Planetary Defense

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This report can be found online at http://larouchepac.com/planetary defense.

INTRODUCTION

Because the ultimate defense is progress

This present report is written against the backdrop of an ongoing series of writings by Lyndon LaRouche, and is the product of the collaboration of the LaRouchePAC's Basement Team's ongoing work with him. The fullest understanding of the following will be gained from a reading in the context of his current international efforts and writings.[1]

The world's population is still reeling from last year's natural disasters. Japan, a first-world nation, was brought to its knees by a magnitude 9.0 earthquake and subsequent tsunami in March; the US faced a record number of weather-related disasters; East Africa was hit with the worst drought in over half a century, putting 13 million people at risk; and the list goes on. If we find ourselves so vulnerable to threats which should be predictable, what hope do we have in the face of threats never before encountered?

In one sense, such natural disasters cannot be separated from those of man's making, such as the twin crises of the collapse of the trans-Atlantic-

1. Starting from his September 30, 2011 international webcast, and a subsequent series of writings, "Principle or Party?," "The Fall of the British Empire: Obama's Armageddon End-Game," "What is Creativity, Actually?: The Real Human Mind," "A World at Its Wits' End: The End of the World's Wars," "Reflections on a Work by Nicholas of Cusa," and, "To Keep a Promise: The Mystery in Your Time." All on LaRouchePAC.com

US Navy

Damage following the March 11, 2011 magnitude 9.0 earthquake in Japan, one of a series of unusually severe natural disasters during 2011.

centered global financial system and the immediate specter of thermonuclear war. Both underscore the imperative to redirect global policy away from the contrived conflicts of oligarchical manipulation, which have kept mankind in a state of relative infancy, toward the conscious evolution of the human species.

Recently, circles in Russia have proposed to judo the current insanity of a drive towards war by invoking Lyndon LaRouche's principle of the Strategic Defense Initiative (SDI).[2] Termed the Strategic Defense of Earth (SDE), this new initiative would focus on cooperation between the USA and Russia for missile defense, as well as defense against the threat of asteroid or comet impacts.[3] This is not the stuff of science fiction, as this very real threat was underscored by the recent near-miss of asteroid 2005 YU55.

This follows the same general intention expressed in a recent proposal for international collaboration on a network of satellite and Earth-based observation systems to provide warnings of earthquakes, extreme weather, and other natural disasters before they occur, as well as help to coordinate any emergency response measures needed. The proposal, called IGMASS (International Global Monitoring Aerospace System), would monitor everything from the structures and changes in the Earth's crust (from mineral deposits to fault lines), to the electrical, magnetic, and particle conditions of the atmosphere, ionosphere and above, providing a comprehensive picture of the interactions of these Earth systems.[4]

These proposals come in the context of the emergence of a new global frontier, the Arctic. As documented in a recent LPAC policy paper,[5] Russia, China, and other leading nations have taken the first steps in what must become a full mobilization toward the development of this region—a prospect that should be seen as a new launching point for a renewed global focus on space colonization.

Generalized warfare is no longer a tolerable option for our species. As the SDE and IGMASS proposals indicate, we require a new concept of the strategic defense of the human species, which must be informed by two primary considerations:

1. If we wish to survive as a species, we must eliminate the ideology of monetarism, the false belief in an intrinsic value built into money, or any object for that

2. See the feature video, "A Brief History of Lyndon LaRouche's Strategic Defense Initiative," LaRouchePAC.com. Lyndon H. LaRouche, Jr., "SDI Revisited: In Defense of Strategy," *21st Century Science & Technology,* Summer 2000.

3. This initiative was proposed in October by current Deputy Prime Minister for Defense Dmitry Rogozin, then Russian ambassador to NATO. See, "As World War Threatens, Russia Proposes SDE," *Executive Intelligence Review*, November 25, 2011.

4. The project has been presented several times at the United Nations, and as of the summer of 2011, was being headed up by former Roscosmos Chief Anatoly Perminov. Several nations, including China, Ukraine, Argentina, and Indonesia have expressed their interest in this project. On April 4th, 2011, Perminov stated: "At the moment, China and NASA are seriously considering joining this project. I don't like to use the word 'saving mankind,' but we do need such a system to warn us about potential such threats… Every time I talk to somebody and explain why we need such a system, everybody supports the idea." See, Russians Propose Global Monitoring," *Executive Intelligence Review,* April 22, 2011.

