FIRST ENGLISH TRANSLATION OF WEBER 1846 TREATISE

The Ampère Angular Force And the Newton Hoax

by Laurence Hecht

The Internet posting by *21st Century Science & Technology* of the first English translation of Wilhelm Weber's historic 1846 treatise on electrodynamics,[1] raises anew the crucial question which could not be effectively addressed by any of the principal characters in a scientific battle that raged nearly two centuries ago. No true appreciation of the fundamental laws which lie at the basis of our modern physical science can be had, without first recognizing the manifold ways in which the imposition of the Anglo-Dutch financial institution's hoax, known as Isaac Newton, has infected modern science. Achieving clarity on this question is of urgent importance. For example, the currently fashionable package of environmental frauds, including Al Gore's climate hoax, and the injection of statistical methods into science generally, could never have been taken seriously by any scientist trained in classical methods.

The importance of Weber's work in electrodynamics was first brought to our attention by Manhattan Project physicist and physical chemist Dr. Robert J. Moon, designer of the Chicago cyclotron and a crucial figure in the development of the first atomic pile and the first plutonium reactor at the Hanford reservation. The implications of Weber's work for the present include the discovery of far more efficient paths to nuclear fusion, utilizing least action pathways determined by the nuclear geometry. Hence the several-fold importance of the appearance of this translation at this time.

The Weber, or more properly, Gauss-Weber electrodynamics, arose as an attempt to establish the validity of a crucial discovery of fundamental principle by France's André-Marie Ampère over the period of 1820-26. To appreciate the significance of Ampère's breakthrough, and the subsequent work of Germany's Carl Friedrich Gauss and Wilhelm Weber, a certain deeply embedded misconception resulting from the widespread promotion of the Newton hoax must be briefly addressed. Contrary to popular myths regarding the history of science, all competent fundamental investigation in modern science derives from the unique resolution of the paradox of knowability developed by Cardinal Nicholas of Cusa in his 1440 *On Learned Ignorance,* and the associated reforms in social policy embodied in the Council of Florence, as the case of Johannes Kepler's revolution in astronomy sufficiently illustrates. Yet, today that proven method of scientific advance has been virtually buried, except as it persists as an inchoate impulse within the actually human spirit. (The rapidly maturing work of the LaRouche Youth Movement's "basement" research teams is the happy exception which holds the promise of reversing that otherwise civilization-destroying trend.)

We owe this destruction of the scientific method to the success of Fra Paolo Sarpi's (1552-1623) New Venetian Party operation, in finding a way to permit a limited progress in science, for reasons of state, while virtually outlawing any examination of the philosophical-epistemological issues on which fundamental discovery in science rests. That method,

1. Wilhelm Weber, *Determinations of Electrodynamic Measure, Concerning a Universal Law of Electrical Action,* issued at the founding of the Royal Scientific Society of Saxony on the day of the 200th anniversary celebration of Leibniz's birthday, published by the Prince Jablonowski Society, Leipzig 1846. 146 pages in pdf format. Posted March 2007. www.21stcentury sciencetech.com/Articles%202007/Weber_1846.pdf

which became the state policy of the extended Anglo-Dutch financial empire from the late 17th Century onward, is conveniently identified as the Newton hoax, the immediate work product of Venice's Antonio Conti. By the time of the work in question, a virtual cult of Isaac Newton adulation, including salons and special "ladies' editions" of Newton's philosophy, had overtaken France and was weighing heavily upon the rest of Europe.

The Ampère Revolution

Ampère's revolution in science was completed by 1825 and published in 1826 as his *Memoire sur la théorie mathématique des phénomenes électrodynamiques uniquement déduite de l'expérience*[2] (Memoir on the Mathematical Theory of Electrodynamic Phenomena Uniquely Deduced from Experiment). Ampère showed therein that the restatement of Kepler's discovery of the principle of universal gravitation, as associated with the name of Newton, could not possibly apply as a universal law, once the newly discovered phenomena of galvanic currents (persisting direct current, as opposed to the static discharge investigated by Franklin) were taken into account. Specifically, Ampère showed that the attempt to reduce the laws of nature to an interaction of self-evident particles obeying an inverse square law of attraction could not hold in respect to electrical currents. In that case, taking the infinitesimal element of current as the presumed self-evident existent, it turns out that the laws of interaction must be modified to take into consideration the angular direction of the current flow. Thus, the simple inverse square law gives way to a term embodying the sine and cosine of the angles which each member of a pair of infinitesimal current elements make with the line connecting their centers (See **Figure 1**).

While Ampère's discovery might appear today as a merely mathematical artifact, it must be understood that Ampère had presented his discovery within the prevailing formalism of "laws of force" with the obvious intention of challenging the Newtonian orthodoxy. The Newtonians of his day were not mistaken in their visceral dislike for Ampère's innovation. While Jean-Baptiste Biot and most of the physics establishment in France rejected the work, as a member of the Academy, Ampère was nonetheless officially honored for his discovery. Yet, within several years, under the reign of Louis Philippe, demotion and assignment to a strenuous position as inspector of schools, under conditions of ill health, hastened his early death at the age of 62.

