Cosmoclimatology, Kepler, and Moon's Model of the Nucleus

by Laurence Hecht

Against the decidedly stupefying trend of greenhouse gas studies dominating the scientific media, a report by the Danish investigator Henrik Svensmark in the February 2007 issue of the Royal Astronomical Society journal[1] shows the potential for the sorts of happy discoveries we can expect to occur more frequently, once the 40-year-long domination of science by the Green hysteria is finally lifted.

Svensmark and a determined band of co-workers scattered across the globe have been pursuing the hypothesis that it is not primarily events on Earth, but those in far-distant space that are the principal determinant of climate change. Apart from its immediately useful effect in helping to steer a deluded population away from its current lemming-like fascination with the greenhouse gas hoax, the significance of such studies, taken as whole, goes well beyond what even most of their authors have begun to contemplate. The relationship of microcosm and macrocosm, the existence of Keplerian harmonies acting simultaneously from the very small to the very large, with bearing on certain stubborn paradoxes of the subatomic domain, and matters pertaining to the distinction among the three Vernadskyan domains of non-living, living, and cognitive processes all now fall within the realm of experimentally investigable phenomena, once the blinders of Newtonian-Cartesian reductionism and statistical acausality are removed from the social environment surrounding science.

A short review of the work will help to bring that point more clearly to the reader's comprehension, following which we shall briefly outline some of the deeper scientific issues which the work implies.

Cosmic Rays and Clouds

A basement experiment at the Danish National Space Center helped to convince Svensmark that cosmic radiation, from within our galaxy, perhaps even beyond, plays a leading role in the formation of low-level clouds in our atmosphere. These clouds in turn reflect sunlight, and act as the cooling agent to produce the alternating episodes of Ice Ages and warming which show up in the geological record, over the last 550 million-year period known as the Phanerozoic. The degree of cloudiness is linked to the intensity of cosmic radiation, which is modulated on a regular cycle by two phenomena within the Solar System, and others lying without.

Within the Solar System, the Solar wind, a flux of magnetic radiation emanating from the Sun, and the Earth's own magnetic field act to divert the influx of charged particles which make up the cosmic rays. Decreases in the Solar wind and the terrestrial magnetic field have been correlated to increases in cosmic-ray flux, and these, in turn, to episodes of cooling.

Of the outlying determinations, the motion of our Solar System through the four principal spiral arms of the galaxy, in a cycle of about 143 million years, has played a key role in determining successive cold periods of Earth's geological history, known as Ice Houses. This, according to astrophysicist Nir Shaviv of the Hebrew University in Jerusalem, and his collaborator, geologist Jan Veizer of the Ruhr University and University of Ottawa. The rate of formation of supernovae, such as the relatively recent (circa 1054 A.D.) event which produced the Crab Nebula, is increased within the more dense mass concentrations of the galactic spiral arms, leading to greater intensity of cosmic radiation received at the Earth. Changes in the cosmic-ray flux, owing to the Earth's motion through the galaxy, may be as much as ten times greater than those caused by the cyclical variations in Solar and terrestrial magnetic fields. The smaller Earth- and Sun-modulated changes may help to explain shorter-term variations in climate, and possibly prove to be the much sought-after amplifier of the Milankovitch cycles of variations in the Earth-Sun orbital relationship.

Svensmark's team in Copenhagen used naturally occurring cosmic rays, supplemented by gamma rays, to carry out a laboratory test of their effect on cloud formation. Ultraviolet lamps, representing the Sun, were shone into a plastic box containing purified air and trace gases that occur over the oceans. Analysis of the experiment showed that high-velocity electrons, produced by the impact of cosmic rays on air molecules, act as catalysts to speed the formation of microscopic droplets, which act as condensation nuclei for cloud formation. Various studies have shown the correlation of low-level cloud cover to increases in the cosmic-ray flux.

1. "Cosmoclimatology: A New Theory Emerges," *Astronomy & Geophysics* (February 2007).

Geological and biological evidence from the past, known to paleoclimatologists as proxy records, can be used to estimate cosmic-ray intensity and temperatures over long historical periods. Cosmic-ray intensity can be estimated from the proxy record of the isotopes beryllium-10, carbon-14, and chlorine-36 deposited in various strata, isotopes which are thought to derive either from the original cosmic-ray source, or as a result of collisions in interstellar space. Collisions of the extremely high-velocity protons which make up cosmic rays also occur in our atmosphere, resulting in a variety of nuclear, atomic, and chemical changes. Historical temperatures are inferred from a number of proxies, one of the most important being the so-called $\delta^{18}O$ (delta 18-O) record. This is the measure of the relative ratio of two isotopes of oxygen which have been locked up for history in the carbonaceous shells of sea creatures, especially the foraminifera. Cores drilled out of the ocean bed provide a chronological record of deposition of these shells. The ratio of the oxygen-18 to the more prevalent oxygen-16 isotope is inversely proportional to the temperature at the sea surface-air boundary, and thus provides a record of the temperature at the time of incorporation of the oxygen into the shell. Related studies of the oxygen isotope ratios permitted the confirmation in 1983 of Vernadsky's 1936 observation that the mass of the biosphere was roughly the same 3.5 billion years ago as it is today.[2]