5. See, "Self-Developing Systems and Arctic Development: Economics for the Future of Mankind," by Sky Shields and Michelle Fuchs, http://www.larouchepac.com/node/20987.

matter. The immediate reinstatement of the original 1933 Glass-Steagall legislation is required to separate out the mass of hyperinflationary speculative debt of the presently failed monetary system, a debt to which a sovereign United States has no obligation. However, after decades of a severe lack of real, physical economic investment, the amount of money remaining after this separation would not be enough to fulfill our obligations to the future-oriented, capital intensive projects we require. This requires the employment of credit, as opposed to money per se, a unique kind of debt which has been and can be legally uttered by Congress for such productive purposes as we will outline here.[6] A credit system, as opposed to a monetary system, is the means by which humanity ensures that future generations progress to successively higher levels of physical economic activity.

2. Mankind exists within a universe that is inherently anti-entropic. This means it is impossible to indefinitely maintain any fixed level of economic development, and any attempt to do so will guarantee the extinction of the human species. Most glaringly dangerous in this regard is the very existence of the "green" ideology, which calls for halting fundamental economic advancement (e.g., nuclear power) in the name of so-called "sustainability."[7] In the context of a ceaselessly developing universe, this means death.

Mankind's ability to ensure his own existence depends absolutely upon our unique capability to consciously wield ever higher qualities of power sources, representing increases in levels of energy-flux density.[8] Thus, the relatively immediate future existence of the human species will necessarily be characterized by mastery of what LaRouche has identified as the nuclear/thermonuclear economic platform, spearheaded by a Moon-Mars colonization perspective.[9]

In doing so, we will begin to gain a competent understanding of the "weather" conditions inherent to our galaxy, with which we must contend both on the Earth, and on any body we begin to inhabit. We must set out now to do what is presently unthinkable—to come to not only understand, but to increasingly control these forces.

But before getting back to this, we must ask ourselves the question: do we actually know enough about the threats that we face? Do we know our enemy adequately? In this report, we will examine the second of the two points listed above: that the real threat is not from events in a passive universe, but in the fact that the galaxy itself is evolving, and that its rate of evolution defines what must be our own.

1. Overturning the Big Lie

The story of humanity's existence is one of a newcomer to our galaxy. Borrowing from President John F. Kennedy's famous 1962 Rice University address, if we take the age of the Earth as one day, the development of complex life on Earth began about 3 hours ago.[10] Humans have existed for a mere 3 minutes, and recorded human history began only within the last tenth of a second.

We can locate the mere several million years of mankind's existence within the development of complex life over the past half billion years. Written in the fossil record is a history of ceaseless development and increasing activity, a process that can only be characterized as anti-entropic. (See Appendix 1: The Principle in Evolution.)

Reading this story, the development of life shows a clear periodicity of rise and fall, punctuated by great dips called mass extinctions. The overall trend of the increase in diversity and dominance of life is characterized by these cycles, one of about 60 million years, and another of about 143 million years—periods which mankind has yet to experience.[11]

6. The single biggest obstacle in this respect is President Obama, who has acted as an outright agent of the imperial forces of Wall Street and London. Whereas the current slate of Republican Presidential candidates falls pathetically short of addressing this reality, the necessary solutions are being presented by a LaRouche PAC-sponsored slate of federal candidates.

