THE RIEMANNIAN SPACE OF THE NUCLEUS

Relativistic Considerations in The Moon Model

by Laurence Hecht

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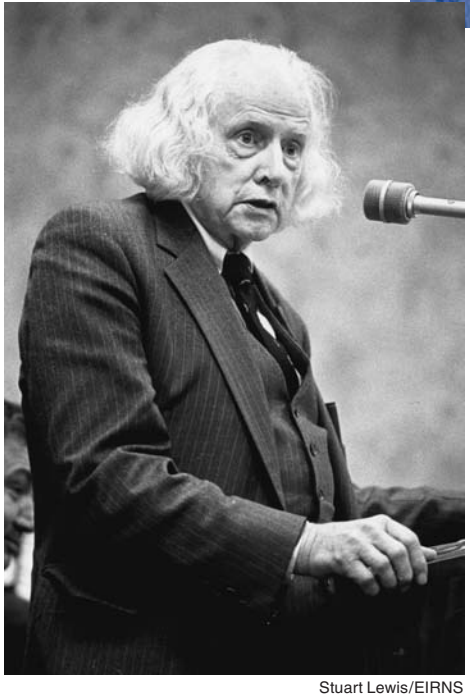
The atomic nucleus as a relativistic space-time domain.

JPL/NASA

Artist's depiction of the Mars Express orbiter approaching Mars. Lyndon LaRouche's proposed 50-year mission to establish a scientific colony on Mars has created an atmosphere of optimism, in which old problems will find solutions.



Stuart Lewis/EIRNS

Robert J. Moon (1911-1989), a University of Chicago professor of physics and physical chemistry, proposed a Keplerian model of the atomic nucleus in 1985.

The enthusiastic response to LaRouche's recent call for a 50-year mission to establish a scientific colony on Mars, itself an expression of the bubbling social ferment now nearing its boiling point, prompts this renewed attack upon a scientific problem which it has been my destiny to battle with for over 20 years. It is in the nature of a period such as this, that problems which seemed unapproachable just a short time ago may suddenly appear within one's powers to grasp. I now believe that a solution to some longstanding problems within the core of modern physics, problems which never should have existed, but are the legacy of ugly compromises forced upon earlier generations by the tyranny of empire, is now possible.

It is my hope that with this formulation of the problem related to unsolved questions of the atomic structure and the so-called wave-particle paradox, we may undo that ugly legacy, thus freeing ourselves and giving renewed meaning to the work of those predecessors forced to labor under conditions in which science itself was victim to the Brutish Empire.

I begin with a statement of the problem as seen from my unique standpoint, limiting the case here largely to considerations of the nonliving domain. In a subsequent report I will attempt to address the same problem from the standpoint of the relationship among the three domains, as defined by Vernadsky.

For over two decades, I have been in possession of knowledge demonstrating that what is currently taught as dogma regarding the atomic nucleus is systematically flawed. The problem goes beyond that sort of error

which the typical empiricist would attempt to resolve by experimental trial, to deeper methodological issues which touch on the real content of science. Prompted by crucial leads provided me by Manhattan Project veteran and University of Chicago professor of physics and physical chemistry Dr. Robert J. Moon,[1] I undertook a dedicated study of the writings of the founders of experimental and theoretical electrodynamics, André-Marie Ampère and Wilhelm Weber. That study, which was largely carried out between the years 1992 to 1998, demonstrated to me that certain assumptions inherent in modern thinking on these subjects are in error to a childish degree. I summarize the leading features of this still suppressed electrodynamics in three points:

(1) Ampère's demonstration of the physical presence of an angular force, essentially overthrowing the fundamental assumption of potential theory as still taught, and its conclusive experimental proof by the 10-year collaboration of Carl Friedrich Gauss and Wilhelm Weber;

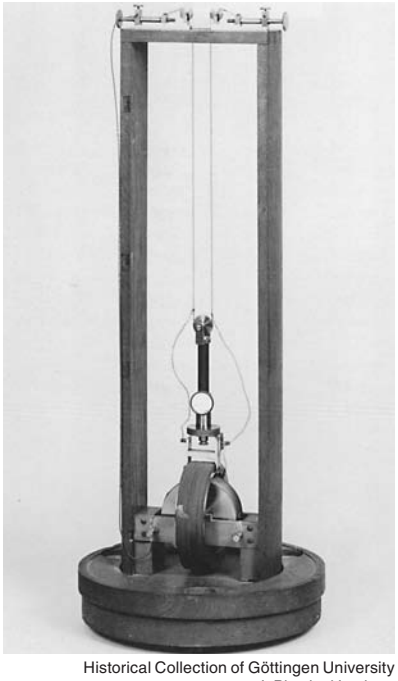
(2) The 1855 Weber-Kohlrausch experiment, establishing the relative velocity at which the force between electrical particles is reduced to zero, and provoking Bernhard Riemann to propose (1858) a similarity in the propagation of light and the electrodynamic potential;