One thus begins to get a sense of the broad-ranging nature of climate science researches. The tools of climatology have evolved from breakthoughs in other fields, the revolution in nuclear science launched by the Curies' separation of radium in 1898 being one of the most crucial turning points. The phenomenon of ionization (transformation of neutral to charged particles), which causes the formation of cloud nucleation particles, was first observed in cloud chambers perfected by C.T.R. Wilson in 1911. As it had been recently demonstrated that radioactive substances can ionize the air, it was naturally assumed at first that the cloud particles spontaneously forming in Wilson's apparatus were caused by radioactive elements buried in the Earth. However, cloud chambers taken aloft on balloon flights soon revealed that the phenomena increased rather than decreased with altitude.

A long series of investigations finally led to the conclusion in the early 1950s that the principal ingredient of the cosmic rays were high-velocity protons. Subsequent study identified the nuclei of all of the elements of the periodic table in the cosmic rays, occurring in roughly the same proportion as found in the Solar System, but with some difference of isotopic composition. These are now thought to derive from the explosion of very dense stars, creating what are called supernovae. An earlier belief that the cosmic rays were gamma rays was proven wrong when the gamma rays which had been detected were found to be the by-product of radioactive transmutations caused by the impact of the cosmic rays on atmospheric gas molecules. However, gamma-ray sources also exist in interstellar space, and send their radiation to the Earth.

From Cusa to deBroglie

Such considerations bring us to the deeper questions always implicit in any new scientific work. As Cardinal Nicholas of Cusa identified in his 1440 launching of modern science with the work *On Learned Ignorance,* the crucial question of science is the paradox of unknowability: How it is that from the provably false impressions of the senses it is possible to arrive at a truthful approximation of reality. In modern practice, the rejection of Cusa's solution to that problem is most clearly indicated in such usages as "particle physics," and the assumption of the existence of self-evident elementarities making up the so-called "building blocks" of nature, which are then presumed to interact according to statistical processes. The sorts of misinterpretation of fundamental data coming out of Ernest Rutherford's Manchester laboratory, especially after the first decade of the 20th Century, exemplify the problem for the rest of 20th Century physics. For example: the insistence upon interpreting Moseley's demonstration that the square root of the wave lengths of the X-ray spectra of elements corresponded to singularities known as atomic number, as a proof of the existence of small, massy particles according to Prout's hypothesis, when the data clearly showed wave phenomena.

Louis deBroglie's 1923 correction, demonstrating that the "masses" of so-called elementary particles are better represented as the frequencies of certain, not perfectly definable, resonant oscillators, a hypothesis which was rapidly and irrefutably confirmed by the experiments of Davison and Germer in diffracting electron waves, has always been the preferred line of thinking of the more insightful class of investigators.

To bring the matter more nearly to the present, the contribution of two leading young actors in the 1940s race to develop an atomic weapon is relevant. In a conversation more than 40 years after the event, Kiel University physicist Dr. Erich Bagge, formerly the chief assistant to Werner Heisenberg in Germany's ill-fated World War II atomic bomb project, learned from his American counterpart, University of Chicago Professor Robert J. Moon, how it was that the American side had solved the problem of the poisoning of the carbon moderator, a necessary step in the construction of the Chicago pile. Germany's forced reliance on a heavy water moderator had been one of several factors in the fortunate failure of their project at that time.

The occasion for this unusual encounter was a private dinner following a 1985 Fusion Energy Foundation seminar at which Bagge had presented his work on the phenomenon of pair production, that is, the creation, and subsequent annihilation, of the "anti-particles," the electron and proton. Bagge thought he saw in this phenomenon a refutation of the prevail-

2. J.M. Hayes et al. as cited in Veizer "Celestial Climate Driver," *Geoscience Canada,* Vol. 32, No. 1 (March 2005).

ing theory of the neutrino. Bagge had been present at the 1930 Tübingen meeting to which Wolfgang Pauli sent his famous letter arguing for the existence of a never-observed fundamental particle, which he claimed could account for certain paradoxes of beta decay. Among other ironies, Bagge delighted in noting that Pauli had been prevented from attending the meeting on the insistence of his wife that he instead escort her to a festival ball.

