



The Scientific Legacy of Dr. Peter Graneau: Instantaneous Interconnection of All Things

Dr. Neal Graneau

Physicist and new energy pioneer Dr. Peter Graneau passed away peacefully on February 25, 2014, with his family near him in Concord, Massachusetts. He was 92 years old. Peter was born on March 13, 1921 in Silesia, Germany, where his father was a landowner and businessman. After the war, that part of Germany was annexed by Poland and his parents were able to move to a property they owned further west. Since his studies at the University of Berlin had been interrupted by the war, he was able to move to England, become a British subject and attend the University of Nottingham, where he studied physics and was awarded the B.Sc. (First Class Honours). While at University, he met the girl he would fall in love with and eventually marry, Brigitte, who from that time until today gave unfaltering support to his scientific work. They married in 1955 and moved to London, where he joined a large industrial laboratory BICC (British Insulated Callender's Cables) as assistant research manager while he continued to work on his Ph.D. thesis, entitled "Coupled Circuit Theory for Electromagnetic Testing." He was eventually awarded the Ph.D. degree in 1962 after a successful resubmission and his first taste of serious scientific controversy. At this time he was also appointed as a Fellow of the Institute of Physics.

At BICC (1955-1967), Peter's aim was to bring about collaboration between industry and academia, not a common practice at that time. He was very successful in initiating many joint projects, especially in the advancement of non-destructive fault testing of standard electrical cables, and exploring novel forms of electrical energy transmission using liquid nitrogen cooling and vacuum insulation. He also enjoyed a time playing with trains while contributing to the electrification of Britain's railway network. During this period, he produced 16 fundamental electromagnetic (EM) theory publications, based on the merger between his academic and professional work. These papers covered the mechanisms of inductance, EM induction and superconductivity. His goal was to create calculating techniques based on the pre-Maxwellian electrodynamics theories which did not require considering magnetic fields and their artificially imposed relativistic time delays. These algorithms have been demonstrated to be accurate and involve far fewer calculation elements and steps, but have still not been taken up by the power engineering or physics community as it is still not culturally acceptable that EM calculations can be performed without magnetic fields.

Peter and Brigitte's son, Neal, was born in London in 1963. Fourteen years later, Peter would commence a close scientific collaboration that would last until today.

In the early 1960s, Peter was asked to serve on a U.S. com-

mittee under the auspices of the "Highway Beautification Act," championed by Lady Bird Johnson. His part in the grand scheme to improve the urban and rural U.S. landscape was to develop new and efficient power transmission technologies to facilitate the economical undergrounding of the unsightly overhead electrical power corridors that blight the environment. He eventually forged a conglomerate of three Cambridge, Massachusetts institutions—Simplex Wire & Cable, Arthur D. Little and MIT—and in 1967, together with his wife and son, moved to Concord, Massachusetts to lead this project. He set up a research laboratory in the Simplex facilities and built prototype sections of cryogenically cooled vacuum insulated rigid cable, designed for high power underground AC power transmission with very low loss. He formed a close collaboration with the Vacuum Barrier Corporation, whose liquid nitrogen handling skills were vital to the potential success of the "cryocable" concept. This work was proceeding well, but came to a temporary suspension when the site of the Cambridge Simplex plant was sold to MIT in 1969, with the buildings being demolished.

Undeterred by these events, together with the president of Simplex, he formed a company called Underground Power Corporation with offices in Weston, Massachusetts and at the same time established a new electrostatics and power transmission laboratory at MIT in the Francis Bitter National Magnet Laboratory, with funding from the U.S. National Science Foundation and Department of Energy. There he built a 138 kV test cryocable section including connector, termination and switching components. He designed high voltage surge diverters which were successfully tested at the Westinghouse Waltz Mill test facility in Pennsylvania. He also explored the economics and feasibility of utilizing sodium as a low-cost cable conductor. During this period he filed more than a dozen patents. This work culminated in his first book, *Underground Power Transmission: The Science, Technology and Economics of High Voltage Cables* (Wiley, 1979), which covered existing technology plus his own contributions.