(3) Weber's subsequent deduction (1871) of the bound state of pairs of like-charged particle/waves within the confines of a 10^{-16} to 10^{-13} cm spherical radius, establishing the natural basis for the formation of the atomic nucleus.

In the period from 1999 to 2006, I was able to apply that understanding of the Ampère-Gauss-Weber electrodynamics to the Keplerian model of the atomic nucleus proposed in 1985 by Dr. Moon.[2] I arrived at a structure which at once overcame what had been two of the leading objections to the Rutherford-Bohr-Sommerfeld model of the atom, without the need to invoke any new conditions *ad hoc*. The objections of leading chemists, Lewis, Parsons, Langmuir and others, to the Bohr atom were

1. The University of Chicago cyclotron, which Moon built in 1936 as a graduate student of William Draper Harkins, its use by Moon in solving the problem of the carbon moderator in the first atomic pile, and his unique role in understanding completely new phenomena in nuclear chemistry arising in the Hanford plutonium reactor, were among his key contributions to the wartime Manhattan Project. The virtual suppression from the historical record of Moon's crucial contribution is not surprising to those who know the inner secret of postwar science, including Moon's pedigree as a student of Rutherford's arch-enemy, W.D. Harkins. See: www.21stcenturysciencetech.com/Articles%202005/moon_F04.pdf

2. "Robert J. Moon on How He Conceived His Nuclear Model," 21st Century Science & Technology, Fall 2004, pp. 9-20 http://www.21stcenturysciencetech.com/ Articles%202005/moon_F04.pdf



Historical Collection of Göttingen University
I. Physical Institute

The original bifilar electrodynamometer used by Gauss and Weber in experiments conducted from 1832-1839. The inner coil is removed and placed at various positions on the laboratory table. Electrification of the two coils causes an electrodynamic potential between them, rotating the coil which hangs from two wires. The angle of deflection is measured by a telescope aimed at the small mirror above the coil.

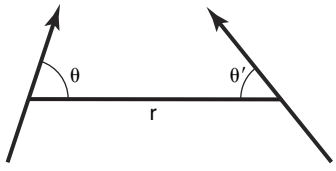


Figure 1
AMPÈRE'S VIEW OF TWO CURRENT ELEMENTS
The two current elements are represented by arrows; θ and θ′ are the angles which the current elements make with the line connecting their centers; r is their distance apart.

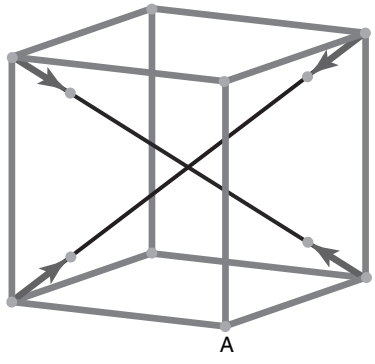


Figure 2
A REPRESENTATION OF TWO WEBER PAIRS ON A CUBE
Two Weber pairs, represented as Ampère current elements, are shown following two diagonal axes of the cube. Between the two at the base, there is neither attraction or repulsion; the force is zero.

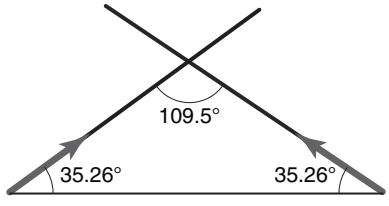


Figure 3
AMPÈRE'S ANGULAR FORCE FORMULA
When the angles θ and θ′ are equal to 1/2 (arc cos 1/3), or 35.26 degrees, for two parallel current elements, the force between the current elements goes to zero, regardless of the current strength. As the two current elements at the base of the cube in Figure 12 move toward the center, they trace the sides of an isosceles triangle, which has an apex angle of 109.5 degrees and base angles of 35.26 degrees—and zero force between them.

