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).[1] 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

[1] 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.[2] 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[3] 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

[2] 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.

[3] 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.[4]

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.[5] 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.

[4] 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.

[5] 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.