As a result of a health scare in 1977, Peter deliberately sought a retreat from the high pressure commercially oriented research in which he had been devoting most of his efforts and took advantage of an opportunity to return to his true love of delving into the fundamental laws of electromagnetism that began during his Ph.D. research. With a new grant from the National Science Foundation, he was able to construct a series of rudimentary, but highly poignant experiments in his MIT laboratory that aimed to produce effects that would distinguish between the predictions of the pre-Maxwellian electrodynamics developed by scientists such as Ampère, Neumann, Weber and Kirchoff and those of the

field theories of Maxwell, Lorentz and Einstein.

Peter delved deeply into the history of the various theories and discovered that in many situations, the two sets of laws predicted the same effects, but were based on entirely different philosophical principles. The earlier laws were modelled on Newtonian physics, which can be generically described as “instantaneous action at a distance” (IAAAD). This notion assumes that every individual particle attracts or repels every other particle in the universe at all times. The strength of this force is proportional to the product of their masses (gravity), charges (electrostatic force) and inversely proportional to the square of the distance of their separation. In the armory of IAAAD forces, Newton quantified gravity, Coulomb did the same for the electrostatic force and Ampère deduced a similar equation for small elements of electrical conductors, which are known as current elements. Maxwell went as far as describing Ampère as “the Newton of electricity.” However, Maxwell in the 1870s was on a self-proclaimed mission to develop a field theory specifically to introduce an undetectable substance that inhabited the space between all pieces of matter with as many properties as required to explain all known experiments. For no reason, other than fashion, this new field theory approach became popular in England and within 20 years had pervaded continental Europe and the rest of the scientific world and the IAAAD era came to an end. When Einstein was a student in the last years of the 19th century, he was only taught field theory, even though this theory was known to be flawed by its lack of Galilean invariance. At that moment, it would have been entirely logical to return to the IAAAD theories which were necessarily Galilean invariant as a consequence of their Newtonian origin. However, history shows that physicists, like politicians, never elect to make a U-turn, and history shows that the physics community preferred to patch up the existing flawed theory to make it even more complicated. This patch was the development of Lorentz invariance and led to special relativity and ultimately general relativity.

At the beginning of the 20th century, it simply was not possible to experimentally distinguish between the two sets of theories either by experiment or calculation. The necessary experiments required high current power supplies and the calculations involved digital computers, neither of which yet existed. As a consequence, logic would dictate that both theories should have been kept alive until they could be distinguished by predictions and then experiment would determine which to keep. Needless to say, this did not happen; however in 1977, Peter Graneau realized that the necessary high current power supplies were already in his lab and that his son had the skills to write the appropriate computer programs in FORTRAN on the mainframe computer at his high school, Phillips Exeter Academy. During the Christmas 1977 vacation, the two set to work to design experiments that were simple to build and easy to model and calculate predictions. The two laws to be compared were the Lorentz law (the force law attached to Maxwellian field theory) and the IAAAD Ampère’s force law (the original electrodynamic force law, empirically derived in 1822). The fundamental difference between the two is that Ampère’s law predicts that electrodynamic force can have a component in the same direction as the current flow in a current element. The Lorentz force denies the existence of such a longitudinal

component. Approximately 20 experiments were performed in the MIT laboratory and all confirmed the existence of the longitudinal force component. These experiments ranged from DC currents of hundreds of amps in liquid mercury and copper circuits to much higher pulsed currents of tens of kiloamps in railgun and exploding wire configurations. Some of the effects that were analyzed, such as the location of the recoil forces in a railgun, have direct implication on technologies for which large amounts of taxpayer money is currently being spent. Unfortunately, the still unfashionable nature of IAAAD theory means that many scientists are still struggling to make their data fit the flawed field theory. Peter Graneau remained convinced throughout his life that someday, logic will prevail and the science and engineering community will accept new ideas rather than continuing to believe existing dogma, but this process has taken longer than he expected.