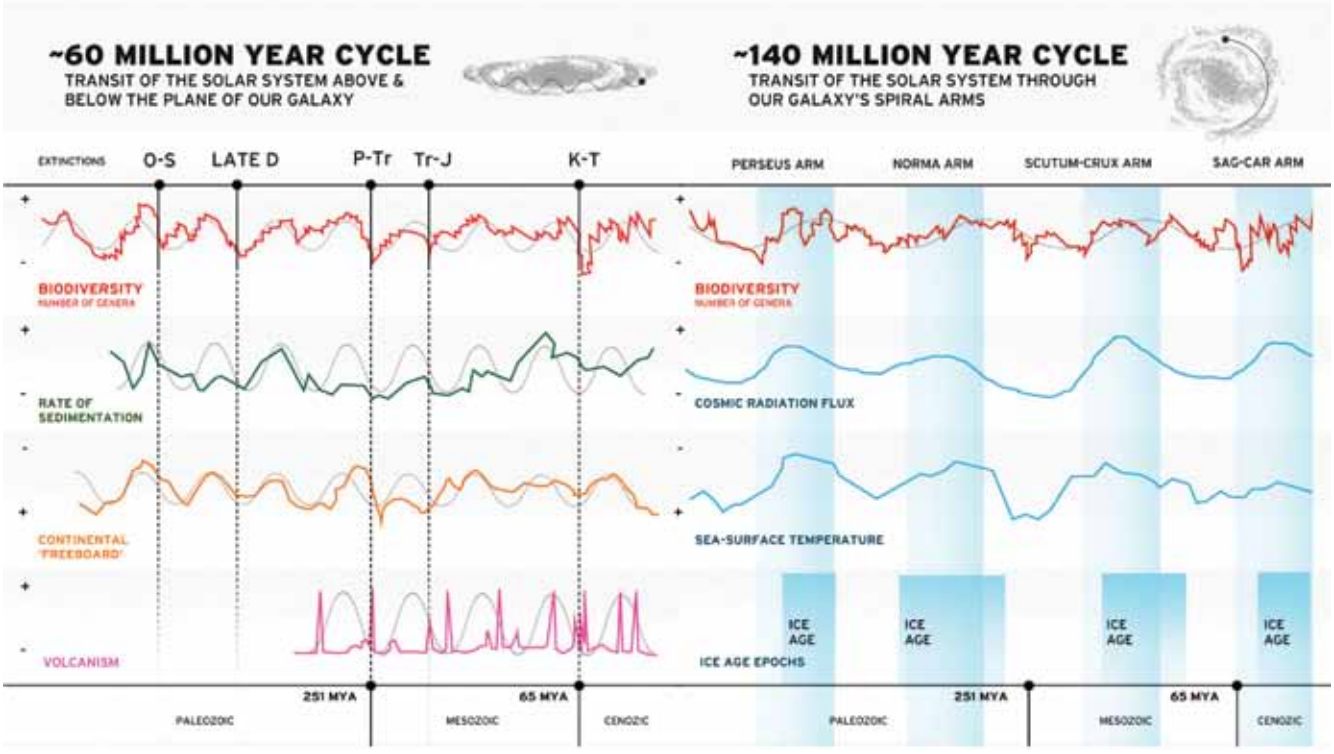
7. The policy of halting economic progress has been the explicit intention of the British Empire, and is part of its genocidal depopulation agenda. For example see, "Behind London's War Drive: A Policy To Kill Billions," by Nancy Spannaus, *Executive Intelligence Review*, Nov. 18, 2011.

8. For example, the succession of wood burning, to coal, to oil, and then nuclear fission. Each of these steps expresses a qualitative leap in the ability of the human species to support its own existence.

9. This must be accomplished with the perspective of matter-antimatter reactions already in mind as the next frontier.

10. Beginning at the Cambrian explosion dated to approximately 540 million years ago.

11. The initial hint of a periodicity in the fossil record was noticed in the 1980's, and thought to be about 30 million years. In 2005 a reanalysis with improved dating scales indicated a strong periodicity of 62 million years, and a weaker but significant period of 143 million years. See Rohde & Muller, "Cycles in fossil diversity," *Nature*, Vol. 434, 2005; and, John Sepkoski, "What I Did With My Research Career—Or How



Graphical representation of the two theorized orbital cycles of our solar system through our galaxy, and the corresponding cycles in biodiversity and geophysical/climate activity. See: "Cycles in fossil diversity," R. Rohde & R. Muller, Nature, Vol. 434, March 10, 2005; A. Melott and R. Bambach, "A Ubiquitous ~62 Myr Periodic Function Superimposed on General Trends in Fossil Biodiversity: Part II," 2009, arXiv.org preprint; H. Svensmark, "Cosmoclimatology: A New Theory Emerges," A&G, Feb. 2007, Vol. 48; N. Shaviv, "Cosmic Ray Diffusion from the Galactic Spiral Arms, Iron Meteorites, and a possible climatic connection?" Physical Review Letters, Vol. 89, Issue 5; S. Peters, "Environmental Determinants of Extinction Selectivity in the Fossil Record," Nature, July 31, 2008, Vol. 454; A. Prokoph et al., "Time-Series Analysis of Large Igneous Provinces: 3500 Ma to Present," The Journal of Geology, Vol. 112, No. 1 (Jan., 2004), pp. 1-22.

The Earth as a whole appears to pulsate with the same cycles, like a heartbeat of our entire planet. The uplift and collapse of entire continents, as indicated by sedimentation rates and other records, has occurred on the same cycle of approximately 60 million years. Even periods of large-scale continental volcanism have been shown to have this same approximate 60-million-year cycle.[12]

Long-term climate variations of the entire planet, moving from global ice ages to global warm periods, occur on a period of about 143 million years, corresponding to one of the cycles of biodiversity mentioned above.[13] The same cycle has also been teased out of the clues left in meteorites, which have recorded changes of the cosmic radiation environment of our entire solar system.[14]

In trying to unravel the tale of these cyclical changes the Earth has experienced, we are directed beyond the reaches of our planet and our solar system. Even the longest cycles of Earth's motion with respect to our solar system, such as changes in the eccentricity of our planetary orbit, are only on the scale of hundreds of thousands of years. In searching for larger cycles, we are led to the motions of our solar system through our galaxy, cycles on commensurable time-scales to the major changes on Earth which we've outlined.

