The Convergence of New Physics Paradigms: Unity in Diversity

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The sections in this paper were originally written for the website of the newly forming Global Science Foundation (GSF) [1], to introduce non-technical readers to the various categories of research among independent scientists today. Now they can also be found under the "Topics" heading of the World Science Database (WSD) [2]. Their second purpose is to expose researchers in each individual area to work arising from other areas, encouraging them to recognize common ground with research in completely different disciplines. Indeed the convergence of key ideas across disciplinary boundaries is striking, strengthening the conviction that the paradigms emerging among independents today are both profound and unifying. However, just as for decades individuals have developed theories in isolation, so entire communities of independent scientists have emerged in complete ignorance of the larger community of paradigm challengers. Today the WSD and GSF are committed to breaking down these walls of isolation. Thus, in celebration of the fact that the "Electric Universe" community will join the Natural Philosophy Alliance (NPA-18) at its annual conference in July 2011, this paper collects the various short essays into a single unit. Hopefully, the reader can sense the full weight of paradigms poised to change the face of science drastically and forever. While the various categories could be categorized in a number of ways, topics here include: Cold Fusion, Cosmology, Electric Universe, Electrodynamics, Aether, Expansion Tectonics, Gravity, New Energy, Quantum Mechanics, Relativity, Structure, Tesla Technologies, and Unified Theory.

1. Introduction

Until the twentieth century, science was always cast under the broader definition of natural philosophy, or the study of nature and its laws. Since our knowledge of the universe has expanded so voluminously over the past 100+ years, the scientific community has compartmentalized much of what we know into more and more narrowly defined specialties. Today, however, the Global Science Foundation (GSF) recognizes the need for a return to a broader perspective, integrating and unifying the various branches of science, because emerging paradigms will arise precisely from better understanding of these unifying principles. Thus, it's no surprise to discover alternatives to current mainstream interpretations in virtually every discipline and subdiscipline of science, and to find common threads across disciplines. But since knowledge literally advances one project at a time in one area of interest at a time, it's obviously still helpful and useful to sort out the various GSF projects by topic. Therefore, this page attempts to introduce most of the various areas of GSF research, demonstrating how each area has something important to contribute to new paradigms in science.

Basic research attempts to answer the question, "How does the universe work?", as opposed to applied research, which seeks particular applications or technologies. And though life sciences are definitely foundational, GSF research focuses on physical sciences. Many categories, such as chemistry, materials science, or various branches of engineering, might be included in the list below, but are not considered "basic". Instead both chemistry and materials science, for example, would fall under the broader category of "Structure", since it is ultimately the structure of atoms and molecules that determine various properties of materials. Listed below are a dozen or so categories in which current GSF projects naturally organize themselves, though projects are not required to fall into one of them. The categories reveal much about particular interests in independent science today, and therefore about the projects currently being considered and funded by the GSF.

2. Cold Fusion (Low Energy Nuclear Reactions)

In 1989, electrochemists Martin Fleischmann and Stanley Pons announced an "excess heat" anomaly by running an electric current between metallic electrodes set in deuterium-doped or "heavy" water. Indeed, this "electrolysis" process sometimes produces very unexpected results with electrodes such as palladium or nickel. It was claimed that the excess heat resulted from actual transmutation of elements at room temperature, and was hence dubbed "cold fusion", though it has since been renamed "Low Energy Nuclear Reaction" (LENR) to avoid negative connotations. The 1989 announcement sent hundreds of scientists into the lab, attempting to reproduce the Pons-Fleischmann results, but sadly with limited success. Besides lack of reproducibility, the Pons-Fleischmann experiment received criticism for not producing neutrons, tritium, and other by-products associated with traditional hot fusion reactions. Consequently the "official" word emanating from the US Department of Energy (DOE), MIT and other mainstream institutions was that cold fusion was unfounded and invalid. According to mainstream science, the case was closed in 1989.

Nonetheless, since 1989 hundreds of scientists around the world have in fact reported similar anomalies, especially in countries like Japan, where cold fusion research has received some government funding support. Scientific conferences dedicated solely to cold fusion have been held every year in numerous locations around the world, and a massive literature has developed relating to the subject. Several common characteristics have emerged, the most striking of which is the "resonant" nature of the reaction. Many experimental setups produce no reaction at all, while many others produce results only after days or even weeks of waiting. A cold fusion reaction can be compared with the photoelectric effect, in which only light of a sufficient frequency releases electrons from a metal surface. Even the smallest intensity light liberates electrons, while low frequency light produces no reaction at all regardless of how intense the beam. By this analogy, hot fusion could be compared with a high intensity beam or a Mack truck, which tries to force the reaction by creating the most intense collision possible. old fusion compares with a low intensity beam, but focuses on the proper resonant condition that allows the reaction to proceed. The difference in approach may be foundational, and may lead to a profoundly new way of understanding the very nature of matter and energy.