Rudolf Kohlrausch (1809-1858), at right, worked with German physicist Wilhelm Weber (1804-1891) in 1855 to measure the ratio of electrostatic to electromagnetic units.

summarized by Harkins in 1919, the objections being: First, how it is that positive charges could overcome the electrostatic Coulomb repulsion to agglomerate in a central nucleus; second (the widespread objection of chemists of the time) that orbiting electrons are not compatible with the evidence from stereochemistry and crystallography which indicates usually fixed interatomic bond angles, and; third, the exclusive reliance on the data of spectroscopy to the exclusion of other evidence.

The solution was to consider the nuclear protons, which Moon had, in first approximation, placed at the vertices of the nested Platonic solids forming his nuclear shells, rather as Weber-paired particle-waves oriented along the diagonal axes of the solids. The result retained the optimization of charge distribution upon each spherical shell, and among the shells, which had been a key consideration in Moon's structure. By considering the protons on diagonally opposite vertices as *Weber pairs,* that is the stable bound state of linear oscillation of two like charges which Weber had shown to be a consequence of his Fundamental Electrical Law of 1846,[3] the first objection as to Coulomb repulsion was overcome naturally.

Next, by considering the extra-nuclear electrons as corkscrew-like orbits shaped by the field induced by the continuously accelerating and decelerating linear-paired protons, the valid objection of the chemists to the Bohr-Sommerfeld concoction was overcome. The electrons are thus not orbiting about the nucleus at all azimuths, but locked into certain orientations corresponding to the directionality of the diagonals of the Platonic solids. The nuclear orientation thus determines the possibilities for the chemical bonds.

Also within that 1999-2006 effort, I noticed that the Planck action constant could be interpreted as a physical action (that is the product of a mass × velocity × length) in which the mass is the mass of the electron, the velocity that of light, and the length the Weber critical length, rho.[4] The Planck action constant, *h,* is the product of these quantities into 1/α (= approximately 137):

$h = 2\pi \cdot m_e\, c(\rho/2) \cdot (1/\alpha)$.

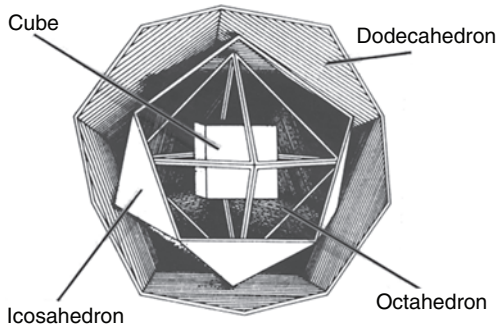


Figure 4
THE MOON MODEL OF THE NUCLEUS

A nesting of four of the five Platonic solids, starting with the cube, then octahedron, then icosahedron, inside a dodecahedron complete the first shell. The 46 vertices of the nested figure represent palladium, atomic number 46. To go beyond palladium, an identical dodecahedron is joined to the first one at a face.

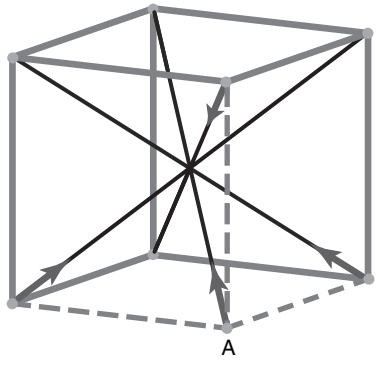


Figure 5
THE SELF-SUSTAINING CUBE

The current element proceeding from vertex A is attracted by the three nearest current elements. The direction of attraction is along the three edges shown as dashed lines. The vector sum of the attractions is in the direction of the diagonal that the current element is already pursuing. Weber pairs placed along the four axes of a cube thus produce an electrodynamically stable configuration.

3. Wilhelm Weber, "Electrodynamic Measurements, Sixth Memoir, relating specially to the Principle of the Conservation of Energy," Philosophical Magazine, Fourth Series, pp. 1-19 (Jan. 1872); 119-149 (Feb. 1872).

4. The distance, ρ, below which the repulsion of like charged particles changes to attraction is:

$\rho = 2e^2/m_e^2$, where *e* is the charge of the electron in *e.s.u.*, *m* is the electron mass, and *c* the velocity of light in free space.

