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Concerning the Coming Report on 'Keplerian Orbits' in Local Plasma and Related Events

by Lyndon H. LaRouche, Jr.

During the 1970s and 1980s, Dr. Daniel R. Wells was a scientific advisor to the Fusion Energy Foundation (FEF), along with his former teacher at Stevens Institute of Technology, Dr. Winston H. Bostick, another fusion pioneer and a co-founder, along with Mr. LaRouche and others, of the FEF in 1974. For more about Dr. Wells and the FEF, see "An Appreciation of the Work of Fusion Scientist Daniel Wells," in 21st Century Science & Technology *magazine, Fall 2001.*

Physicist Daniel Wells.

During an FEF seminar, Dr. Dan Wells was perturbed by my fresh reference then to my "hobby-horse" theme, that the Keplerian orbits are essentially "force-free fields" of the same principled character as "force-free" states occurring in nuclear-fusion plasma experiments. Dr. Wells has reported, that he has made the relevant calculations (for the approximation of Keplerian values given by Titius-Bode), and sees my observation as empirically confirmed for so-called "force-free" plasma states. For reasons which ought to be obvious enough, it is important that I provide some cautionary observations, as background information for those associated with our efforts in this and related matters.

1. Dr. Wells has contributed a discovery, which, for reasons I shall indicate below, will tend to revolutionize all theoretical physics, including biophysics.

2. Although it might first appear, that Dr. Wells simply worked through proof of my hypothesis, he did so in a way I am by no means qualified to do. He is a leading figure in study of so-called "force-free" fusion configurations, very strong in qualifications as an experimental physicist in this field, and in the relevant implications of the work of Riemann's collaborator, Beltrami. Partly because of his additional background, in aerodynamics, the outstanding features of his earlier work reflect the relative ease with which he brings the hydrodynamic standpoint to bear on conceptualization of experimental results. He has acted in the tradition of creative scientists who, by rigorously working through provocative hypotheses presented, transform such hypotheses into important new discoveries of their own.

All scientists live in a sea of ideas, a sea swarming with both old and fresh hypotheses, and also shrewd conjectures which fall somewhat short of the qualifica-

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tions of a true hypothesis. Most of these are the hypotheses, or conjectures contributed by others, some their own. In practice, fruitful scientific workers pick out certain among these swarming propositions as either worthwhile ventures, or as notions of sufficient significance to be worked through rigorously. The fortunate such scientist, is one so skilled in the design and construction of scientific instruments that he can correlate abstract ideas with definite experimental actions in the easiest, most immediate way.

3. What Dr. Wells has done, belongs to the class of the most important contributions to advancement of physics fundamentals. For reasons indicated by Riemann in his "On The Hypotheses Which Underlie Geometry," improved insight into the general lawfulness of the universe centers upon correlating what appear to be anomalous phenomena occurring on the scale of the very large (i.e., astrophysics) with seemingly anomalous events in the very small (i.e., microphysics, or a scale slightly greater than that of microphysics proper). If a new discovery in physics resolves such apparent anomalies, where previously prevailing analyses can not, the discovery effected is proven to be of a universal validity, and is thus usefully classed as a fundamental discovery.

4. Dr. Wells' work, while relatively conclusive in respect to the limited proposition it asserts and proves, is otherwise of a preliminary character. Rather than relying upon the Titius-Bode construction for making Kepler's values more precise, we must accomplish the long-overdue reconstruction of Kepler's proofs from the standpoint provided by Gauss, Riemann, et al.; the lack of sufficient modern emphasis upon elaborating a Gauss-Riemann constructive geometry, has caused this important reworking of Kepler to be neglected. Dr. Wells' work, by proving a principle of physics, thus supplies a sense of urgency and practical importance for completing the long overdue recasting of Kepler's work.

Kepler's three laws of physics are entirely accurate in respect to the hypotheses for which Kepler sought empirical verification. However, for the same reason that Kepler was influenced by an erroneous interpretation of musical harmonics, his physical hypotheses are not the most correct ones. Hence, during 1981, I proposed that we work through the physics of well-tempered polyphony, as an indispensable pedagogical step for education in principles of plasma physics and coherent radiation. This proof for musical composition, couched in the same terms of Gauss-Riemann physics employed for the LaRouche-Riemann "model," is key to the next fundamental stage in refinement of Dr. Wells' work.