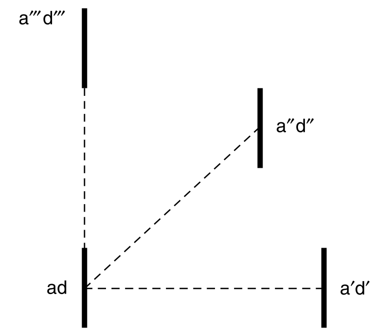
Elsewhere, Ampère's work was also under attack. Even before his 1826 publication, an anomymous pamphlet (later attributed to England's Michael Faraday) had circulated at a Paris physics conference, attacking the Ampère-Fresnel conception of the *magnetic molecule.* This was the hypothesis, widely accepted today, that magnetism is the result of the motion of microscopic electrical currents within the particles of matter. In Germany, Hermann Grassmann argued the impossibility of so "complicated" a phenomenon as the angular force. Hermann Helmholtz found it offensive that anyone should propose that nature might work on the basis of anything more complex than attraction and repulsion of elementary particles according to the inverse square law.

In James Clerk Maxwell's revision of electrodynamics, which was codified in an 1873 textbook, which is widely accepted today as the classic work on the subject, the Ampère angular force had disappeared. Maxwell accepts the argument that, as electrical currents only appear in complete circuits, any dependence of the force exerted by the individual current element upon the angular direction is eliminated in the totality, when the vector sum of all the elements within the circuit are taken. By such means, all subtleties may be removed from Nature and Life—the "bottom line" for all thus becomes the proverbial "six-feet under."

Gauss's Intervention

What rescued 19th-Century physics from irrelevance respecting such matters, was Carl Friedrich Gauss's recognition of the extraordinary significance of Ampère's discovery. Even more than Ampère, Gauss suffered the oppression of the Sarpi-Newton cult, a condition which was exacerbated by his dependency since childhood upon the charity of the Duke of Brunswick and Hanoverian nobility. Gauss nonetheless resolved, by no later than 1828, to make the experimental

FIGURE 1
The Force Between Current Elements



Early experiments with two parallel wires showed that the wires attracted each other when the current flowed through them in the same direction, and repelled in the opposite case. From this, Ampère could conclude that any two parallel, small sections of the wire (current elements) would behave accordingly. This is the relationship of element ad to a′d′ in the diagram. But what if the second element is in another position, such as that of a″d″ or a‴d‴? Direct observation could not decide these more general cases.

2. In A.M. Ampère, *Electrodynamiques, uniquement déduite de l'expérience* (Paris: A. Hermann, 1883). A partial English translation appears in R.A.R. Tricker, *Early Electrodynamics: The First Law of Circulation* (New York: Pergamon, 1965), pp. 155-200.

proof of the Ampère angular force a central point of concentration. At the Assembly of the Society of German Scientists and Physicians, which took place in the Fall of 1828 in Berlin, Gauss was introduced to the young physicist Wilhelm Eduard Weber, a disciple of Ernst Chaldni who had already distinguished himself through highly original studies in wave behavior and acoustics. Weber was awarded a professorship at Göttingen University in 1831, where an intense experimental collaboration with Gauss began. As Weber reports the work in the 1846 treatise, in order to prove Ampère's hypothesis, it was first necessary to find a means of positively measuring the effect of one current-carrying conductor upon another. All of Ampère's deductions derived from experiments in which no force was produced, sometimes called equilibrium, or *null* experiments. As Weber noted, it were possible that subtle forces were acting, which were masked by frictional or other effects within the apparatus.

However, in order to positively measure the sometimes small external forces exerted by the conductors, it was first necessary to discount the effects of the constantly varying magnetism of the Earth. A means of determining the absolute measure of the Earth's magnetic strength was thus required. Hence, the first collaboration, which bore fruit in less than two years, was directed to the design and construction of the bifilar magnetometer, an instrument which could resolve the ambiguities left by the previous measuring techniques. The paper reporting on this achievement is one of the landmarks in the history of experimental physics, which includes among its achievements, the first statement of a universal system of physical units known as the Gaussian system, and a preliminary formulation of what was to become known as Dirichlet's Principle.[3]

In 1837, a crisis was provoked at Göttingen by the accession of Queen Victoria to the British throne, and the appointment, under Salic Law, of a male ruler of the Hanover territory formerly under direct British rule. Wilhelm Weber was among a group of professors known as the Göttingen Seven who were dismissed for their principled refusal to sign a loyalty oath to the new King Ernst Augustus. The famed philologists Jacob and Wilhelm Grimm, and Gauss's son-in-law, the orientalist Heinrich Ewald, were also in the group. Weber was able to continue his collaboration with Gauss from off campus for several years, by the help of an aid society established for the dismissed professors. By that time, the experimental work establishing the validity of the Ampère angular force had been largely completed.[4]

3. Carl Friedrich Gauss, "The Intensity of the Earth's Magnetic Force Reduced to Absolute Measurement," translated from German by Susan Parmacek Johnson, July 1995, www.21stcenturysciencetech.com/Translations/gaussMagnetic.pdf

4. Laurence Hecht, "The Atomic Science Textbooks Don't Teach: The Significance of the 1845 Gauss-Weber Correspondence," *21st Century Science & Technology,* Fall 1996, www.21stcenturysciencetech.com/articles/Atomic_Science.pdf

Weber's Results

The chief apparatus, known as the electrodynamometer, was an adaptation of the bifilar magnetometer, employing two electrical coils in place of two bar magnets. Both apparatuses employed the precision angle-measuring technique, conceived by Gauss, in which angular deflection is observed by noting the image of a meter stick, placed atop a terrestrial telescope, which has been reflected through a small mirror attached to the rotatable part of the apparatus.