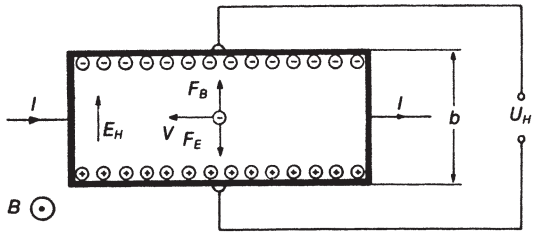


Figure 6
SCHEMATIC REPRESENTATION OF THE HALL EFFECT

Given a conductor through which the current I is flowing, and a magnetic field B perpendicular to the direction of the current and the plane of the current-carrying transistor, the Hall effect describes the deflection of the charged particles sideways, also known as the Lorentz force, F_B. The particles will collect on the edge parallel to the electron velocity (when no magnetic field is present) and move from the opposite edge of the transistor.

This charge separation leads to the buildup of an electrical field E_H (the Hall field). As soon as the resulting force F_E compensates for the Lorentz force, an undeflected current continues to flow. A potential difference U_H is created between these two edges.

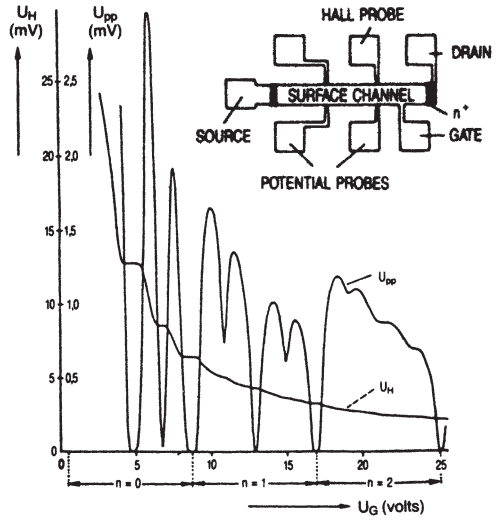


Figure 7
KLITZING'S EXPERIMENTAL CURVE

This is what the grid voltage U_G versus the Hall voltage U_H actually looks like, according to Klitzing's experiment. The plateaus in the Hall voltage can be seen clearly. U_{pp} is the longitudinal voltage, which becomes zero when the plateaus appear. Klitzing first published these results in 1980 in Physical Review Letters.

This implied that the hypothesized harmonic resonator of Planck might be identical to a collection of 137 Weber-paired electrons. In Weber's conception of the stable bound state of two like charges, the charges oscillate along a straight line of length ρ, accelerating towards the center where they pass through one another, and decelerating out to the maximum distance of separation, ρ. The product $m_e c(\rho/2)$ would represent the physical *action* of a single pair of electrons (*Weber pair*) moving in this configuration.[5]

Did the figure 137 have any physical significance? The configuration of 137 electrons was the same that Dr. Moon had deduced from consideration of the paradoxes arising out of the early 1980s von Klitzing experiments showing quantization in the Hall resistance.[6] Noting first that the presence of an impedance in so-called *free space* implied the existence of some sort of structure, Moon considered the fact that the ratio of the maximum Hall resistance (25,812 ohms) found in super-cooled thin-layer semiconductors, to the impedance of free space (376 ohms), was almost precisely 137/2.

The impedance of free space is a phenomenon related to the propagation of electromagnetic energy, the Hall resistance occurs in the propagation of electrical currents, and thus the two phenomena would not usually be related. Moon, however, supposed that the electromagnetic propagation in free space occurred in connection with the motion of a grouping of 137 electrons. Going further, he assigned a geometric configuration to that grouping.

Finally, Moon supposed that the configuration of the elec-

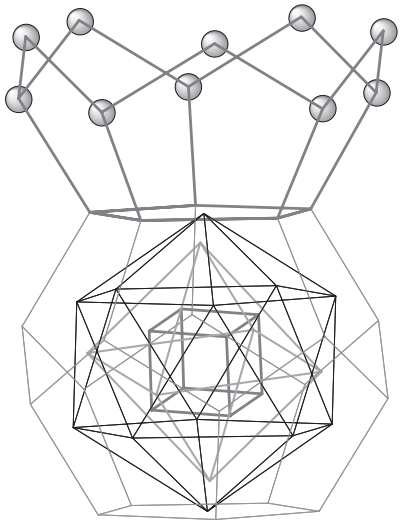


Figure 8
THE MOON MODEL NESTING

In the Moon model of the nucleus, nesting of the cube, octahedron, icosahedron, and dodecahedron (as shown) yield in their vertices places for 46 protons. By building up another nesting of the polyhedra, the two combined dodecahedra have another 46 vertices, making 92—representing the 92 protons of the naturally occurring elements of the periodic table.