5. The implication of this discovery, is that it destroys the last pretext for continued toleration of Newtonian physics, and, implicitly, destroys the foundations of the more popular varieties of statistical thermodynamics and quantum theory. The demonstration, that the most fundamental laws of astrophysics and microphysics are defined in terms of what Newtonian physics must view as "force-free" configurations, destroys the axiomatic basis of popularized instruction in "classical physics," statistical thermodynamics, and interpretations of quantum physics today.

The implication of Newtonian physics in particular, and currently popularized physics more generally, is that the solar orbits are defined by functions of forces among bodies acting at a distance upon one another. Kepler showed, that "force" has nothing to do with determining these orbits, but, rather, that these orbits represent available "force-free" pathways.

The mere existence of "force-free" states in plasma physics, already well established, constitutes what Riemann identified as evidence of a "unique experiment," that special sort of experiment which suffices to prove that one entire theoretical-physics doctrine is mistaken, and a different doctrine required. The followers of Newton and Maxwell might attempt to interpret algebraic formulations in a manner consistent with the "force" assumptions of Newtonian physics; but this is possible only up to the point, that it is shown that events independent of Newtonian "forces" exist. Once the role of "force free" configurations is demonstrated, the authority of the Newton-Maxwell school collapses entirely.

Implications

"Force free" is a misleading term. The term, "force free," is used only to emphasize that the fundamental assumptions of Newton-Maxwell physics are violated by the mere existence of such phenomena. In other words, if Newton had not based a proposed physics on the premises of Descartes, we would have never heard of Newtonian "forces," and would never have thought of describing such configurations as "force free."

As for myself, there is nothing fundamentally origi-

nal to me in the hypothesis which Dr. Wells has explored. I learned the rudiments of the hypothesis before I was sixteen years of age, from Leibniz. Leibniz would not have used the term, "force free"; he would have said, instead, "least action."

Although we owe much to Leibniz for understanding the notion of a Principle of Least Action today, the idea was not exactly original to him. Kepler's hypotheses, on which his three famous laws of physics are based, were already based on the principle of ("force free") least action. Kepler's orbits are "force free" (least action) pathways, which is why they are stable orbits, in which the planet (for example) must remain, unless tremendous work ("force") were applied to move it from that least-action pathway (even if this could be done, the planet would probably disintegrate as a result of being moved from its least-action-pathway orbit). Much of Leibniz's work in physics, like his 1676 establishment of a differential calculus, was based directly on working through Kepler's writings.

Nor was the idea original to Kepler. Kepler's work was based, most prominently, on the direct influence of Leonardo da Vinci, and the direct influence of the scientific writings of Cardinal Nicolaus of Cusa. What Leibniz terms the Principle of Least Action, was described by Cusa as his "Maximum Minimum Principle," (*De Docta Ignorantia,* 1440). The only "axiomatically self-evident" form of existence in the universe, is the generation of a maximum cross-section of work, by a minimum amount of perimetric action: the "Maximum Minimum Principle," or, in other words, the "Principle of Least Action."

The fact that the refraction of light corresponds directly and exactly to least action, rather than as a statistical optimum of variable action, is the simplest sort of direct empirical proof of least action in experimental physics. (Although one aspect of Heisenberg's "uncertainty principle" has conditional experimental validity, the attempt to project such uncertainty upon the laws of cause-effect action in nature, is a wildly fallacious one. As Einstein said, most aptly, "God does not play dice" with the universe.)

The ideas we associate with the notion of "forces," arise as we attempt to account for the possibility of action outside of least-action ("force-free") pathways. Kepler's laws of physics are based, "axiomatically," on the demonstration that the most fundamental laws of physics exclude all notions of "forces." The fundamental laws of physics, properly conceived, are stated entirely in terms of least action, in which no notion of "force" need be considered; only the constructive geometry of physical space-time need be considered. The fundamental opposition of Galileo and Newton to the physics of Kepler, is the simplest case in point, by aid of which we might show how the notion of "forces" was introduced to teaching of physics.

Cusa founded modern science, by elaborating general principles of scientific method coherent with Cusa's discovery of the Maximum Minimum (Least Action) Principle. The collaborators, Luca Pacioli and Leonardo da Vinci, founded applied physics, by showing that the application of Cusa's Maximum Minimum Principle to crucial experimental evidence sufficed to identify and prove the specific kind of geometry of universal physical space-time. By showing that Golden-Section harmonics coincided with both the most general laws of physics, and also living processes, whereas non-living processes do not so coincide, Pacioli and Leonardo proved implicitly that the geometry of our physical space-time is that of a Gauss-Riemann multiply-connected (hyperspherical) manifold. The proof of the work of Cusa, Pacioli, and Leonardo, on this specific point, was the basis for the hypotheses employed by Kepler to establish a comprehensive mathematical physics.