The first of Peter’s publications demonstrating longitudinal electrodynamic force appeared in *Nature* in 1982 and a string of over 50 papers have appeared over the intervening 32 years, most of which were co-authored with his son, Neal. The work up to 1985 was captured in his second book, *Ampère-Neumann Electrodynamics of Metals* (Hadronic Press, 1985). A more complete summary was revealed in his third book, *Newtonian Electrodynamics* (World Scientific, 1996), which was co-authored with Neal and gave the full mathematical derivations and predictive capabilities of the Ampère-Neumann electrodynamics. It established a more complete definition of the Ampèrian current element and focused on the principle that if Ampère’s law predicts the force between two current elements, then Neumann’s poten-

The Peter Graneau Memorial Fund

The non-profit New Energy Foundation (publisher of *Infinite Energy*) has established the Peter Graneau Memorial Fund to further the development of Dr. Peter Graneau’s research on the liberation of intermolecular bond energy in liquids for the purpose of creating new solar driven electricity generating technologies. This fund will support the construction and testing of prototype generator structures that continuously convert electrical energy to kinetic energy of liquid droplets, enhanced by the liberation of stored energy in the bulk liquid. Energy harvesting mechanisms are then used to convert the droplet kinetic energy back into electrical energy. The goal of the program is to achieve a closed cycle that produces a gain in electrical energy at the expense of the renewable atmospheric heat driven by the sun.

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tial defines the stored energy between them. This potential then controls a variety of other electrodynamic effects such as inductance, induction and effects normally ascribed to EM radiation. Most importantly this book presents a complete theory of electrodynamic force, inductance and induction that does not require the notion of a magnetic field. The extension of the theory to distant high frequency instantaneous interactions between sources and antennas (otherwise known as EM radiation) has been published in the last book co-authored by Peter and Neal, *In the Grip of the Distant Universe: The Science of Inertia* (World Scientific, 2006), and elsewhere. The outstanding issues of handling magnetic materials and particle beams with IAAAD theory have yet to be tackled. Peter Graneau always maintained that to have still unanswered questions will hopefully one day encourage more scientists to enter the field.

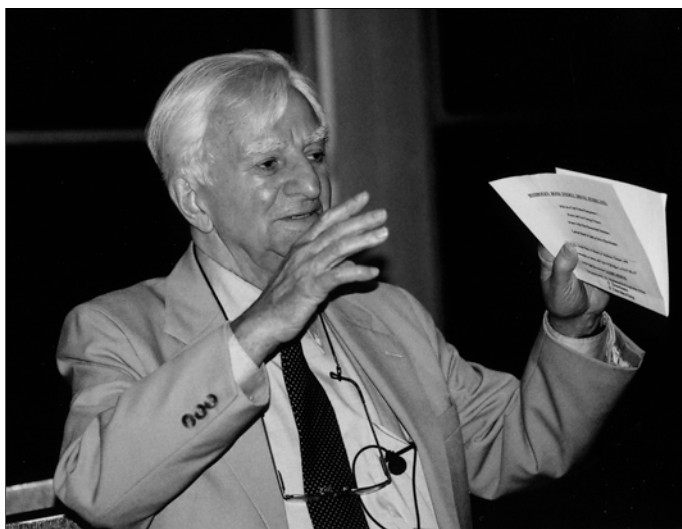
In 1984, during a series of experiments with Neal in which they were experimenting with electrode configurations in salt water to drive a small model boat with the Ampère force, they accidentally discovered that if there was a spark breakdown in the water adjacent to the boat, the resulting force did not propel it forward as expected, but sent it flying to the ceiling where it shattered into many pieces. Over the next few years, water arc experiments were performed in semi-confined cavities and five papers were published with a series of his students quantifying the strength of these explosions and unsuccessfully attempting to predict the magnitude of this force with any form of EM or other force law. The lack of theoretical understanding brought this work to a temporary scientific hiatus. In addition, the laboratory at MIT had to be disbanded due to the expansion of the MIT Plasma Fusion Center.