Research on Biodiversity Yielded Data on Extinction," found in the book, *The Mass Extinction Debates: How Science Works in a Crisis,* by William Glen; Stanford University Press, 1994.

12. Martinson, Peter, "The Importance of NAWAPA for Geophysical Research," on LaRouchePAC.com.

13. See "The Milky Way Galaxy's Spiral Arms and Ice-Age Epochs and the Cosmic Ray Connection," by Nir Shaviv at Sciencebits.com/ice-ages, and "The Spiral Structure of the Milky Way, Cosmic Rays, and Ice Age Epochs on Earth."

14. Shaviv, "Cosmic ray diffusion from the galactic spiral arms, iron meteorites, and a possible climatic connection?" *Physical Review Letters,* Vol. 89, 2002.

Evidence of our travels through the galaxy has been recorded in the meteorite records just discussed, leading to the hypothesis that these fluctuations in cosmic radiation result from our periodic passage through the galaxy's spiral arms. In addition, several astronomers have made calculations of the possible period of our oscillation above and below the galactic disk.[15] The entire perpendicular cycle, from one extreme and back again, would take on the order of 52-74 million years, matching both the cycle of geophysical pulsation of the Earth and the biodiversity cycle of life.

This evidence also indicates that we are heading into the same relative position with respect to our galactic plane as during the extinction that eliminated the dinosaurs 65 million years ago. It appears we are overdue for another such extinction/speciation event.

So, we have to look to our galactic environment to come to know our own Earth. But here, we run into a contradiction between the clear, anti-entropic evolution of life on Earth, and the fact that astronomical and cosmological investigation, including the study of our own galaxy, is dominated by a fraudulent extrapolation of the Second Law of Thermodynamics,[16] a law of increasing entropy. This false doctrine is typified by the work of Pierre Simon Laplace. (See Appendix 2: Laplace's Fraud.)

But, there need not be a contradiction. There is a harmony between the anti-entropy evident in the development of life, and galactic processes. Life is not an exceptional case of "local anti-entropy," which, in order to exist, must increase entropy elsewhere. The universe is not a big box of gas, in which almost all cosmic phenomena of any significance are merely chaotic "explosions." There was never justification for Laplace's fraudulent ideology, claiming that any event could be predicted from the immediately preceding event, in a percussive process resulting in an increasing dissipation of free energy, ending in complete stasis.

The development of the Earth's biosphere has been an anti-entropic process, never reversing, but proceeding incessantly towards higher levels of energy-flux density. As the fate of the dinosaurs tell us, creatures that can't keep up go extinct. The persistent anti-entropic nature of life cannot be created from entropy, and as we will show, neither can the evolution of galaxies, whose long-period cycles resonate with the development of life on Earth.

The question remains: what is our galaxy, really?

The Anomalous Redshift

Here, we aim to permanently dispel the idea of an assumed entropic fate of heavenly bodies. What we can discover in a study of galaxies, unhindered by false assumptions, is the creation and growth of galaxies, evolving into new states—indicating not only a maturation (as opposed to death), but even what we could call creativity.

This evidence comes from the early work of the American astronomer Halton Arp, studying the systemic associations and physical interactions between very high-redshift galaxies and low-redshift galaxies, something which is prohibited in the doctrine of Second Law cosmology. (See Appendix 8: Redshift.) The entirety of present cosmology demands that two galaxies with vastly different redshifts must be greatly separated in space and in time—yet we see clear examples where this is not the case.[17]