Admittedly the underlying process of cold fusion is still not fully understood. But this is no reason to abandon an area of research that could provide such foundational insights. Since 1989, cold fusion experts have greatly improved their knowledge of what does and does not produce reactions, and a number of independent scientists have made theoretical advances to explain the experimental results. Meanwhile, electrochemical anomalies related to the dipole nature of water, most notably Brown's Gas, created via electrical pulses to electrolyzed water, have also attracted the interest of independent researchers. Are cold fusion and Brown's Gas different forms of the same thing or are they two profoundly different phenomena? Much more remains to be done. If 1% of the multi-billion dollar budget currently allotted to hot fusion research could be invested in cold fusion, it might revolutionize the foundations of science.

3. Cosmology

If astronomy asks "how", cosmology asks "why" the Universe is what it is. Mainstream science believes it has found the ultimate answer to the question of Universe origins with the Big Bang theory, and thus does not entertain alternative explanations. Historically, the Big Bang theory arose from Edwin Hubble's observation that the frequency of light from more distant sources is proportionately "shifted" down from the known spectra of hydrogen, helium, etc. Scientists in the 1930s compared this "redshift" with the well-known Doppler Effect, in which the frequency of a sound wave is reduced when received from a receding source. Since redshift was observed (nearly) equally in all directions, they concluded that everything is moving further away, and hence that the Universe is expanding. Further, if it has always been expanding, then it must at one time have emanated from a single point. This theory, popularly called the Big Bang, became accepted as mainstream in the 1960s.

However, there are other explanations for redshift besides a "Doppler Effect", and even accepting the Doppler idea, there could be other solutions besides a Big Bang. In the late 1960s, astronomer Halton Arp observed several redshift anomalies, in which stars at similar distances, even gravitationally linked, nonetheless produced radically different redshift values. Arp's "intrinsic redshift" throws a wrench into the whole works, because it shows that at least some redshift doesn't result from Universe expansion, but from other causes. Needless to say, neither Arp's work nor the work of the many other independent astronomers and cosmologists has received a hearing from mainstream science, despite a vast literature. Furthermore, slight differences in the amount of redshift from different directions (called "anistropies") have been observed, demanding explanation. Finally, questions have been raised as to whether the Doppler analogy between sound and light is valid, and whether "expansion" of the Universe is even meaningful, since one must ask "with respect to what" the Universe "expands".

Bottom line: many concepts in accepted modern cosmology have problems, and many legitimate questions remain unanswered. Is it merely a coincidence that the distances from the sun to the various planets in our solar system form a geometric pattern (Bode’s Law)? Were some planets broken out of others or have they grown by accretion? Why do they spin along the axes they do? The GSF doesn't claim all the answers, but does claim the need to investigate these foundational questions with an open attitude. While mainstream science has invented the Big Bang, black holes, dark matter, dark energy, and appeals to other universes, scientists who refuse to accept these unproven concepts receive ridicule. Despite this, scientists over the last 100 years have produced many viable alternatives to explain planetary evolution, the formation and annihilation of solar systems, and ultimate questions of origins. The GSF supports both theoretical and experimental research in innovative cosmology.

4. Electric Universe

In 1903 Norwegian physicist Kristian Birkeland predicted auroral currents perpendicular to the earth's magnetic field. In the 1920s, Irving Langmuir studied the filamentary structure of electrical discharges, providing a foundation for modern plasma confinement. Both Birkeland currents and Langmuir sheaths revealed not only fundamentals related to electromagnetism, but also its significance in the dynamics of the solar system. Systematizing this knowledge, Hannes Alfvén founded the science of magnetohydrodynamics in the 1940s, boldly claiming that the universe is predominantly composed of plasma, or electrically charged matter. From these foundations has emerged a large body of literature supporting the importance of electricity and magnetism in governing celestial bodies. For example, Anthony Peratt of Los Alamos Labs succeeded in simulating virtually every known galaxy type via electromagnetic models. Yet mainstream science remains fixated with gravitational models of the cosmos, regarding electromagnetic forces of secondary and inconsequential importance, despite the fact that they are stronger than gravitational forces by a factor of 10^{40}.