In this figure, 10 protons are added to the second dodecahedron, representing the element barium (56).

5. The same value for the Planck constant would result for a pair of protons, as substituting the value for ρ into m_p c ρ (where m_p is the mass of the proton) would show, thus supporting the universality of the Planck constant.

6. Robert J. Moon, "Why Space Must Be Quantized," *21st Century,* Fall 2004.

Stuart Lewis/EIRNS

Charles Stevens (left) and Robert J. Moon in discussion at Moon's 75th birthday party.

trons in free space was related to the configuration of the nucleus. In the Moon model of the nucleus, the vertices provided by a nesting of cube-octahedron-icosahedron-dodecahedron are the resting place of 46 protons. Two dodecahedra then combine to form the structure for the 92 naturally occurring elements of the periodic table. In Moon's conception for the electrons in free space, three of the nested dodecahedra come together, providing 137 positions (138 minus one at the point of joining) for the electrons. Thus, by a leap of genius, an ordering principle was found by which the usual separation between matter and radiation was overcome.[7]

Relativistic Considerations

> Now it seems that the empirical notions on which the metrical determinations of space are founded, the notion of a solid body and of a ray of light, cease to be valid for the infinitely small. We are therefore quite at liberty to suppose that the metric relations of space in the infinitely small do not conform to the hypotheses of geometry; and we ought in fact to suppose it, if we can thereby obtain a simpler explanation of phenomena.
>
> —*B. Riemann, "On the Hypotheses which Lie at the Foundation of Geometry" (1854)*

Wilhelm Weber's 1868-1871 exploration of Riemann's hypothesis concerning the microcosm was first called to the attention of our association by Dr. Robert Moon in a 1974 meeting at his Chicago home with Charles B. Stevens, and again in a meeting with Lyndon LaRouche shortly thereafter. The subject of the meeting with Stevens being fusion energy, Dr. Moon immediately noted that no important progress could be made without consideration of the paper by Weber, a copy of which in English translation he pulled out from some handy location and began to elaborate upon.[8] I only began seriously to study the Weber work in 1991, after a period of collaboration with Dr. Moon from 1985 to his death in 1989. The profound nature of the document was immediately evident upon cursory reading, but a deeper appreciation required a study of the prior work of Ampère on electrodynamics, and of Gauss's 1832 work on magnetism, which I had completed by 1996.

I summarized above my attempts over the ensuing 10 years to incorporate that understanding of Weber's contribution into the Moon model. However, it was only quite recently that I understood the significance of the work as an explicit elaboration of Riemann's revolutionary hypothesis concerning the foundations of geometry.[9] Weber is describing the change in physical

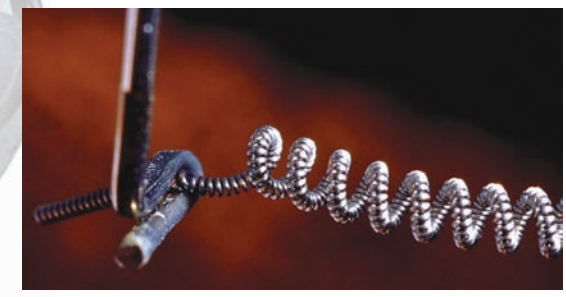
7. According to his autobiographical account, the problem had been one that had occupied Moon since about the age of seven or eight, when he puzzled over the working of a step-down transformer connected to the doorbell in the house of an aunt. After a lifetime of pioneering work in nuclear chemistry, high-energy physics, and the design of electrical devices, Moon was prompted to the solution by attendance at a series of Fusion Energy Foundation seminars led by Lyndon LaRouche over the period 1984-1985, where the fundamental importance of Kepler's discovery to modern science was the central topic. The specific breakthrough occurred one early morning in the spring of 1985 following on a week of study of Kepler's *Mysterium Cosmographicum* in conjunction with some then current papers of LaRouche.