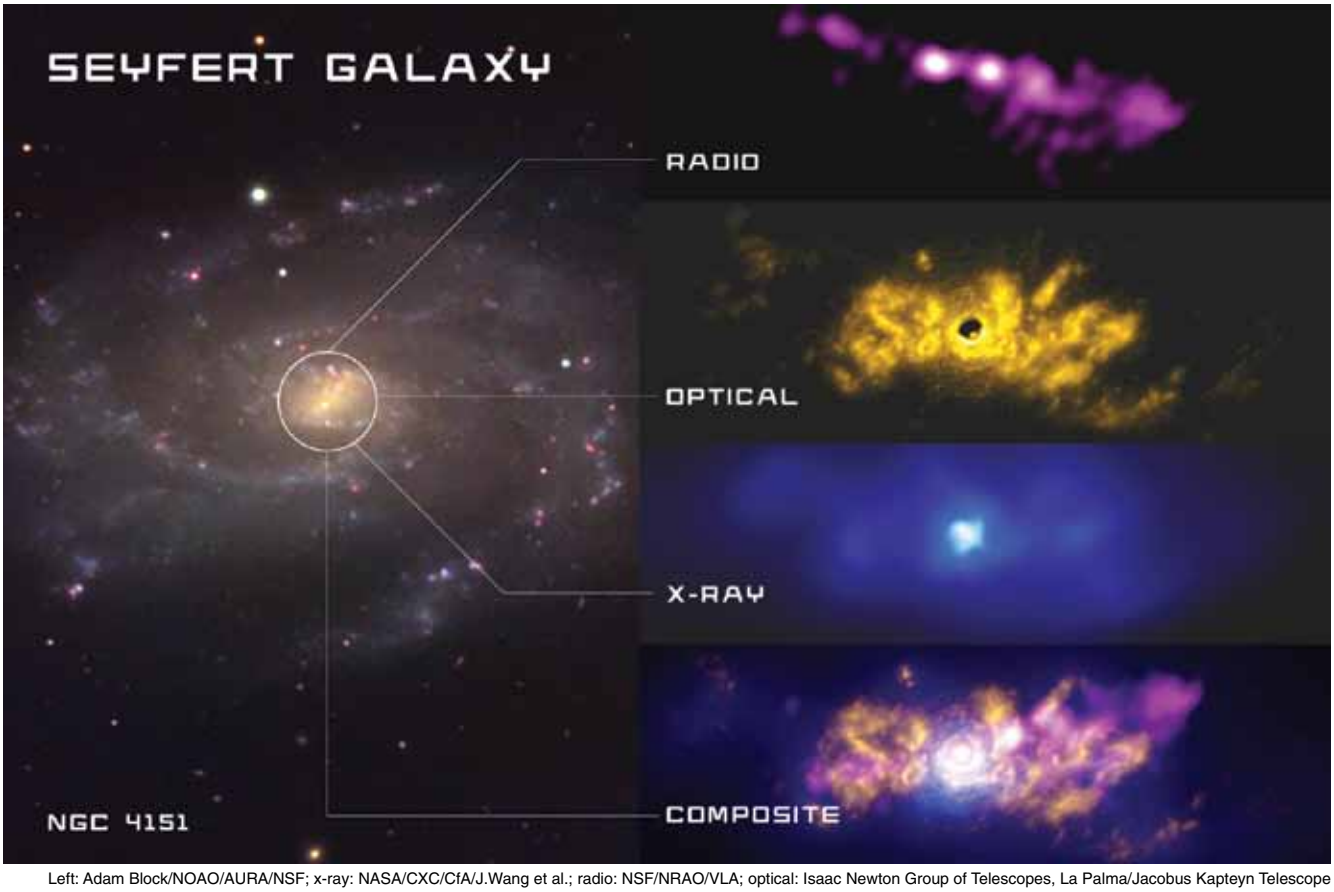
This demonstration explodes the standard Big Bang theory. However, our focus here is not a treatment of the Big Bang as such, but of the much larger issue of the underlying assumption of the fraudulent Second Law of Thermodynamics.

There are two particular types of celestial objects which help to expose the fraud. The first type of object

15. E.g., Bahcall & Bahcall, "The Sun's motion perpendicular to the galactic plane," *Nature* vol. 316, 1985.

16. There is a general disagreement as to what exactly the Second Law of Thermodynamics even states. In its original form, it was a quite reasonable observation by Sadi Carnot, made in the course of his work on heat engines, that heat never flows from a colder body to a warmer one. This observation falls well within the domain of provable, experimental physics. In the hands of Rudolph Clausius, however, it became an irresponsible monstrosity, extrapolated to phenomena whose essential nature had never even been probed scientifically. It became essentially a sort of apocalyptic religious belief, the adherence to which no doubt contributed to poor Ludwig Boltzmann's choice of exit from this world.

17. The work of decades of research into this redshift anomaly is presented clearly in two successive books by Arp, *Quasars, Redshifts and Controversies,* 1988, and *Seeing Red,* 1998. However we are obliged to note a distinction between his observational work, and his theories explaining the new questions posed by the observations. Here we will stick to his observational demonstration of the existence of this anomalous redshift phenomenon, and draw implications, where we can, from there. A fuller treatment of his theories would require another occasion. With that said, credit should be given to Arp's commitment and continuity of work, despite decades of denial and attempted suppression by the academic institutions. By the early 1980's he was forced to move to Germany to continue his work, as he was increasingly denied access to the telescope at his previous occupation at the Palomar Observatory, despite his having worked there for 27 years, and despite the fact that he was considered one of the world's leading up-and-coming astronomers during his early career.