Not only does the Electric Universe concept challenge conventional thinking about planetary interaction, but also the very structure of stars and planets. Mainstream science would have us accept a sun core at millions of degrees, somehow hot enough to sustain steady fusion reactions that have never been reproduced in the laboratory, whereas the electric sun model stresses the importance of lab-reproducible plasma currents throughout the solar system and beyond, providing the sustainable reactions that produce its known characteristics. Mainstream hot fusion models explain little about the relatively low temperature of the photosphere, the filamentary structure of sunspots, and the dominance of the sun's magnetic field. Moreover, mysterious features of many planets and moons can be readily explained in terms of electric potential gradients and plasma currents within and near planets. Geologic features like craters, canyons, and even mountain ranges have demonstrably similar characteristics with scarring damage resulting from abrupt electrical discharges. The Electric Universe model suggests that many features in our solar system may have occurred from massive interplanetary electrical discharges, perhaps even within recorded human history.

Among its most striking claims, the Electric Universe paradigm holds that meteorites, comets, and asteroids are the residue from catastrophic electrical events in an earlier phase of solar system evolution, when electrical exchanges between planets and moons excavated massive volumes of material from the surfaces of both. According to the EU hypothesis, comets likely have the same origins as asteroids, though they move on more eccentric orbits through the electric field of the Sun. EU proponents also cite evidence from NASA and from the global testimony of ancient cultures to the effect that the planet Venus was once a comet. Electric Universe models predict that close examination of actual comets will not reveal conventional "dirty snowballs", but electrical storms and arcing to the surface. It's time that science stepped up to actually study comets at close range to determine the merits of these bold claims.

5. Electrodynamics

If one had to pick a single discipline that integrates and unifies all GSF research, the grandfather of them all, it would certainly be electrodynamics. In fact, an overall theme of independent science today might be that our knowledge of electricity and magnetism remains incomplete. In contrast, mainstream science regards electromagnetism as a closed book, something mastered and put to rest in the 19th century under Ampere, Faraday and Maxwell. Why such a dichotomy of opinion? Most independents point to the 1920s, when Einsteinian relativity and quantum mechanics became overnight superstars, and argue that the outstanding problems of that age were swept under the rug or simply ignored in the excitement of the new paradigms. Ironically these two darlings of 20th century physics are demonstrably incompatible, so the science that led to both, electrodynamics, might indeed need reexamination. The GSF agrees that a fresh look at the fundamentals can never do harm, and could lead to a greater synthesis.

Why are electricity and magnetism so fundamental? James Clerk Maxwell's brilliant discovery that "light" behaves as an electromagnetic wave not only unified electricity with magnetism, but also connected them with optics, and thus with all optical experiments like the famous 1887 Michelson-Morley experiment. Einstein's relativity unequivocally rests on certain assumptions about light, and therefore about electromagnetism. Since J. J. Thomson's 1897 discovery of the electron and Ernest Rutherford's 1911 discovery of the positive nucleus, we've known that electrodynamic forces are at work even within the structure of the atom. Many independents today claim that electrodynamics provide the only valid mechanism needed to balance the forces for finite structures to exist at all. Indeed the driving forces behind cold fusion and Brown's Gas are electrical. Several innovative theories of gravity claim its ultimate cause from the very structure of atoms, with positive nuclei and negative shells. In fact, most gravitational "anomalies" arise from some sort of magnetic action. And moving from the small to the large, most independent astronomers agree that plasma, non-neutral matter, plays a much larger role in the cosmos than conventional thinking would dictate. Much of the technology and invention in the wake of Nikola Tesla's discoveries involve new concepts of magnetism and its fields. In fact, energy itself can be defined in terms of electromagnetic fields. Low temperature physics invariably involves interesting phenomena connected with magnetic fields. Finally, several independent scientists are discovering connections between electromagnetism and thermodynamics.

As observed under the discussion of Electric Universe, even in the 20th Century, significant developments in electrodynamics have advanced. Yet we still don't really know how magnets work, why iron is ferromagnetic, why nuclei are positively charged. Surprisingly basic questions have yet to receive clear, unequivocal answers. It would be foolish to assume that we now have complete knowledge of a subject so foundational, and so rich with surprises.

6. Aether (Ether)

In the 19th century, most scientists believed in a medium for the propagation of light, and called this medium "ether", "aether", or even "luminiferous aether", derived from the Greek αιθήρ, meaning to kindle, burn, or shine. However, the "static" aether concept was shattered by the famous Michelson-Morley experiment, in which no aether drag was measured within the limits of the 1887 equipment. Einstein's relativity attributed to the demise of aether, though ironically Einstein himself in 1920 claimed it necessary and essential. Einstein's "new" aether was dynamic, as are most aethers advocated today. Currently many independents believe the "aether" died a premature death, and that space is not "empty" at all. Aether theories vary greatly in detail, but most attempt to connect with electrodynamic fields and energy in some fashion. The nature of aether is ultimately connected with the nature of light, something that remains a worthy study. Here is yet another area which mainstream science believes is a closed book, yet deserves a closer look.