In a constructive geometry centered around the isoperimetric theorem, lines, points, surfaces, solids, hypersolids, and the implicit enumerability of countable topological harmonic relations, have the character of singularities which are derived, created, by purely constructive methods, from elementary, multiply-connected circular action. The physical space-time cohering with such an elementary, constructive geometry, requires that the notion of time-based action be incorporated, thus superseding physical space by physical space-time. Uniform, least-action forms of time-extension, require that we supersede simply circular action by extended circular action, which can be only, either cylindrical or conical extension. The proof that the highest orders of action in physical space-time are coherent with the Golden Section's harmonics, suffices to prove conclusively, that the geometry of physical space-time is multiply-connected (conical, self-similar-spiral) action.

Physical space-time is not the time-extension of physical space. "Instantaneous" physical space has no

existence; only transformations in physical space-time exist; there is no existence but that of an harmonically-ordered transformation in physical space-time, and this exists only in the Gauss-Riemann space of conic forms of multiply-connected, self-similar-spiral action.

The central feature of a Riemannian space so defined, is that, only in such a Riemannian space does there occur, the necessary generation of those higher-order singularities we associate with the generation of existences such as electrons. The lower-order singularities, such as those of the famous Eulerian topological functions, are not truly existences, but merely forms associated with existences. The generation of an electron, or of a definite quantum of action by coherent electro(hydro)dynamic radiation, is exemplary of the simplest sort of those higher forms of singularities we call "true singularities," "true" because they correspond to efficient physical existences.

The foregoing background observations, are indispensable for understanding how the fallacious assumptions of Galileo, Descartes, Newton, et al., led to the reductionists' notions of "forces."

In the relatively more practicable features of Newtonian mechanics, Newtonian mechanics' best features are simply the work of Kepler turned inside-out. The essential difference, is that Kepler shows the existence of objects, to be created by continuous hydrodynamic action, and Kepler defines his discovery of a principle of universal gravitation from this standpoint. Gravity is an effect of the geometry of physical space-time, a way of measuring the work required to deviate from a least-action pathway, and this in a manner consistent with the principle of least action. The reductionists treat the existence of the discrete particle in empty, shapeless space, as axiomatic, and attempt to reinterpret Kepler's physics, "delphically," by interpreting Kepler's algebraic formulations in terms of Cartesian space's absurd assumptions.

This "delphic" hoax is accomplished, by turning Kepler's definition of gravitation inside-out, to define it as a prime force, rather than a reflection of the physical geometry of spacetime. So, "action at a distance" among discrete particles, is introduced, and Kepler's algebraic formulations "delphically" misinterpreted from that reductionist standpoint.

Gauss-Riemann physics "returns" mathematical physics to the (geometrical) methodological standpoint of Cusa, Leonardo, Kepler, and Leibniz, to the standpoint of a differential (constructive) geometry, of a multiply-connected (conic, self-similar-spiral) manifold. The physics of a complex function is properly so interpreted. Unfortunately, beginning with Laplace and Cauchy in post-Vienna Congress France, and with the post-1850 collaborations among Clausius, Kelvin, Helmholtz, Maxwell, Boltzmann, et al., a radically neo-Cartesian misinterpretation of physics was introduced, leading into the ineptitude of modern statistical doctrines. This neo-Cartesian faction launched a hideous witch-hunt against the work of Gauss et al., and with backing for this effort by the Saxe-Coborg-Gotha and Venetian families, the statistical, anti-Gaussian doctrine was made hegemonic in the teaching of mathematical physics today.

Physics has become ironical, paradoxical, in this way. On the one side, the popularized view of physics' mathematical side, physics is absurd in the main. Yet, since scientific progress depends upon respecting the experimental evidence, experimental progress has the form of contributing seeming anomalies which repeatedly throw the formal side of physics, the mathematical explanations, into crisis. For that reason, the only truly interesting aspect of physics work, is exploration of expanding repertoires of those classes of phenomena which are nature's way of insulting the teachers of mathematical physics.

This interesting side of physics produces two classes of response. More commonly, physicists attempt to patch up the previously respectable mathematical physics, to seem to explain the existence of the anomalous phenomena. Less commonly, the best mavericks of the physics community open their minds to the fact that the experimental evidence has cast grave doubts upon the most precious of the axiomatic assumptions of currently taught physics. Illustrative of the latter activity, is the work of Bostick, Wells, et al., in reviving the physics of Riemann's collaborator, Beltrami, and an associated openness among such and kindred circles of physicists to deeper exploration of the Gauss-Riemann standpoint.