Left: Adam Block/NOAO/AURA/NSF; x-ray: NASA/CXC/CfA/J.Wang et al.; radio: NSF/NRAO/VLA; optical: Isaac Newton Group of Telescopes, La Palma/Jacobus Kapteyn Telescope

Example of a Seyfert galaxy, NGC 4151. Separate close-up images of the active nucleus are shown in radio, x-ray, optical wavelengths, and a composite of all three.

is a specific class of galaxy known as a Seyfert galaxy. These galaxies have very active central cores (nuclei) which shine much more brightly than the nuclei of other galaxies, and across a broad range of the electromagnetic spectrum.

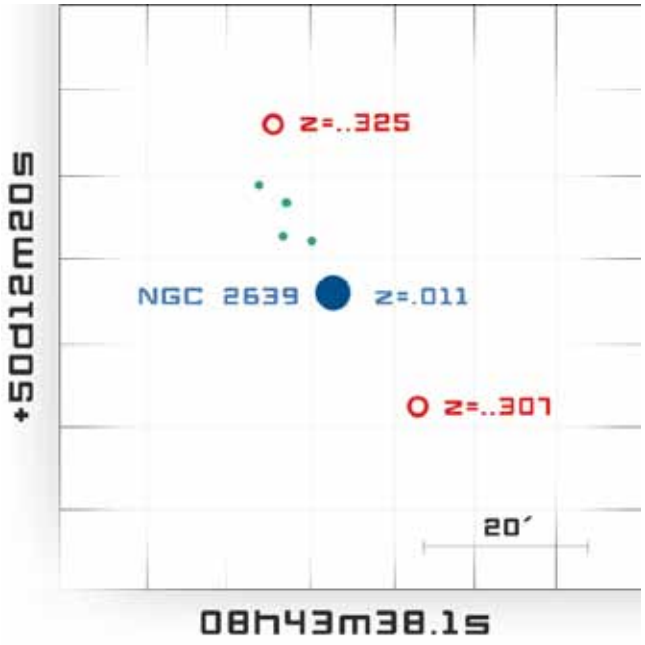
The second type of object is known as a quasar.[18] These are most well known by their extremely high redshifts, and when they are viewed in the sky, they appear relatively faint and small.[19] Standard cosmological doctrine requires that these quasars, on account of their extremely high redshifts, be extremely far away—much, much farther away than the Seyfert galaxies we see.

However, Arp demonstrates that these two classes of objects, which should be vastly separated in space and time, and therefore should be absolutely unrelated to each other, are actually systemically associated. This means that in the general regions around Seyfert galaxies we find significantly higher densities of quasars than we should find were these two types of objects completely unrelated. This correlation suggests that an actual physical relationship between the two objects must exist, i.e., they are close to each other in space and time, meaning that the standard assumptions about redshift fall apart. There must be some other cause for the dramatic redshift of quasars.

Arp calls this anomalous redshift, which can not be attributed to anything within the framework of Second Law cosmology, the intrinsic redshift, a property shared by all galaxies as well as quasars. As will be discussed

18. The name quasar comes from "quasi-stellar radio source." "Radio source" because the first quasars were discovered from their strong radio emissions, and "quasi-stellar" because they visually appeared as singular point sources of light (similar to how we see stars within our galaxy), instead of nebulous blobs (as other galaxies appear to us). Their dramatic redshifts indicated that they lay well outside of our own galaxy.

19. Arp also identified other objects in the image which he thought would turn out to be more quasars. In 2004 they were investigated, and the four unmarked objects in the image above did turn out to be additional high redshift quasars. See, "QSOs and Active Galactic Nuclei Associated with NGC 2639," E. M. Burbridge et al., *The Astrophysical Journal Supplement Series,* 153:159-163, 2004 July.



Seyfert galaxy NGC 2639 with a pair of quasars perfectly aligned across it. This is an exceptionally good example, as the quasars have very similar redshifts as well. If redshifts were actually indicative of distances, these quasars would have to be ~20-30 times farther away than the galaxy. See Arp, "Seeing Red," page 58. The redshift values are indicated by the letter z, and are usually given in one of two forms, either in terms of a special scale ranging from 0.0 to extremely high values of 8+, or the measure of kilometers per second, which is generally used for lower redshifts. (Even though the object may not actually be moving at that speed, this is still used as a convenient measure of the redshift value.)

below, this requires a new approach to physical phenomena, incorporating the notion of a fundamentally creative universe, whose properties require a thorough study of the phenomena of life and cognition.