7. Expansion Tectonics

Does the earth expand or even grow? The most obvious evidence comes from the seafloor ages as described by the National Geophysical Data Center and NOAA Satellite and Information Service [3]. It takes no imagination whatever to see expansion all over the globe and in all directions. Yet plate tectonics claim that the Pacific is "different", since the sea floor, known to be growing, is supposedly being eaten up (subducted) around the Pacific rim. But by what evidence? Why should it do this? Indeed the currently accepted plate tectonic theory leaves many questions unresolved. For example, take away the seabed floor piece by piece in reverse order of age, and all the continents fit together with little or no modification. Plate tectonics provides no rationale, however this is precisely what "expansion tectonics" predicts.

What if expansion, rather than subduction, were the major player in shaping the earth's geologic history? A minority of scientists have been asking this question for decades, and coming up with answers challenging to the very root of conventional scientific thinking. Though preceded by expansions like Ott Hilgenberg in the 1930s, renowned Australian geologist S. Warren Carey established himself as the "father of expansion tectonics" beginning in the 1950s, a time when plate tectonics was not yet "gospel". Indeed expansion tectonics boasts just as venerable a history as plate tectonics, always with some adherents, though never more than today. In fact, the current growth in the growth paradigm is best described as a renaissance, with many geologists worldwide using expansion tectonics to predict the location of new oil fields or the next major earthquake.

Why is this paradigm so challenging to mainstream thought? In no small part through answering the two biggest open questions in expansion tectonics: 1) What causes expansion? 2) Where did the water come from? Convincing answers require deep digging into the fundamentals of how the universe works. Why wasn't the earth covered in water when it was smaller? Is the earth's core a nuclear furnace, like the sun, that reached a critical mass? Are water, methane, and oil produced inside the earth abiotically, or should we accept conventional wisdom that they are strictly "fossil fuels"? If planets expand rather than condense, like a black hole, can gravity be the primary shaper of matter?

8. Gravity

Mainstream science believes it has nearly unified the fundamental forces, electromagnetic, strong and weak, yet one force remains aggravatingly elusive: gravity. What is it? Why do we have gravity? Meaning heaviness, as opposed to levity or lightness, the term gravity was coined by none other than Isaac Newton himself, who surprisingly never claimed to know its cause. Einstein's general relativity characterizes gravity in terms of warped space-time, but provides no mechanism or causal explanation for it either. Why should matter fundamentally attract other matter? Or does it? Is "mass" even a measure of "amount of matter"? Grave questions about gravity remain unanswered.

Several schools of thought regarding gravity exist outside mainstream. Some see gravity as a "push" from everything else in the universe EXCEPT the nearest objects, which impede the otherwise balanced flow of radiation from all directions. Some connect the magnitude of this push with the finite size of the Universe. Some look to quantum mechanics for a corpuscular understanding of gravity "particles", as first envisioned by Newton. Some view the dynamic motion of a vortex as the ultimate source of attraction, with static matter that fundamentally REPELS rather attracts. Some regard torsion physics as the seat of physical understanding. Some look to electrodynamics and the electrical distribution of matter within the structure of the atom as the source of gravity. In the latter model, a tiny net attraction results when offsetting the repulsion between like-charged nuclei or shell electrons with the attraction between oppositely charged nuclei and shells. Of course, these schools are not mutually exclusive, yet all have amassed numerous articles over the past several decades. Certainly these various interpretations should receive greater attention than they do, since mainstream complacency clearly has not engendered the progress of maverick science in addressing the fundamentals.

On the practical side lies the question of whether gravity can be controlled or even reversed. Though this type of research receives harsh criticism from naysayers, the ranks of potential gravity controllers include people from the highest echelons of NASA and Los Alamos Labs right beside garage experimenters. Most anti-gravity experiments involve weight change through rotation or magnetic action. In the 1970s, the late Eric Laithwaite and Bruce de Palma, for example, unequivocally demonstrated weight reduction in spinning objects, yet these startling facts have not been rigorously measured and adequately explained. Other experiments have shown that magnets fall faster (or slower) than neutral objects, indicating a connection between gravity and the earth's magnetic field. Sadly many urban legends have clouded the real issues, partly because of unsupported claims on the side of researchers and partly from straw man criticisms of detractors, often creating more confusion than progress. It's time to strip away fiction from fact, and become systematic about what we really do and don't know. The GSF stands to lead the way in this effort.