Owing to his dislocation and reappointment to a professorship at Leipzig, it was not until 1845 that Weber was able to undertake a written presentation of the extended experimental collaboration with Gauss. As the preserved correspondence establishes, Weber was first inclined to give way to the prevailing academic climate and omit discussion of the angular force. A letter of reply from Gauss caused him to return to the original intention of their collaboration.[5]

As with Ampère, Weber chose to present the results in the mathematical format of a force law, in this case as the force between pairs of electrical particles. On the suggestion of Gustav Fechner, the epistemological psychologist and student of the Zend Avesta who was later to influence Bernhard Riemann, Weber chose to represent current flow in a wire as the motion in opposite directions of oppositely charged electrical particles. By analysis of their relative velocities and accelerations, the anomaly expressed by Ampère as an angular term now appeared as a diminution in the force of attraction or repulsion due to relative motion. Taking into account the laws of induction, unknown to Ampère in 1826, Weber developed a universal expression for the electrical action, in which the static electric (Coulomb) forces were merely the degenerate case in which the relative motion has gone to zero.

Weber's results meant that there was some relative velocity at which the force of replusion between oppositely charged electrical particles would fall to zero. Mathematically, this took the form of a constant within his expression for the force, and for the potential, between the particle pairs. That value was known throughout most of the 19th Century as the *Weber constant.* In a remarkable series of experiments which he carried out in 1855 upon his return to Göttingen University, the value of the Weber constant was found to be the product of the velocity of light times the square root of 2. The experiments, at which Riemann was an observer and sometime assistant, were conducted with Rudolf Kohlrausch.

That determination of a universal "speed limit," usually associated with Einstein's 1905 formulation of Special Relativity, was already implicit in entries in Gauss's notebooks dating to 1833, where Gauss had proposed the relativistic formulation of the electrodynamic law. Einstein's later for-

5. "Text of the Gauss-Weber Correspondence," translated by Susan Parmacek Johnson, *21st Century Science & Technology,* Fall 1996, www.21stcenturysciencetech.com/articles/Atomic_Science.pdf, pp. 22-24 of pdf file.

mulation derived from his unique conception of the *relativity of simultaneity,* but unfortunately was formulated as an attempt to save the appearances of the Maxwellian formulation. Maxwell's rejection of the Ampère-Gauss-Weber work had by then become codified within the teaching of physics in Germany, thanks largely to the undermining efforts of Helmholtz.

The replacement of the Ampère-Gauss-Weber electrodynamics by the Maxwell formulations, is usually justified on the ground that it permitted the unification of electrical with optical phenomena, under the concept of electromagnetic waves. However, an examination of the 1845 Gauss-Weber correspondence shows that Gauss had already entertained the idea of electrical waves in the ether, but rejected it only on the grounds that a "constructible representation" of the phenomena was lacking. Riemann recognized the deep significance of the 1855 Weber-Kohlrausch experiments, and in an 1858 paper, "A Contribution to Electrodynamics,"[6] whose publication was suppressed by Rudolf Clausius, Riemann formulated a relativistic wave theory, based on a concept of retarded propagation of potential.

Whoever should suppose that Maxwell's cleverness of physical-geometric insight surpassed Gauss and Riemann in this respect would surely be unserious. The problem lay not in formulating a geometric picture of wave propagation, but in resolving the underlying epistemological and ontological paradoxes, which had been buried by the promoters of the Newton hoax. These were to erupt again as the crises in physics around the paradox of wave versus particle, the imposition of an acausal, statistical interpretation of atomic phenomena, and its extension into the nuclear and subnuclear domain. The solution to such problems lies outside the realm of mathematical physics *per se,* at least as so narrowly conceived today. A rebirth of the spirit of Nicholas of Cusa, Johannes Kepler, and Gottfried Leibniz, the founders of all modern science, accompanied by a conscious, joyful, and determined overturning of the Sarpi-Newton hoax will accomplish that task.

The treatise, which now appears for the first time in English, was first published in Leipzig in 1846 on the 200th anniversary celebration of the birth of Gottfried Leibniz. The translation is the result of a 1996-97 collaboration of the late Susan P. Johnson and Laurence Hecht. Prof. Andre Koch Torres de Assis of the State University of Campinas in Brazil recently completed the work of equation editing and reviewing the entire manuscript.

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6. Bernhard Riemann, *Collected Papers,* translated from the 1892 edition by R. Baker, C. Christenson, and H. Orde (Heber City, Utah: Kendrick Press, 2004), pp. 273-278.