Between 1987-1997, Peter Graneau was also a visiting professor at the newly established Center for Electromagnetics Research at Northeastern University (Boston, Massachusetts). During some of this period, he was able to concentrate again on the foundations of IAAAD Newtonian electrodynamics. However after a few years, his thoughts returned to the anomalous water arc explosion experiments. He deduced that if the force of the explosions was larger than could be

predicted by any known force law, then there must be a hidden source of energy which is released during the explosion. Experiments were all pointing to the conclusion that the most likely energy storage mechanism was the intermolecular bonding network (hydrogen bonds in water) that defines the liquid state. As a result, he set about forming an international research team to engage in the high current pulsed arc liberation of stored hydrogen bond energy from water. A large part of his experimental equipment was moved to a private laboratory in Canada which quickly set up experiments to examine the anomalous explosions. By 1996, his son, Neal, had secured funding and was able to reconfigure his laboratory in the University of Oxford, UK, to work specifically on the understanding of the energetics of water arc explosions. Until 2005, Peter enjoyed many of his “retirement” years travelling between these two institutions, designing and participating in many exciting trials of both a fundamental and engineering nature. The goal of this research was to further confirm the existence of this hidden stored energy source in water and other liquids, and find techniques to exploit it with the ultimate goal of achieving a new energy generation mechanism and source. The work proved to be challenging for several reasons: a) the difficulty of accurately measuring the energy of an explosion and b) the inefficiency of converting the kinetic energy of a low mass of high velocity water to a heavy energy harvesting device such as a turbine or piston. With this consortium, he published more than a dozen papers on the liberation of intermolecular hydrogen bond energy. Unfortunately the funding for both laboratories was terminated in 2006, however the nine most significant publications from this era were compiled into a soft cover compendium entitled *Unlimited Renewable Solar Energy from Water*, which is available from *Infinite Energy*.

In 2006, foreign travel became more difficult for Peter and he became a technical editor of *Infinite Energy* and was able to contribute more broadly to monitoring and encouraging unconventional energy research as well as furthering his renewable energy interests by promoting the science of liquid bond energy liberation for the benefit of mankind. He continued this role until August 2013, during which time he wrote a dozen editorials (all of which are on the *Infinite Energy* website, <http://www.infinite-energy.com/iemagazine/readarticles.html>). In that period, he contributed ideas and suggestions to the work which Neal was performing with new colleagues in the Technical University in Delft, Holland in which the water arc research had been extended to a continuous low power gain using the electrospray mechanism. All of this research now points to a future electricity generating technology which will produce power 24 hours a day in all locations on the earth and derives its input from the atmospheric thermal heat bath that surrounds us and is driven by the sun.

During their years of joint water arc research, Peter and Neal were able to spend some of their time together on their other pet scientific project, the understanding of the force of inertia. This force, which is normally called fictitious because it does not fit neatly into the present physics paradigm dominated by the theory of special relativity, is nevertheless required to explain the bursting of rotating discs, the pain in your elbow when it presses against the car door during a high speed turn and in fact everything we physically



Peter Graneau illustrates a point during his talk at the 2007 LANR Colloquium at MIT.