9. New Energy

Of all the areas in independent science, the study of energy has probably received the harshest and most unjust criticism. The age-old, predictable response from conventional critics is that "it sounds like perpetual motion, and that's been proven impossible." More than anything, the criticism reveals the ignorance of the critic, because the vast majority of new energy researchers don't claim to violate conservation of energy, but rather to extract it from the environment in new and unconventional ways. They attempt to construct "open systems", which allow environmental energy to flow in, possibly in excess of the losses inherent in any real physical system. For example, wind or watermill systems are traditional "open systems", in which tapping the energy of the wind or river doesn't eventually cause the wind or river to cease flowing. Clearly if energy is conserved, we're not running out of it, but simply losing it to unusable forms such as "heat". The important question is, does nature provide reservoirs of energy that can be tapped and yet replenished? In other words, are there things in nature that will return to a higher energy state after we've extracted energy from them? Many mavericks claim yes.

What sort of things does nature return to a higher energy state after being tapped? Materials that naturally provide dipoles, or separations of opposites. If we had a voltage source different than "ground", say, the potential difference between it and ground would provide an endless source of energy. That is, the energy source would come from the dipole itself, which nature would naturally replenish. But what materials provide dipoles? The two most obvious are water, with an electric dipole, and ferromagnets, composed of magnetic dipoles. Could we shock water into a higher energy state, and tap its energy as it returns to a normal dipole state? Could we "shake up" a magnet, neutralizing its dipole, and tap its energy as the dipole returns it to a lower energy state? These materials are VERY unusual, because most materials are dipole-free in their lowest energy state, whereas water and magnets have HIGHER energy when dipole free, for whatever reason. What about the spherical dipole of the atom itself (positive nucleus and negative shell)? Electrical potential gradients in the atmosphere? Resonance associated with the rotation of the earth? The list goes on, with the common factor being something in nature that provides some kind of dipole.

If the idea of nature providing dipoles sounds naive, consider current sources of energy. In 1800 Alessandro Volta introduced the Voltaic pile, which arose from the natural dipole that arises simply by placing dissimilar materials adjacent to each other. Interestingly, this principle is not only the basis of semiconductors, but an area of intense research today. One early energy maverick, T. Henry Moray, who in the 1920s tapped energy from his "Swedish stone", also invented an early version of semiconductors from this same unusual stone. Vacuum tube inventor Lee de Forest (1906) conducted research in "chiral" or optically active materials, whose unique properties might also be tapped, especially in juxtaposition with other materials. Many mysteries remain regarding chiral and other special materials, and only smugness prevents mainstream science from exploring possible applications of these materials as an energy resource.

A related approach concerns resonance and integrates with concepts of structure. When an electrical circuit is first activated, as when one flips a switch, transient fluctuations dominate for a brief interval until the circuit settles into a steady state. In conventional engineering, this transient "noise" is regarded as a nuisance to be minimized, whereas many new energy researchers see it as a potent, yet untapped source of energy. Could we capture this transience, they ask, with an "energy diode", so those fluctuations are put to work rather than lost? The transience occurs in the first place because the material has certain resonant properties, ultimately based on its very structure. What if we "flipped the switch" with the same frequency as the transient response? Would the response grow without bound? This is the misunderstood argument of Nikola Tesla, the inspiration for many new energy researchers today.

How are we to understand all of these ideas theoretically? First, by defining what energy really is, something mainstream science complacently believes it already understands. Many independents explain their anomalous results in terms of electromagnetic Poynting vectors, "zero point energy", or the Cassimir effect. The energy to be tapped, they claim, actually resides in space in enormous quantities, needing only coherence to be rendered usable. Surprisingly, mainstream scientific literature itself contains volumes of material in support of these ideas. New energy theorists also challenge conventional wisdom regarding entropy and the Second Law of thermodynamics, and ask whether certain systems under certain conditions can be made to "self organize", in harmony with the work of Nobel Laureate Ilya Prigogine, maverick Per Bak, and others. Without doubt, science will benefit from exploring new paradigms in our understanding of energy and entropy.