Recently, we have seen more emphatically demonstrated, the importance of ending that anomalous fragmentation of scientific work which separates microphysics, astrophysics, and biophysics from one another. When the crucial "anomalies" of the three aspects are placed in conjunction, and a correlation of the evidence sought, the most fruitfully stimulating results are obtained: implicitly, a return to the unity of physics under Leonardo da Vinci. Conversely, it is to the degree that

the three specialties are hermetically separated from one another, that the wildest absurdities in each are more readily made to appear plausible. As Kepler emphasized, the laws of astrophysics, and physics generally, must be defined by imposing the initial and persisting requirement, that our universe is one in which living processes are the highest state of organization of the universe as a whole. The attempt to explain life by a physics which axiomatically excluded the principle of life from the laws of astrophysics, leads to a biology in which life is axiomatically impossible by adopted delusions. Obviously, such a physics does not correspond to the real universe.

Living processes, including healthy economies, can be defined only in terms of a multi-connected manifold, as defined in terms of a conic self-similar-spiral action as elementary. Such relevant matters, as the Weierstrass function, the Riemann Surface, and so forth, must be understood from this vantage-point. For this reason, there is a reciprocal and interdependent relationship, among my own discoveries in economic science, the principles of biophysics, and physics fundamentals generally.

Since no later than Plato, this method of scientific work has been rather consistently associated with the development of that well-tempered polyphony best typified by the work of Bach, Mozart, and Beethoven. During the Spring of 1981, I was forced to recognize, that no general understanding of my own discoveries in economic science were likely, unless the student was first grounded in study of the application of constructive geometry to the principles of well-tempered composition. The errors of interpretation of my work, up to that point, reflected either the student's acceptance of the axiomatic fallacies embedded in popular teaching of advanced mathematics, or, similarly, deeply held axiomatic prejudices of the form of belief in naive sense-certainty. One had to consider, not only the emphasis which Plato, St. Augustine, and Kepler had placed upon musical harmonics, but also that without following this pedagogical example, little understanding of the physics of a Gauss-Riemann domain were likely.

In music, it has been said, occasionally but notably, that the comprehension of musical composition can not be obtained, except by focussing attention "between the notes." Bad singing, for example, will result whenever the singer attempts to associate a syllable in one-for-one correspondence with an associated musical note, rather than locating the syllables in respect to an harmonic progression. Similarly, if musicians believe in arbitrary "melodies" selected by no criteria but more or less accidentally "pleasing effects," such musicians are incapable either of composing decent music, or of understanding the nature of musical ideas properly governing interpretation. Such pathological aberrations among musicians, involve deep-seated, ignorant prejudices of an axiomatic quality, axiomatic fallacies precisely identical with those commonplace in a linear misinterpretation of physics.

For reason of the fact, that Dr. Wells' contribution depends significantly on advanced and rather fundamental work in plasma physics, it will tend to be the case, that the student imagines that the significance of this contribution can not be understood, except from an advanced-physics standpoint. The importance of the contribution is that, in and of itself, it pertains to the most elementary of the conceptions which ought to be mastered at the beginning of a study of mathematics, even on the secondary-school level. The contribution bears upon very advanced physics-theorems, as all axioms of physics do, but it is essentially an elementary, axiomatic conception, rather than being peculiar to advanced theorems.

Summary

At first glance, Dr. Wells' contribution illuminates and demonstrates the hypothesis, that a refined version of Kepler's universal laws of astrophysics, is equally efficient in the microphysical domain. However, since the immediate connection exists only in respect to so-called "force free" configurations of physics in the small and relatively small, the proof of the connection, is proof that astrophysics is based fundamentally, not on forces, but on "force free" states of physical space-time. Thus, it demonstrates that the existence of "force" in physical processes is not self-evident, but determined. Forces do not govern universal processes, but, rather, universal, "force free" processes produce the by-product phenomena we associate with the phenomena of "forces."

That proposition, thus, emphasizes that Gauss-Riemann physics is not merely a matter of choice of formal mathematical apparatus. It demonstrates that the fallacy of anti-Riemannian mathematical physics, is an ontological fallacy, rather than merely a formal error. This point is, properly, the most fundamental principle governing a successful revolution in the contemporary and future practice of physics.