea suits our concept that the Universe possesses a net electrical charge and that all star systems can be represented by cavities which are deficient in that charge. Where the word "negative" occurs in this work it means only the electron and does not imply the existence of an opposing or second type of charge.

For a time we, like others before us, considered the solar charge to be of positive sign, because of the gradual acceleration of the proton wind as it moves away from the Sun. However, this same phenomenon can be viewed as a flow of ions towards a surrounding region of negative electrical charge.

Insofar as solar wind electrons have, if any, only trivial anisotropy in their motion and since detected cosmic-ray ions - which Juergens (1972) has described as the spent wind from the most luminous stars - outnumber cosmic-ray electrons by at least two orders of magnitude, it is logical to conclude that within the region of the Sun most electrons are occupied with sustaining the transaction tending to eliminate the solar cavity. These electrons are *not free:* they form a => *transactive matrix* enveloping the Solar System.

Cells, and maybe even whole biological organisms, are surrounded by charged "skins" or "sheaths" (Ency. *Brit.,* 1974, *Macro.,* vol. 3, pp. 1045 ff.) Their interiors are even more charged than their perimeters, which indicates to us that these biological entities are electron collectors. This, we argue, also applies to the operation of the Sun.

Atoms may be considered in the same way. The atom has long been known to be characterized by electric transactions forming both the inter-atomic linkages (which create molecules of many kinds) and the inter-atomic coupling, which defines the "electron-shells" of the atom and may even delineate the chemical elements themselves.

The atom is modelled here as a plenum of charge enveloping a nucleus, which we regard as a massive, dense, compact electrical cavity. Like the cell, the atom exposes to the world a negatively charged perimeter. We therefore chose in this work to avoid speaking of negative and positive ions (say, for example, electrons and protons) being produced when an electron is removed from an atom. Rather we speak of electrons and electron-deficient atoms.

This rhetoric then allows us to describe net charges on bodies that are "negative" (as with the Galaxy, the Sun and the cell) without specifying the sign of the charge. When we refer to ions in this work, we always mean electron-rich atom or molecule. It is noteworthy that atoms are almost always detected and measured when their electrons undergo some form of transition

[35] Heilbron, J.L., *Electricity in the 17th and 18th Centuries,* Berkeley: U. of California Press, 1979.

that defines the energy levels and reactions of the atoms. Electrons seem to be the monetary currency of the Universe; stars, cells, and atoms transact and transform to obtain them.

It seems to us that the Solar System's development from creative-nova into binary, through the destructive nova which freed the planets and in the subsequent rearrangement and destructive encounters, is also a story of electron exchanges on the grandest of scales.

The elementary principle governing Solar System behavior is that planets act to accumulate electrons from their surroundings, but in reality they are forced, by the Sun and by their orbital motion, into that space where the electron supply is least capable of yielding electrons to them.[36] Planets are also constrained by their electric charges to avoid other planets to the maximum extent. In terms of conventional gravitational models this latter behavior has been described as least-attraction interaction; we see it simply as mutual repulsion between bodies of similar charge density.

Further, planets maximize their capture of the locally precious electrons by developing an electrosphere about their solid surfaces. Atmospheric layers, when present, are within the transactive junction between the planet and its electrosphere. The current flow across the lowest 20 kilometers of Earth's atmosphere is evidence of such a junction. At the outer perimeter of the electrosphere, the "magneto-pause" and "shock front" mark the transactive layer through which the Earth attempts to absorb interplanetary electrons and to exclude solar wind ions. The junction is not always successful: cosmic ray ions regularly break into the Earth's domain, as do bursts of energetic ions generated by solar flares. These ions make the Earth's task Sisyphean: it accretes electrons only to be forced also to take in electron-deficient ions that are hungry as well for the electrons.

An examination of the electrospheres present in the Solar System[37] reveals a "shielding" that protects the charged planets, for they are immersed in a flow of plasma, which must remain close to charge-neutrality. In the plasma, the local differences between electron and ion densities is small, as it is in a metallic conductor through which an electric current flows. Hence in some proportional fashion the small quantity of incident electrons from the Galaxy are distributed to all of the bodies within the cavity by way of the nearly "neutral" plasma. But, in the main, electron accumulation is accomplished by the ejection of ions into the interplanetary plasma from the solar and planetary electrospheres.

By launching ions towards the periphery of the cavity, where electrons are still available, the Sun gains galactic electrons; by contributing to the ion flow the planets gain an appropriate number too. Protons are observed flowing into the solar wind from the electrosphere of the Earth and Jupiter. This outward flow perplexes those analysts who assume electrically neutral planetary environments. Yet it need not, for it can be understood as the only effective method of accumulating electrons within an electron-poor cavity. The planet "disguises" its charge level by surrounding itself at great distances with an increasing proportion of ions to electrons. In this way, so to speak, the planet can defend itself in a system where the central Sun voraciously devours any available electrons and jettisons ions onto any reachable

[36] Here again, as with stars (as noted earlier in Chapter Three), it is apparent that space itself is the primary determinant of behavior. The stars, planets, and other material in the space compete for the contents of space. These contents not only seem to be atoms and electrons but also a spatial infra-charge, which is not normally available to the body in the space, but whose presence governs all transactions which can occur.

[37] Conventional descriptions of the planetary exospheres describe their electrical properties only as adjuncts to their magnetic properties hence they are there called magnetosphere. Here we consider their magnetic properties secondary manifestations of the fundamental electrified state (see Chapter Thirteen).

electron-sink. The planets, like flotsam, deal with the solar jetsam. Thereupon, the view from each planet is through an electrical fog.[38]

The methodological problem posed in describing quantitatively an electrified cosmos is an experimental problem common to all systems where the instrument disturbs the measured systems. The dilemma cannot be resolved simply by recognizing that the instrument and that which is measured are rendered indistinguishable. We can scarcely imagine how to go about measuring the actual complex of charge-levels existing within the planetary spheres. The problem of determining the charge on a cosmic body resembles the long-established problem of determining how we can feel at rest on the Earth whilst hurtling at fantastic speeds on the globe, in orbit, through the Galaxy, and in the Universe.[39] Should electrical charge prove to be at one and the same time the fundamental element in the Universe and unmeasurable, then we may have to hammer one more nail into the coffin of deterministic physics.

For the first time we are confronting processes occurring at the interactive junctions between large bodies. The very size of the transactions permits humans to observe them broadly, and even to fly among them. (On the microbiological cell level the membrane problem is equally important and complex and there is hampered by technical problems of observation.) Still, the definition of perspectives is difficult in the cosmic sphere, and this is in turn the result of confusing the identities of the actors and the sets. Given the electron and electron-deficient atom as the principal actors, and the scenery of electrospheres, plena and sheaths, the cosmic drama can begin to unfold understandably.

[38] The screening of the planets from the Sun resembles the "view" that the valence electron has in, say, a sodium atom; it does not "see" the full nuclear charge because it is screened by the shells of the intervening electrons.

[39] The Earth's equatorial velocity due to rotation is 0.46 km/ s, in orbit Earth travels 30 km/ s, the Sun moves through the Galaxy at 19 km/ s and orbits the galactic center at about 275km/ s. The galaxy itself may be traversing the universe at speeds near 540 km/ s. Only the first two motions are known with confidence.