10. Quantum Mechanics

Max Planck started a scientific revolution in 1900 when he resolved Wein's paradox, which predicted infinitely increasing energies for smaller and smaller wavelengths of light. By assuming that the "resonators" producing these energies were quantized in packets of *hf*, Planck showed that these energies actually decrease as wavelengths approach zero, as confirmed by experiment. Five years later, Einstein named a packet of light *hf* a "photon", using the idea to explain the Photoelectric Effect, and in 1914 Neils Bohr used the quantization of angular momentum *h* to develop his model of the Hydrogen atom, which featured quantum (all or none) "jumps" between states. But these were all a preamble to the experiments of Compton (1923), Stern / Gerlach (1923), Davisson / Germer (1926), and others, which made it clear that electrons behave like waves as much as waves behave like electrons. Two competing theories of wave-like electrons were submitted by Schoedinger (1926) and Heisenberg (1927), and these formulations were simply too successful to ignore. Quantum mechanics was born.

But in the aftermath of all this upheaval, a great debate emerged as to the true meaning of the newly discovered equations. Bohr, along with Heisenberg, insisted that quanta behave by a fundamentally different set of rules than what we observe at the macro level. He said that we will just have to live with the insanity of quantum physics, a mantra later repeated ad nauseam by Richard Feynmann. Conversely Einstein believed that reality had to make sense, and moreover the famous Einstein, Rosen, Podolsky paper (1935) showed that either Bohr's quantum mechanics is incomplete or that interactions between bodies are instantaneous. Though Einstein went to his grave believing nothing could interact faster than the speed of light, both the theory of John Bell (1964) and the experiments of Alain Aspect (1982) confirm that interacting particles indeed remain coupled at great distances, and affect each other instantaneously. So-called "quantum entanglement" remains a challenge for theoretical physicist to this day, yet mainstream thinkers refuse to consider the possibility that all the difficulties could stem from preconceptions assumed in the formative years of quantum theory.

To complicate matters, beginning in the 1930s came the discovery of several new "particles": the meson (muon), pion, neutrino, kaon, etc. Are these in fact different sorts of particles or are they really just a repackaging of the same old stuff? Are we compelled to accept the concepts associated with these "particles" simply because somebody 75 years ago invented them to explain otherwise inexplicable changes in mass? Should a scientist suffer ostracism because he challenges the ideas spoon fed to him?

The GSF welcomes original ideas on the nature of quanta. Few mainstream scientists even bother to ask whether the cause of quantized interactions can be known and understood, perhaps on the basis of 3D flowing structures. Few question the nature of a photon or the existence of a neutrino, though their effects could be explained with the invention of particles. Few realize that an entirely different interpretation of quantum mechanics competed with Bohr's orthodox "Copenhagen" interpretation from the beginning, and that it was based on the statistical properties of an ensemble of particles rather than the mysterious, unknowable properties of individual particles. Until all the questions are answered to everyone's intellectual satisfaction, the GSF regards an unwillingness to consider alternatives the very definition of foolishness.

11. Relativity

In 1999, Time magazine dubbed Albert Einstein "Person of the Century" for his innovative and paradigm-breaking theory of relativity, which supposedly redefined time and space themselves. Yet the man on the street understands little of Einstein's ideas, except that they lead to warped space-time (whatever that is), an expanding universe, black holes, worm holes, an ultimate speed limit at the "speed of light", and the possibility of time travel. Most students in science encounter Einstein in a physics course, and solve a few problems, but never quite get comfortable with the ideas, and rarely use them in any practice anyway. Most people believe relativity essential to the development of GPS, though GPS scientists actually use Newtonian physics, to the details of particle physics, though it remains grossly incompatible with quantum mechanics, and to space travel, though nothing has ever returned from space at a younger-than-expected age.

For over 100 years, Einstein's relativity has spawned books, papers, and theories pointing out many basic flaws and paradoxes. Are time and space really just two aspects of the same thing, or do the 4D equations associated with relativity actually originate with the dynamics of light, as understood by Einstein's 19th Century predecessors? Does time itself pass differently depending on how fast you travel, or is it really just that fast travelling clocks run slow? And with respect to what should one determine velocity anyway? Is it really arbitrary? Does someone on a speeding train move faster than another walking on the ground, just because an observer says so? Does the wind move with respect to the windmill, or does the windmill turn differently if an observer runs very fast? And if a body's velocity is arbitrarily determined by observer, is that body's energy, which depends on velocity, also just a matter of opinion? Finally, Einstein's special relativity deals with "linear" or translational motion, but at the velocities where his ideas apply, is there really any such thing as "linear"?