feel. The two authors developed a theory of inertia based on the instantaneous interaction principle that they had developed during their study of IAAAD electrodynamics. It appears that the inertia that we feel on earth, and which makes all objects resist acceleration in proportion to their mass, can be due to instantaneous force interactions between every atom and every other atom in the universe. This highly thought-provoking concept was first conceived by Ernst Mach (1838-1916) and is often called "Mach's Principle," although he never delved into its mathematical consequences. Peter Graneau recognized that although it contradicts much of the philosophy of modern physics, it is consistent with all known experiments and the electromagnetic theories he was promoting and provides a vastly simpler mathematical framework with which to understand the laws of nature. The Graneau mathematization of Mach's principle was unexpectedly accepted for publication in the most prestigious journal dedicated to promoting general relativity (*General Relativity and Gravitation*) in 2003. Feeling that perhaps a change of attitude was in the wind, Peter and Neal wrote another book together entitled, *In the Grip of the Distant Universe: The Science of Inertia* (World Scientific, 2006). It primarily described the long and tortuous history of this much misunderstood subject, presented the outlines of an IAAAD theory of the effects normally ascribed to EM radiation, demonstrated the circular reasoning behind all of the so-called experimental confirmations of special and general relativity and concluded with their IAAAD theory of inertia. One of the final conclusions presented in the published paper and the book was that if the force of inertia and the force of Newtonian gravity were one and the same thing, then in order to explain the physics we observe on earth, the universe must be accelerating away from itself. Moreover, the acceleration is related to the product of two constants, one of which is the mysterious Newtonian gravitational constant and the other is defined by the matter distribution of the entire universe which can be finite even for an infinite universe. In the last 15 years, it has become clear that the universe is actually accelerating away from itself, which runs quite contrary to the famous Big Bang theory and consequently, modern physics is now inventing yet more invisible

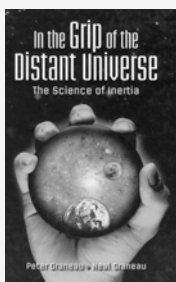
notions such as dark energy to explain this anomaly. Peter and Neal were very proud to have discovered that the most recent cosmological measurements could be much more easily explained by a return to IAAAD Newtonian physics and first year undergraduate mathematics. However, just as in the field of electrodynamics, modern cosmologists have no stomach for a paradigm shift yet.

A broad encapsulation of Peter Graneau's research career reveals that he was motivated both by a love of pure fundamental physics at its most raw and unconventional edge as well as a strong sense of providing creative and entirely unexpected engineering solutions to real problems. In 2009, he received the Sagnac award from the Natural Philosophy Alliance "in recognition of a lifetime commitment to excellence in scientific pursuit, for experiments in water plasma explosions and railgun recoils, and for theoretical presentations of Amperian longitudinal forces, instantaneous Machian interactions, and the unique role of water in renewable energy."

It can be seen that many of Peter's "pre-conventional" ideas and projects have not yet reached the marketplace due to the normal human resistance to change. High power underground cryocables and sodium cables will only be developed when the price and shortage of copper demand a change from existing power transmission methods. Similarly, only when fossil fuels and nuclear energy have become economically and environmentally impractical will there be serious demand for the required R&D investment in a renewable solar energy technology which functions 24 hours a day in all locations. Peter knew that many of his ideas were simply ahead of their time and hoped that history will eventually demonstrate their utility. Similarly, while the world of field theory or even aether-based physics continues to stumble onward by continually inventing new and invisible repair mechanisms every time it runs into a conflict with experiment, there will be only marginal interest in a return to the vastly simpler IAAAD physics that he promoted. He nevertheless maintained faith that since the brightest minds, 400 years ago, were eventually able to strip away the hideously complex epicycles of Ptolomaic astronomy and replace them with the much simpler heliocentric

**In the Grip of the Distant Universe:
The Science of Inertia**

by Peter Graneau and Neal Graneau



This book presents the history of the science of inertia. Nobody denies the existence of the forces of inertia, but they are branded as "fictitious" because they do not fit smoothly into modern physics. Named by Kepler and given mathematical form by Newton, the force of inertia remains aloof because it has no obvious local cause.

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Two meter tall supersonic fog jet



Infinite Energy technical editors Peter Graneau, Bill Zebuhr and Scott Chubb at the 2007 LANR Colloquium at MIT.

