The Importance of Leyton's Hierarchies of Symmetry

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In his hierarchies of symmetry [[1]], Michael Leyton has initiated what can only be called a great revolution in physics and thermodynamics. E.g., in classical electrodynamics, all EM fields, potentials, and their energy are presently assumed to be freely created from nothing at all by the associated source charge(s), in total violation to the conservation of energy law [[2]]. This "source charge problem"—unsolved prior to 2000 when a solution was proposed by the present author [[3]]—has long been called the most difficult problem in electrodynamics [[4]].

Yet a solution exists in particle physics, if one associates with an "isolated charge" its associated clustering virtual charges of opposite sign, due to the well-known polarization of the vacuum by a presented charge. The "isolated classical charge" thereby becomes a special dipolarity, and thus must exhibit the proven asymmetry of opposite charges [10,11]. Hence it continuously absorbs virtual photon energy from the seething vacuum, coherently integrates the virtual (subquantal) energy bits into observable quanta (photons)—a negative entropy interaction—and re-emits the energy as observable photons in all directions.

This action by the source charge establishes and continuously replenishes the associated external EM fields and potentials and their energy, spreading radially outward at light speed in all directions. This saves the conservation of energy law, but it also clearly establishes that all EM fields, potentials, and their energy—in every circuit and every electrical device—come directly from the vacuum via the source charge's special asymmetry. The source charge continuously consumes positive entropy of the virtual state of the vacuum, and produces negative entropy in the observable state, in its ordered deterministic macroscopic potentials and fields spreading across the universe.

Applying Leyton's nested hierarchies of symmetry [1], now this source charge process can be clearly defined and understood. Taking the virtual energy of the vacuum as randomized and at maximum entropy, that is a completely broken symmetry. The Leyton effect generates a Leyton symmetry at the next higher level, which may be interpreted as coherent integration by the spin of the charged particle of its continuous absorption of those disordered virtual photons. That produces the continuously-increasing, tentatively observable potential on the charge, which is that predicted Leyton symmetry.

In turn, yet another broken symmetry exists at that level, so that the continuously increasing potential is also continuously dissipated by emission of observable photons. That is another broken symmetry, which then must produce yet another Leyton symmetry at the next higher level, thereby accounting for the fact that the macroscopic potentials and fields that are formed and sustained by the emitted photons are deterministic and symmetrical as a function of radial distance to each distant point and time of arrival at that distant point.

This solves the long-vexing problem of the source charge and its associated deterministic EM fields and potentials, in consonance with the conservation of energy law. However, now there is also a broken symmetry at this new macroscopic level, so the macroscopic field energy can further be intercepted, collected, and dissipated to power circuits and devices and systems.

The Leyton effect thus accounts for EM fields and potentials and their energy, for the ability to build EM circuits and power systems, and explains how all EM energy is directly extracted from the seething vacuum via the asymmetry of the source charge in its exchange with the vacuum.

The implications for physics and thermodynamics are profound. In electrodynamics, it means that electrical power systems freely powered by cohered virtual energy from the vacuum are possible; in fact, all the EM field energy in every power distribution system comes from the vacuum via the source charges, not from cranking the shaft of the generator. In thermodynamics, it shows that the present equating of a change of external parameter (such as potential or field) as work [[5]] is erroneous, since simply changing the magnitude of the parameter is not a change of Leyton hierarchical level. Leyton's principle also accounts for the well-known gauge freedom principle, which assumes that the potential energy of a system can be freely changed at will. Gauge freedom and regauging are widely used in modern physics. By contrast, present thermodynamics is in serious conflict with gauge freedom, and in fact thermodynamics erroneously excludes that gauge freedom principle itself.

Leyton's principle at last sheds clear light on the fundamental asymmetry problem of thermodynamics: If only positive entropy can occur per the Second Law, then how was the entropy initially ever so low in the first place? [[6]] Since Leyton's work shows that broken symmetry at one level requires and generates symmetry at a higher level, then that is a negative entropy concept, consistent with work by Evans and Rondoni [[7]] showing that a nonequilibrium steady state (NESS) system can exhibit negative Gibbs entropy, with that entropy subsequently decreasing further toward negative entropy as time passes. Though Evans and Rondoni could not find a physical system exhibiting such a continuous negative entropy production, Leyton's hierarchy of symmetries effect requires it. The source charge example advanced by the present author [3,[8],[9]] provides the first known physical system exhibiting precisely that kind of continuous production of negative entropy, consistent with the work by Evans and Rondoni and applying Leyton's principle.