Independents probe far beyond the superficial question of whether the equations of relativity are correct to the deeper questions of what those equations really mean. But they don't end there. In 1916 Einstein's general relativity attempted to extend his ideas to non-linear motions by playing with the very nature of space and time. Gravity, so the theory says, results from the warping of "space-time", and bodies travel through "space-time" that fits the given "metric" or mathematical 4D coordinate system. So body A warps the space-time through which B travels, and vice versa. It sounds very much like A simply interacts with B, just as Newton described centuries before. So are there other ways to describe this motion, or is space-time warping the only possibility? And how did general relativity (GR) wind up theorizing on gravity when special relativity began with electrodynamics and the nature of light? Einstein failed to make a connection between the two, so did he gloss over a few steps? What does GR have to say about electrodynamics anyway? At best, we'd have to conclude that GR is incomplete. At worst, inconsistent with quantum mechanics, despite nearly a century of attempts to reconcile the two.

As was made clear in the discussion of quantum mechanics, Einstein was indeed a genius, and contributed much to physics. But that doesn't make him infallible, nor does it make it prudent simply to accept his ideas on blind faith, as scholars of the late Middle Ages were prone to accept the ideas of Aristotle. The GSF recognizes that many fundamental questions have not been answered completely or satisfactorily by Einstein's notions. Therefore challenges to his ideas should not automatically meet scorn, but should be tested on their own merits. This is how science is supposed to be conducted.

12. Structure

In 1927 Werner Heisenberg published his "uncertainty principle", declaring a limit to how much we can "know" about a particle's position versus its momentum. From this concept, a conviction has arisen that the structure of particles can't be "known" in detail. Instead conventional wisdom dictates that we must accept the properties of elementary particles as "intrinsic", given, not derivable. Yes, we can measure the mass, spin, magnetic moments, and other properties of such particles, but can't expect to derive any of them, because uncertainty forbids it. Thankfully, a number of maverick scientists refuse to accept conventional wisdom on this point, and advocate a dynamic balance of forces to sustain finite structure in particles.

Actually the notion of structure is nothing new, since attempts to understand the fundamental structure of matter extend back to the Greeks, and no doubt before. The idea of finite structures bound together by their own motion has almost invariably led natural philosophers to closed loops and vortices, since motion confined to finite space simply must circulate. After the Greeks, vortex ideas were explored in the 17th century by Kepler, Descartes, Leibniz, and Huygens, in the 18th by Swedenborg and Bošković, and in the 19th by Ampère, Fresnel, Kelvin, Rankine, Tait, and many others. In fact, Ampère actually visualized the ultimate particles as tiny electrical circuits, whereas Kelvin, for example, was less specific about the vortexing matter comprising particles. In 1915, an English visiting graduate student at Harvard, Alfred L. Parson, presented the first "modern" model of the electron, the "magneton", a toroidal circuit of electrical charge. Parson meant to improve Bohr's famous 1913 model of the atom, which depicted electrons as circulating point charges, by "smearing" the charge around the entire circuit. According to the known laws of physics, accelerating charge must radiate, yet in Bohr's model, as in all point particle models, electrons mysteriously accelerate without radiation. This anomaly has been swept under the rug with the mantra that quantum physics behaves by a different set of rules than classical physics. Though little known today, Parson's magneton was a substantial influence on Gilbert Lewis's concept of molecular bonding and Arthur Compton's famous Compton Effect. In fact, one of Compton's graduate student, Winston Bostick, was one of the maverick's who revived Parson's magneton idea in the 1960s.

Most structuralists claim that the known properties of elementary particles can be determined by the manner in which the various circuits comprising particles intertwine. That is, particles are identified by their "topology" or "knottedness". Today science is just beginning to appreciate the connections between the properties of knots and of fundamental particles. By applying a set of rules consistently, some structuralists have reproduced not only properties of particles, but hundreds of characteristics throughout the periodic table. Eventually, structuralists hope to explain not only the structure of hydrogen and helium, say, but why water remains electrically dipole, why iron is ferromagnetic, and why nuclei remain positive. Finally, structural principles, such as found in the work of Buckminster Fuller, can apply at the macro- as well as micro-level, can be used to explain the nature of DNA, and may even explain mysteries at the cosmic scale. Answers to these questions can revolutionize science in ways hard to even imagine today.

13. Tesla Technologies

Who was Nikola Tesla? To most, he was the man who championed AC power against Thomas Edison's DC, and whose 3-phase systems to this day transport much of the world's electrical power. To fewer, he was radio's father, whose dozens of inventions were all but stolen by Marconi, and who built the first remote control systems over 100 years ago, decades before anyone else. To fewer still, he was the genius of 1899 in Colorado Springs, where he conquered the electrical forces of nature in a series of experiments still controversial and not well understood. Did Tesla discover ways to transport energy wirelessly, as he claimed, and even tap the "cosmic rays" of an "aether" as an endless source of energy? Or did the arguably greatest inventor of all time die a deluded old man, as many believe? What happened to his work after death remains enigmatic, a great spy story, but far more important is whether his ideas lived up to his incredible claims. The number of scientists who take these claims seriously has grown steadily since his 1944 death, to the point where entire organizations have thrived around the ideas of this one man.