8. Wilhelm Weber, *Sixth Memoir* (1872), *op. cit.*

9. The relationship between Riemann and Weber is not well known, in good part because of the conscientious suppression of the work of both. The supposed separation between the departments of mathematics and physics, which is the ironic subject of the concluding sentence of Riemann's 1854 "Hypotheses," adds to the obfuscation of the relationship. According to the biographical evidence, Weber, a generation older than Riemann and a generation younger than Gauss, played a role both as a sort of father figure to the younger Rie-

A later model of Weber's electrodynamometer, which was built by Siemens Bros.

laws within the space which we would recognize today as the atom and nucleus. There are indeed two realms, the domain of the atomic nucleus defined by a spherical radius of approximately 10^{-16} centimeters, and the larger domain of the extra-nuclear nucleons. Developments in physical chemistry which only began to emerge in the two decades following Weber's death in 1891, would have made it possible to carry the exploration Weber initiated into the experimental domain. However, historical considerations alluded to earlier, dictated that that program was never completed. Instead, an abortion known as the Rutherford-Bohr-Sommerfeld atom emerged into the light of day, was fondled and adored, took on new proportions as it grew, and was dressed in fine clothing to be admired and obeyed by subsequent generations of the dutiful. That Emperor, like the others, has no clothes, though a century of steady application of physics has produced enough diarrhea to hide the fact from many.



This magnified view of a tungsten filament in an incandescent bulb is an example of a spiral wound around a spiral.

Weber's explorations of that Riemannian domain may now be considered in light of modern experimental knowledge about the atomic and nuclear domain. We now outline a few of the key points under consideration, leaving a more detailed analysis to subsequent reports.

The Path of the Electron: The stable bound state of a proton pair, as identified by Weber, is a linear oscillator confined within a sphere of radius approximately 10^{-16}cm. The relative velocity of the two protons along that radius rapidly increases from zero at the spherical boundary to $\sqrt{2}\cdot c$ when the particle-wave pair meet and pass through each other at the center. The linear motion of the charges will produce magnetic field lines in a circular configuration, like that found around a current-carrying wire. However, the acceleration of the charges would tend to cause the circles to distort into a corkscrew-like figure.

The net external effect of the field produced by the proton pair would be zero, just as a doubly wound Ampère solenoid produces zero magnetic effect when two oppositely directed currents are passed through it. However, in the very short moments of extremely rapid acceleration and deceleration of the charges, intense localized fields must be produced.

An electron pair, by itself, would be capable of a similar linear oscillation within a larger sphere of radius approximately 10^{-13} cm. However, placed within the field of the proton pair, the two individuals in the electron pair would be caused to spiral around the field lines produced by the more rapidly oscillating proton pair. The general result would be a spiral wound around a spiral.[10] The precise motion of the electron can be calculated theoretically from the equation of motion of the proton pair and the known laws of electromagnetic interaction.

The spatial orientation of the proton pair, which is defined by the vertices of the Platonic solids in the Moon model of the nucleus, will define the orientation around which the doubly spiralling electron will form its trajectory. Except in the case of the single electron of the hydrogen nucleus, there will be no circular or elliptical orbits.

Symmetry Inversion: The field lines which form around a moving positive charge have the reverse polarity of those around a moving negative charge, thus causing a reversal of the rule of handedness to be applied. The corkscrew-like field lines which form around the moving proton will be strongest at the center and weakest at the ends of the line along which the protons oscillate. One might thus expect the first spiral (corkscrew) of the electron to trace a path which is expanded at the outside and pinched toward the center, appearing like two megaphones placed mouthpiece to mouthpiece.

However, a special consideration arises in the space of reversed symmetry found below the Weber critical length. The electron, being repelled the closer it comes to the proton, will tend to be forced outward at the center, precisely where the magnetic field strength, which would tend to draw it in, is greatest. Whether the corkscrews are then pushed to the opposite extreme of being narrower at the ends and more loosely wound at the center, or perhaps the final figure is cylindrical, should be possible to be determined by calculation. Attention should be paid to the possibility of synchrotron radiation deriving from the electron's spiral orbit around the magnetic field line. The continuous change in the field lines and the reversal of charge symmetry produces something not before encountered.

It also seems possible that the solution to this problem, which is intimately connected with that of the true path of the electron, could lead to a new interpretation of the Planck action constant and the fine structure constant. Both these phenomena are connected with the presently still unclear relationship of radiation and matter. Moon's supposition requires a precise value of 137 for the inverse of the fine structure constant. The discrepancy of the measured value by an amount equal to 0.036 might be due to any number of factors, possible within the rela-

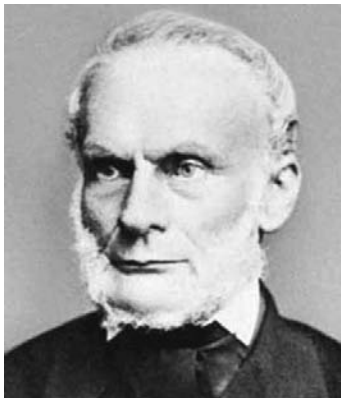
mann, and as mediator between Gauss and his brilliant young student. When Riemann was ailing with tuberculosis, it was Weber who prevailed on university authorities to subsidize a curative trip to Italy. Yet, once the point of the paper is recognized, it is obvious on internal evidence alone, without biographical substantiation, that the *Sixth Memoir* constitutes Weber's tribute to the life of his dearly beloved younger friend.