Copernican vision, this process could happen again. Despite the obstacles in getting his work more globally accepted, Peter Graneau was thoroughly content that he had laid much of the framework on which a new future physics could be based. This contribution has been recognized by many colleagues and is his lasting legacy. Similarly, if his stored liquid energy technology can overcome the known and yet unknown engineering obstacles that stand in its way, it may be an even more important and lasting legacy for the benefit of mankind.

It is extraordinary that a single theme has run throughout Peter Graneau's entire professional career and that is the concept of instantaneous interconnection between all particles across the entire universe. It seems to apply equally to electrical as well as mechanical force interactions. It runs throughout his published output of five books and over 150 published journal papers and conference presentations. He also felt so strongly that he recently created a spiritual angle to it. In his last months he expressed the view that since we are all interacting continuously with every atom in the universe, their combined motions retain a memory of us after we leave our earth bound body. He often expressed to his family that if he passed away he would be joining the distant universe, where he now resides in peace.



The New Energy Foundation Board of Directors and the staff of *Infinite Energy* greatly appreciate the efforts that Peter Graneau made on our behalf as a technical editor for the magazine. We have lost a true friend and co-pilot in the tireless search for new energy and new physics. We hope that readers will re-visit Peter's writings on our website, <http://www.infinite-energy.com/iemagazine/readarticles.html>

Peter's family indicated that he was "proud to have become one of Concord's authors" (Massachusetts). He will be buried in Concord's Sleepy Hollow Cemetery, where literary greats Henry Thoreau, Nathaniel Hawthorne, Ralph Waldo Emerson and Louisa May Alcott are also buried.

The World Science Database has an extensive list of Peter's papers available: http://www.worldsci.org/people/Peter_Graneau

We offer our heartfelt condolences to Peter's wife Brigitte and son Neal. Some of Peter's colleagues have offered the following tributes to his life and work:

Andre Koch Torres Assis

It is with great sadness that I write this. Peter Graneau was a good friend of mine and very important in the beginning of my career.

Around 1988 I discovered his papers dealing with Ampère's force between current elements. This subject had essentially disappeared from the textbooks during most of the 20th century. These textbooks discuss only the force of Grassmann and the law of Biot-Savart. And what is nowadays called Ampère's circuital law is not due to Ampère himself, but to Maxwell. Ampère never spoke nor worked with the concept of a magnetic field. Peter made important experiments and calculations related to Ampère's force between current elements, bringing it once more to the forefront of modern science.

I first met him in 1989 during a Conference on the Foundations of Mathematics and Physics in the 20th Century: The Renunciation of Intuition. It was held in September 1989 at the Department of Mathematics of the University of Perugia in Italy, organized by Umberto Bartocci and J. Paul Wesley.

He invited me and we worked together for a year at the Center for Electromagnetics Research at Northeastern University (Boston) from October 1991 to September 1992. It was a wonderful stay. Our exchange of ideas was excellent. We published three papers together: "Kirchhoff on the Motion of Electricity in Conductors" (1994), "The Reality of Newtonian Forces of Inertia" (1995) and "Nonlocal Forces of Inertia in Cosmology" (1996).

Peter was a person of strong opinions and fought hard for his beliefs. He loved not only Ampère's electrodynamics but also action at a distance and Mach's principle. He was in favor of the reality of Newton's *vis insita* (innate force of matter) or *vis inertiae* (force of inertia). He also had a deep interest in the origin of inertia and believed that it did come from a gravitational interaction of the test body with the distant masses in the cosmos.

One magical moment I had with Peter was a walk we took together at Walden Pond, a lake in Concord, Massachusetts, close to his home. The philosopher Henry David Thoreau lived there for two years, from 1845 to 1847, and wrote a famous book describing his experiences living there, *Walden; or, Life in the Woods*. During our tour on the lake we discussed physics and the origin of inertia. We had a very good insight about the influence of the distant masses in the cosmos acting on the spinning top. These real inertial forces, arising from a gravitational interaction, prevent a gyroscope from falling to the ground. We published these ideas in a joint paper in 1995 discussing the reality of Newtonian forces of inertia.