The strong prediction of broken symmetry by Lee and Yang [[10]] and its experimental proof by Wu et al. [[11]] in 1957, initiated a great revolution across physics and won a nearly instant

Nobel Prize in Dec. 1957 for Lee and Yang. Another such great revolution in physics and thermodynamics, initiated by Leyton's discovery of the nested hierarchy of symmetries, now poses a follow-on revolution equally as far reaching and important.

References and Notes

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[1]. Michael Leyton, *A Generative Theory of Shape*, Springer, Berlin, 2001.

[2]. This appalling assumption that the conservation of energy law is false, is slipped past the student in the following manner of teaching: "We have here a source charge. Associated with the charge are its fields and potentials." That slips in the creation of those EM fields and potentials, and their energy, so smoothly that the students are unaware they have been "had" and led to assume that the source charge freely creates all that EM energy—reaching across the universe—out of nothing at all.

[3]. T. E. Bearden, "Giant Negentropy from the Common Dipole," *J. New Energy*, 5(1), Summer 2000, p. 11-23. Also carried on http://www.cheniere.org/ and on DoE restricted website http://www.ott.doe.gov/electromagnetic/ .

[4]. E.g., see D. K. Sen, *Fields and/or Particles*, Academic Press, London and New York, 1968, p. viii. Quoting: *"The connection between the field and its source has always been and still is the most difficult problem in classical and quantum electrodynamics."*

[5]. (a) See Ralph Baierlein, *Thermal Physics*, Cambridge University Press, Cambridge, 1999, p. 2. *Quoting: "Energy transfer produced by a change in external parameters is called work*." This is not true unless the input of external energy was in different form from the energy of the external parameters changed. Our comment is that, rigorously, work is the *change of form* of energy, not the *change of the magnitude* of some form of energy per se. Thus conventional thermodynamics is completely wrong in that assumption, and it erroneously excludes the widely accepted gauge freedom principle of quantum field theory, used in modern physics and electrodynamics. Gauge freedom requires that the magnitude of a potential—and hence the potential energy of the system—can be freely changed at will, without performing work and without cost to the system operator. (b) J. D. Jackson, *Classical Electrodynamics*, Second Edition, Wylie, New York, 1975, p. 219-221; 811-812 shows how gauge freedom is conventionally and rather universally applied in classical electrodynamics by symmetrically regauging the Maxwell-Heaviside equations, making the resulting equations much easier to solve. Symmetrical regauging actually produces a net stress potential and therefore a rotation of the frame of the system out of the lab frame. Electrodynamicists therefore err when they argue that the symmetrically regauged system is still identical to the original system.

[6]. See Huw Price, *Time's Arrow and Archimedes' Point*, Oxford University Press, 1996, paperback 1997, p. 36. Quoting: *"…the major task of an account of thermodynamic asymmetry is to explain why the universe as we find it is so far from thermodynamic equilibrium, and was even more so in the past."*

[7]. D. J. Evans and Lamberto Rondoni, "Comments on the Entropy of Nonequilibrium Steady States," *J. Stat. Phys*., 109(3-4), Nov. 2002, p. 895-920.

[8]. T. E. Bearden, *Energy from the Vacuum: Concepts and Principles*, Cheniere Press, Santa Barbara, CA, 2002, Chapter 3.

[9]. M. W. Evans, T. E. Bearden, and A. Labounsky, "The Most General Form of the Vector Potential in Electrodynamics," *Found. Phys. Lett.*, 15(3), June 2002, p. 245-261.

[10]. (a) T. D. Lee, "Question of Parity Conservation in Weak Interactions," *Phys. Rev.*, 104(1), Oct. 1, 1956, p. 254-259. Errata are given in in *Phys. Rev*. 106(6), June 15, 1957, p. 1371; (b) T. D. Lee, Reinhard Oehme, and C. N. Yang, "Remarks on Possible Noninvariance under Time Reversal and Charge Conjugation," *Phys. Rev.*, 106(2), 1957, p. 340-345.

[11]. C. S. Wu, E. Ambler, R. W. Hayward, D. D. Hoppes and R. P. Hudson, "Experimental Test of Parity Conservation in Beta Decay," *Phys. Rev.*, Vol. 105, 1957, p. 1413.