10. The tungsten filament of an ordinary incandescent light bulb, seen under 25× or higher magnification, provides a convenient model for visualization. The experiment should be carried out soon however, before Al Gore succeeds in replacing these easily available specimens with the more expensive, and often malfunctioning, fluorescent substitutes.

tivistic system under consideration. However, no explanation presently exists for it.

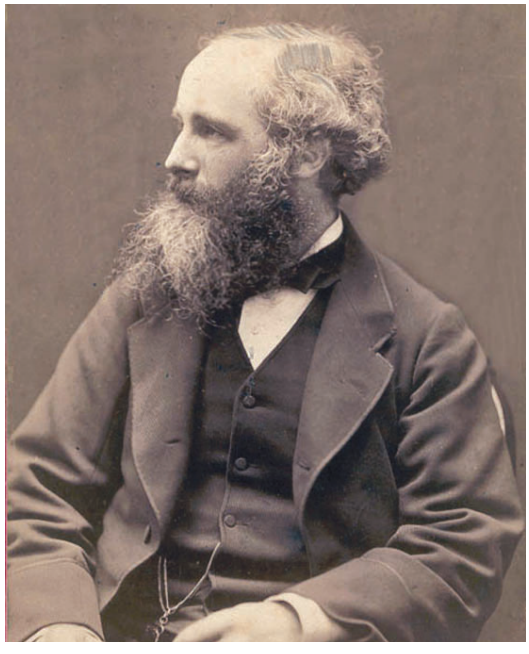
A clearer understanding of the nuclear geometry in its relationship to the electron is essential.

Relative Velocity Greater Than c: Among the most interesting of the conclusions of the Weber-Kohlrausch experiment was that the relative velocity at which the force between two moving charges reduces to zero is equal to $\sqrt{2}$ times the velocity of light, or $\sqrt{2}\cdot c$ in our modern notation.[11] The value defines the ratio of the electromagnetic to the electrostatic unit of force, and is incorporated into the system of modern physics. There is thus no contradiction, but rather a complete correspondence, between the results of the Weber-Kohlrausch experiment and all subsequent electrodynamic measurements. The contradiction with the results of Special Relativity, where the relative velocity c forms a maximum limit, is not normally considered, because the Weber formulation of 1871 is unknown or ignored.



Rudolf Clausius (1822-1888) suppressed the 1858 work of Bernhard Riemann on the implications of the Weber-Kohlrausch experiment, thus allowing the substitution of Maxwell's empirical fraud.

It should also be noted that the Weber formulation of a change in force, and of potential, with relative velocity (first proposed by Gauss in 1833) is consistent with Einstein's famous 1905 proposal, that the paradox encountered in experiments measuring the charge-to-mass ratio of moving electrons could be overcome by assuming that the mass increases with relative velocity according to the expression $\sqrt{[1-(v^2/c^2)]}$. The same expression will be found in Weber's First Memoir of 1846 (in example 2 of §32) for the quantity he defines as *reduced relative velocity* (with the important difference that Weber's symbol *c* is $\sqrt{2}$ times greater than that employed in modern usage).[12]



James Clerk Maxwell (1831-1879) admitted in his Treatise *that he was unwilling to "contemplate other geometries than our own," concerning his treatment of the work of Ampère, Gauss, Weber, and Riemann.*

The Gauss-Weber formulation is *relativistic* in the precise sense of a velocity-dependent force law. When the Riemannian implications of the 1871 paper are taken into account, the concept is *relativistic* in the broader sense, although not the specific sort of implications that are introduced by Einstein's considerations of time. There are several points to keep in mind in attempting a comparison of the two systems. First, in keeping with the program proposed by Gauss in 1832,[13] Weber retained the constancy of the measures of *mass, length,* and *time,* and instead introduced the relativistic consideration by a change in the force or potential with velocity. That difference in the formulations can usually be resolved by algebraic substitution, and may thus appear as merely an artifact of the mode of expression, although more is involved.