In 1999 I published the paper "Arguments in Favor of Action at a Distance," which appeared in the book *Instantaneous Action at a Distance in Modern Physics: Pro and Contra*, edited by Chubykalo, Pope and Smirnov-Rueda. I dedicated it to Peter with the following words, which are appropriate to finish my remembrances: "This paper is dedicated to Peter Graneau, the strongest advocate of action at

a distance known to me. I have profited greatly from many conversations held with him."

Thomas E. Phipps, Jr.

Real contributors to physical science are few and rare in our times. The fundamentals are all supposed to be known. The purposes and effects of higher education in physics are to quell any doubts and suppress any curiosity about those fundamentals. Yet it is precisely at that level that contributions are most needed and most effective. I have been privileged to know a handful of doubters of the rule that all is well in the sub-basement of physics. Among them the Graneaus, father and son, have been outstanding examples. Now the number of this precious few is reduced by one, perhaps the foremost. Peter Graneau is no longer with us. Not only was he a leader in experimental studies that revealed important new facts about nature, he was a scholar able to read from the past of physics some of the crucial messages that fashion has by-passed and forgotten. I have in mind particularly the amazing electrodynamic insights of Ampère, a still not adequately appreciated pioneer of the subject. To have unearthed and empirically validated the existence of Ampère longitudinal forces, as Peter and Neal have done (and as Peter documented in his classic *Ampère-Neumann Electrodynamics of Metals*) is a far greater contribution to physical science than any number of string theories, Theories of Everything, or other unverifiable Nobel-worthy tarradiddles with which the academic physicist-politicians of our era disport themselves in preference to getting down to work in the laboratory. That of course is only the barest beginning of what Peter achieved. Others will know more of his numerous further accomplishments—I mention only what impinged directly on my own research. The world of physics has lost a unique asset. We shall not see his like again.

Cynthia Kolb Whitney

Peter was a very courageous person, and he inspired me to be a courageous person. He knew full well that the science establishment of his day had been hampered by adherence to some indefensible ideas, and that throughout history

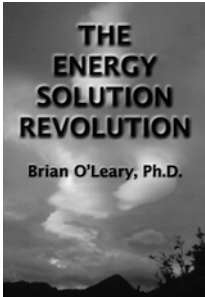
there had been individuals with ideas that might work out better, but had been set aside. He studied in detail the ideas of André-Marie Ampère, a giant from before the time of Maxwell. I am still studying Peter's work involving Ampère's ideas. I believe those ideas, used in conjunction with ideas from statistical mechanics, will ultimately take us to the unification between electromagnetism and gravity. So my presently-developing paper on this subject will be dedicated to Peter.

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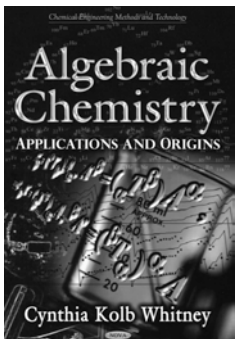
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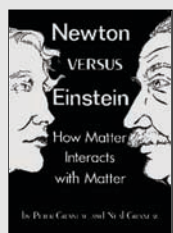
**Algebraic Chemistry:
 Applications and Origins**
 Dr. Cynthia Kolb Whitney

In Issue 101, *Infinite Energy* published "New Theory Applied to Important New Technologies" by Dr. Whitney. The subject of the paper was mainly cold fusion, and the novel analysis technique applied to the problem was called "algebraic chemistry." *Algebraic Chemistry* is the product of the author's probe into theoretical problems unsolved in the 20th century, such as the seeming conflict between relativity theories and quantum theories.



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 How Matter Interacts with Matter**
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