Not only did Arp show that there is a general association between Seyfert galaxies and quasars, but also that there is a tendency for pairs, or even multiple pairs of quasars to line up perfectly across these active galaxies, as seen in the image here.

As both Seyfert galaxies and quasars are relatively rare objects, the chances of those in the image above being unrelated, and only accidentally seen near each other in the sky, is quite small. The chance of finding just two unrelated quasars with similar redshifts this close is only about 1 in 100. Add to this the probability of seeing a Seyfert galaxy this close to the pair, and the likelihood of being a chance occurrence drops dramatically. Include the fact that they all line up nearly perfectly, with the Seyfert galaxy almost exactly in the middle, and the likelihood that this is mere coincidence becomes vanishingly small.

Perhaps one or two incredibly rare exceptions could be tolerated, but by the mid-1990s Arp had identified dozens of very clear cases of such alignments.

Not only does this mean that these objects with dramatically different redshifts are located very close to each other in space and time (close in extra-galactic astronomical terms at least), but, as we will see below, these examples also point to the creative nature of galaxies, acting to generate new states of existence in the universe.

This evidence of the paired alignments, gathered from what were then new x-ray observations, fits in perfectly with decades of Arp's earlier work, during which he had studied anomalous cases of galaxies that were known to be ejecting massive structures from their central cores.[20]

These earlier studies uncovered numerous cases of objects with very high redshifts in close proximity and along the same direction as the jets of ejected material, and sometimes even within the jets, showing that these high redshift objects were actually being ejected from much lower redshift galaxies. This evidence has long indicated that it's not just quasars that have this intrinsic redshift property, but that all galaxies do.