Two more fundamental differences, make comparison difficult:

1) Einstein's formulation addresses the shortcoming in the mathematical expression of the Faraday-Maxwell field representation when propagation occurs at the speed of light. Weber's formulations do not address the question of propagation. By proceeding from his ingenious considerations of the relativity of simultaneity, Einstein was able to draw conclusions respecting time beyond anything addressed by Weber.

2) Weber's formulation, by introducing the consideration of a change in curvature in the small (I here employ the term in the most general sense of a change in physical behavior), arrives at a set of possibilities not considered by Einstein. That is, that the laws of electrodynamics would define the binding force of the nucleus and describe nuclear fusion.

Some Implications

The existence of a relative velocity greater than the speed of light by a factor of $\sqrt{2}$ is a crucial anomalous feature of the curvature of space-time (or "state of space" to borrow Vernadsky's term) in the microcosm as deduced by Weber. This is a characteristic of the domain, which is not known to modern physics. Further exploration of the Riemannian space of the nucleus from a strictly honest standpoint is required. Somewhere in the data available or about to be available lies the solution.

The suppression, by the hand of Clausius, of Bernhard Riemann's 1858 reflections on the implications of the Weber-Kohlrausch experiment, to the effect that the propagation of the electrody-

11. The constant *c,* as employed by Weber, which had been known as the *Weber constant* throughout most of the 19th Century, was thus equal to $\sqrt{2}$ times the velocity of light.

12. Weber gives there the factor $[1-(a^2/16)v^2]$ for the square of reduced relative velocity. He later replaced the quantity $4/\alpha$ by the symbol *c,* giving $\sqrt{(1-v^2/c^2)}$ for the reduced relative velocity. Keep in mind, however that Weber's *c* is $\sqrt{2}$ times that employed by Einstein and modern usage.

13. Carl F. Gauss, *The Intensity of the Earth's Magnetic Force Reduced to Absolute Measurement* (1832), English translation at www.21stCenturysciencetech.com/translations/gaussMagnetic.pdf

Philip Ulanowsky/EIRNS

The author teaching a class on the Moon Model in 1992.

namic potential is retarded at the same rate as is the propagation of light, is one of those injustices that even now, 150 years after the fact, cries out for redress. Whether understood as such at the moment or not, Clausius's intervention against the publication of Riemann's 1858 work,[14] proved to be the most decisive step in the successful substitution of Maxwell's empiricist fraud for the considerations which had been percolating within the ranks of leading scientists, since the treatment, by collaboration of Ampère and Fresnel, of the phenomena of light and electricity.

There is no deep mystery to Maxwell's fraud. His frank admission, as in the Preface and concluding chapters of his famous *Treatise*, that he is unable to conceive of any means of propagation of the electrical action, other than one *at-a-distance* which he mistakenly, (perhaps even ignorantly, to give him the moral benefit of the doubt) attributes to Ampère, Gauss, Weber, and Riemann, or through a *medium* (his own conception), is the problem. His stated unwillingness to" "contemplate geometries other than our own," seals the case.

To the morally degenerate, results are everything. As in the case of the Wall Street trader, whose apparently wild success up to the moment of his declaration of bankruptcy and jailing, so also for scientific practice. Such frauds against the real intellectual development of the science of electrodynamics as those committed by Hermann Grassmann, Clausius, Maxwell, and Helmholtz, which even now appear to go unpunished, perhaps ""too big to fail," are yet heading toward their final come-uppance.

The case against Maxwell's substitution of an apparently algebraically equivalent formalism expressing the propagation of an electromagnetic action is precisely the same as that to be made against the fraud committed by Sir Isaac Newton (or the collection of actual living entities behind that largely synthetic figure), respecting the discoveries of Kepler and Leibniz. However, the more elaborate development of science in the intervening 150-year period since the crime against Riemann's legacy, as compared to the earlier period from Kepler to Gauss and Riemann, has meant that the damage has been worse.[15]

The consideration of further work on the Moon model of the nucleus, and the questions raised by the prospect of space colonization will bring this seemingly arcane issue in the history of science into sharper relief.

14. "A Contribution to Electrodynamics," published posthumously.

15. The rescue of science, by Planck and Einstein, from the worst atrocities of Clausius and Maxwell's frauds, did not entirely resolve the problem. It could only have been by a thorough exposure of the fraud itself that a cleaer path out of the morass could have been laid. Such a course was unavailable at the time, as Planck once noted ironically in pointing out that his was the first generation of German physicists to be educated in the "new" (Faraday-Maxwell) electrodynamics.