The famous Tesla coil produces millions of DC volts and impressive lightning-like sparks that Hollywood and science fiction writers still associate with the cutting edge of scientific knowledge - perhaps even more than the most expensive nuclear reactor or Tokamac, though hobbyists can build impressive Tesla coils for a mere few hundred dollars. These displays share a common characteristic with many paradigm challenging designs: they are "open systems", interacting with the surrounding environment. Where does the energy of those tremendous sparks go? If all that charge can be dispersed, can the process be reversed, so that energy is instead collected and concentrated? Apparently Tesla himself thought so.

A lesser known Tesla invention, the Tesla turbine, also illustrates several features common to the new paradigms based on resonance and dynamics rather than brute force and statics. Actually conceived when Tesla was still a child, the Tesla turbine features a simple series of round, parallel plates that spin in response to a fluid or gas flow through the spaces between the plates. Conventional thinking views these turbines as inefficient, because the fluid's adhesion to the plates causes them to spin, and adhesion is associated with lossy friction. But in fact, once the plate spins reach resonance with the fluid flow, the plates are literally "at rest" with respect to that flow. The fluid or gas actually gets sucked inward and passes perpendicularly out from the center of the plates. Unlike the flow that turns a fan blade, there is indeed very little turbulence, because the path of the flow itself is allowed to vortex inward, as nature's flows often do. It is here that we find convergence with the ideas of Viktor Schauberger, who conducted experiments in the 1940s showing decreased and even negative resistance to flows with spiral geometries that resonate (or "match impedance") with the flow velocity. It is time for GSF scientists to conduct controlled experiments that confirm or deny these ideas, which could have significant application to any fluid dynamic system, from car or airplane engines to heating and cooling systems.

14. Unified Theory

Many scientists propound theories trying to unify the four classic forces in nature, electromagnetic, strong, weak, and gravity, to the point that "theories of everything" are now a dime a dozen. In the 1970s, the infamous "string theory" looked like the Holy Grail for unifying all of physics, yet 40 years later its legacy consists of libraries of confusing mathematics with little advance in physical understanding. Of course, mainstream science has to some extent unified strong and weak forces with electromagnetism, but many independents claim that these "forces" were artificial to begin with, since they say electromagnetic forces suffice to explain the structure of atoms. And even if gravity were unified with the the other three, could a "unified" theory be complete in any sense if didn't connect these forces with thermodynamics or quantum mechanics? Clearly unification means much more than one simple formula to solve all the world's ills. It means a return to the drawing board and rethinking physics from its very foundations.

Among independents many comprehensive theories exist, superior to and yet simpler than string theory, in harmony with a significant portion of scientific observation and experiments. Most, but not necessarily all, of these theories revolve around electrodynamics; many focus on its connection with gravity; some involve aether concepts; many spawn profoundly new definitions of energy, mass, light, spin, etc. In virtually every case, the unified theory comes not from new mathematical equations, but from radically new interpretations of old ideas. If history serves any purpose, we should expect not one grand unified theory expounded by one especially brilliant theorist, but rather a number of unifying ideas that converge on certain unifying principles. Today we're seeing clear convergence toward dynamic as opposed to static structures, the hugely significant yet largely overlooked roles of magnetism and plasma, the fundamental nature of the vortex and resonance, possible conditions for self organization, and surprising connections between thermodynamics and electrical interactions. Rather than seek a single solution to the problem of unification, therefore, the GSF intends to unify physics one connection at a time, in a *process* of unification.

15. Conclusion

Many scientists become "independent" initially in one area, yet remain "mainstream" in others. Sadly most remain blissfully ignorant of areas outside their particular vantage, however, once one challenges ideas in, say, relativity, it's surprising how that opens the door to challenging orthodox thinking in quantum mechanics or the nature of energy, for example. It is not accidental, because, as this paper set out to show, these ideas do converge around certain themes of electrodynamics, plasma, structure, resonance, vortex, self organization, etc.

This is not to suggest that all independents eventually think alike. Far from it. Indeed the GSF believes that a healthy scientific community accepts and even embraces differences of opinion as part of the process of growing in knowledge. The best ideas will ultimately prevail if given the freedom and opportunity to be expressed and heard.

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