

# Wilhelm Weber Defended

by Laurence Hecht

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## **The Electric Force of a Current: Weber and the Surface Charges of Resistive Conductors Carrying Steady Currents**

by Andre Koch Torres Assis and Julio Akashi Hernandez  
Montreal: Apeiron, 2007  
Paperback, 237 pp., \$20.00 (Available in pdf format at <http://www.ifi.unicamp.br/~assis>)

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**P**rof. Andre K.T. Assis of the State University of Campinas in Brazil is a fierce defender of Wilhelm Eduard Weber, the collaborator of Carl Friedrich Gauss in the determination of the absolute value of the Earth's magnetic force, and the author of the Universal Law of Electrical Action. On this orientation, we wholeheartedly agree. On other matters, related to the deeper significance of the Gauss-Weber-Riemann electrodynamics, we have maintained a friendly disagreement for some years.

In this new work, I find our points of difference reduced to a minimum, and have discovered much new material of interest. Dr. Assis has focussed this work on refuting the charge levelled by Clausius, Maxwell, and others, that the alleged failure to detect a force between a current-carrying wire and a nearby stationary charge invalidates Weber's fundamental law.

In a sharply formulated summary of the current dogma in Chapter 1, Dr. Assis answers the argument against Weber's force law, following the discovery at the turn of the 20th Century that the positive charge seems to remain connected to the lattice of a conducting wire, while the negative charge is put into relative motion.

In Chapter 3, "Experiments," the work of a great number of investigators, establishing the existence of the Weber force in the case in question, is brilliantly summarized. I found here material that was new to me, despite having paid close attention to developments in the area.

While the evidence shows that there are no grounds for denying the existence of a force between a conductor and a static charge, it remains a shame that, after all these years, a more decisive experimental demonstration of the existence of the force has not been

achieved. Dr. Robert Moon's 1958 proposal, never funded by the University of Chicago Physics Department, remains exemplary of the sort of procedure that could provide a decisive proof (cf. *21st Century*, Fall 2004, p. 46).

Later chapters in the book are devoted to theoretical calculations related to the Weber force, including an original treatment of the resistive spherical shell. An appendix, "Wilhelm Weber and Surface Charges," contains a penetrating study of Weber's important paper in the *Electrodynamic Measurements* series, devoted to resistance measurement.

A second appendix, on Gustav Kirchoff's derivation of the telegraphy equation, in which he demonstrated that the propagation of current in a wire would be limited by the velocity of light, sets the record straight that both Weber and Kirchoff had preceded Maxwell by several years in this discovery. It might usefully have been added that Bernhard Riemann, in a paper dated 1858, had already recognized that the propagation of the electrical potential in free space is retarded at the same rate as the propagation of light. Riemann was the closest friend of Wilhelm Weber and prized student of Gauss.

### **What Is Left Out**

Which brings us to our criticism. It is in matters relating to the historical development of the subject where the book's shortcomings appear, not so much in what is stated as in what is left out.

Weber's electrodynamic studies began as an effort, as chief assistant to Gauss, to establish the existence of the Ampère angular force. As Gauss had noted explicitly in his 1839 paper "General Propositions Relating to Attractive and Repulsive Forces Acting in the Inverse Ratio of the Square of the Distance," the existence of the Ampère angular force meant that the entire edifice of potential theory built upon the Newtonian structure would collapse.

It was no accident that Gauss devoted more than 10 years of his life to inquiring as to the existence of the angular force. The publication of the experimental proof under Weber's name in 1846, appeared, appropriately, in a volume

marking the 200th anniversary of the birth in Leipzig of Gottfried Leibniz, Newton's opponent on matters underlying this fundamental point.

It was James Clerk Maxwell who first introduced into the field of electro-dynamics the false dichotomy between theories of *action-at-a-distance* and theories of *propagation in a medium*. Under this false categorization, Ampère (who was virtual co-author with his dear friend Augustin Fresnel of the modern wave theory of light), Gauss (the untiring, if also circumspect, champion of Kepler against Newton), and Gauss's students Weber and Riemann, are all classed as defenders of the *action-at-a-distance* theory!

Unfortunately, most among that small circle of modern defenders of Weber and Ampère have allowed themselves to be trapped into Maxwell's false dichotomy. To oppose Maxwell, is thus, supposedly, to uphold Newton.

The proper treatment of the matter revolves around a crucial point made by Gauss in the 1845 correspondence with Weber, respecting the need for a rigorous *constructible representation* of the electrodynamic propagation, a representation which Maxwell failed to provide, despite what has been drilled into the heads of generations of physics and engineering students.

A rigorous solution to that problem still awaits discovery. The difficulty does not lie in the realm of formal mathematical representation, where most, including Maxwell, have looked. The solution revolves around the issue, identified by Lyndon H. LaRouche, Jr., of the real existence of the *ontological transfinite*.

Riemann's remarks on the Newton problem in the posthumously published "Philosophical Fragments," and his attempts at formulating a theory of propagation of the *retarded potential*, come closest to the direction of a solution. A thorough familiarity with the work of Ampère, Gauss, and Weber is an essential prerequisite to fully comprehending those efforts.

Despite the noted shortcoming, this new work of Drs. Assis and Hernandez may usefully assist in that endeavor.