Moon's Nuclear Model

Bagge's seminar discussion of the puzzling positron peaks appearing in heavy ion collision experiments carried out at a Darmstadt facility in 1985, was one of the inputs into Dr. Robert Moon's elaboration of a new conception for the structure of the nucleus the following year. From measurements observed in his own and others' experiments, Bagge had postulated that the positron-electron pair creation was triggered by gamma-ray quanta, noting the Crab Nebula as a high-level source of gamma-ray bursts. Subsequent observations by orbiting laboratories suggest the existence of extremely powerful extra-galactic sources of this still-unexplained high-frequency radiation.

Relative to the nuclear structure, in a short report on the Darmstadt experiments, Bagge had written:

"If one conceives of the impact of a uranium nucleus (atomic number = 92) of 6 MeV energy per nucleon on another uranium nucleus of the same type at rest, as being a pair-producing process, as if the Fourier-analyzed Coulomb fields of the 92 impacting protons would be fields of light quanta, then these trigger electron-positron pairs in the Coulomb field of the nucleus at rest."[3]

Moon had been an early advocate of the deBroglie interpretation, and carried out pioneering researches with his teacher William Draper Harkins on the analysis of surfaces by electron waves (1936). The other leading influence on Moon's thinking within physics currents, was the anti-Maxwellian standpoint of the Ampère-Gauss-Weber electrodynamics. This tradition had been kept alive in the United States by work such as the mid-1920s researches at MIT's Electrical Engineering Department led by Vannevar Bush,[4] the same figure who later became scientific controller of the Manhattan Project as director of Franklin Roosevelt's wartime Office of Scientific Research and Development. Certain unique features of the Weber electrodynamics lay behind Moon's 1936 design of the Chicago cyclotron, the device which powered the isotope studies of the Manhattan Project, and in his pioneering conception of the synchrotron.

Moon's later breakthrough, the Moon model of the nucleus, achieved in the Spring of 1986, followed immediately upon a first-time reading of Johannes Kepler's *Mysterium Cosmographicum,* a course which had been prompted by certain provocative remarks made by Lyndon H. LaRouche at the preceding Fusion Energy Foundation seminar series. Moon proposed an ordering of the nuclear protons, corresponding to the vertices of the two dual pairs of Platonic solids, nested in similar fashion to Kepler's Solar System. In preparing a report on Moon's discovery in 1986, I recognized that the vertices of the solids formed by the midspheres of those in Moon's model, i.e., the cyclic, Archimedean solids, corresponded to certain closure relationships of both neutron and electron shells.[5]

In a post-war collaboration at the Argonne National Laboratory, Moon and his friend, the German-Jewish emigré and Nobel chemist James Franck, had encouraged Maria Goeppert-Mayer in a study of certain well-known anomalies in the periodic table relating to abundances and isotope distributions. Under the influence of Enrico Fermi, Goeppert-Mayer chose a more mathematically acceptable mode of presentation of her work, organizing it around a reductionist conception of spin-orbit coupling in the nucleus, which derived from a so-called "spin" of a non-particulate electron in its non-existent orbit. Even with that concession to socially acceptable physics, the implication in her work of a lawful ordering in the isotope distribution was parodied by Eugene Wigner in the disparaging term "magic numbers," a label which has stuck ever since. My earlier attempts with Moon's model seemed to point in a direction that would resolve certain obvious problems left unanswered by Goeppert-Mayer.

Recent developments by a working group of the LaRouche Youth Movement in elaborating Kepler's *Harmony of the World,*[6] have made it clear that a continuation of Moon's hypothesis in the direction of the musical harmonies would prove fruitful. An application of deBroglie's hypothesis of the equivalence of mass and frequency, or wave length, would make it possible to consider the atomic mass relationships of the isotope table as a set of musical harmonic relationships. The reason for the abundance distribution of the elements and isotopes, as well as the laws governing both nuclear and chemical combination, would have to follow from some necessary set of principles determining such harmonic relationships, in a way similar to Kepler's conception of consonance and congruence. The determination of processes on Earth, including life processes, must thus reflect a yet-to-be-discovered universal harmony of a Keplerian variety.

The happy discoveries in a Copenhagen basement, suggesting new understandings of the interaction of cosmos, climate, and the conditions for life on Earth, thus resonate in many new and unexpected ways which the promoters of Al Gore's greenhouse hoax are unlikely to appreciate.

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3. Erich Bagge, "Low-energy Positrons in Pair Production," *21st Century Science & Technology,* Fall 2004, p. 24.

4. V. Bush, "The Force Between Moving Charges," *Journal of Mathematics and Physics,* Vol. V, No. 3 (March 1926)

5. Laurence Hecht, "Mysterium Microcosmicum: The Geometric Basis for the Periodicity of the Elements," *21st Century Science,* May-June 1988.

6. See wlym.com/~animations