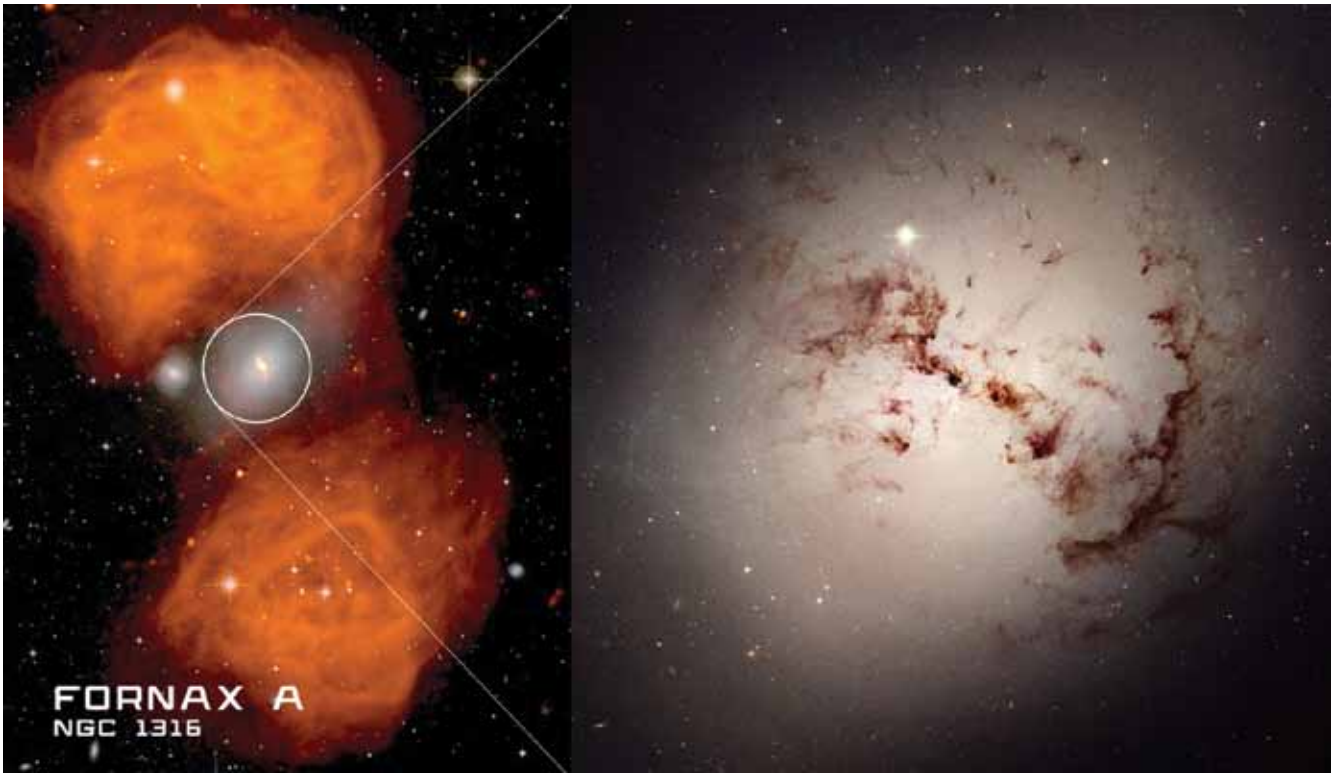
Creative Galaxies

The intrinsic redshift evidence shows us a creative universe, in which galactic systems are created and then evolve and develop, more closely resembling the morphogenesis of a living organism than any Second Law, entropic process.[21]

Though more work needs to be done to determine the exact nature of these processes, the intrinsic redshift values observed for different quasars and galaxies

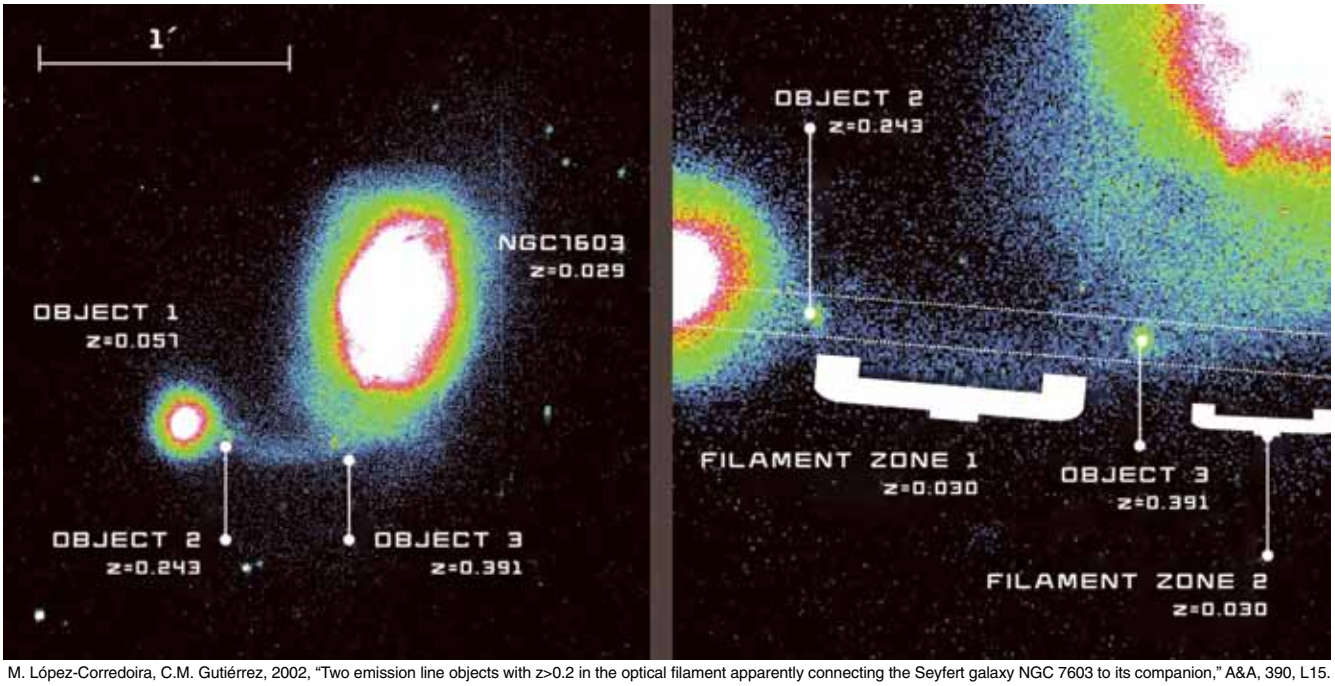
20. The idea of galaxies ejecting any material should be seen as problematic for the doctrine of Second Law cosmology, as that doctrine describes the core as an incredibly dense region of matter which should be gravitationally pulling material in, not ejecting it out.

21. Arp, in collaboration with Jayant Narlikar, developed a theory which attempts to explain the relation of redshift to a galaxy's evolution. This present report is not intended to treat the specifics of their theory. Instead we will propose an approach which is methodologically fundamentally different than that taken by Arp and Narlikar. This new approach, as we will discuss in the following section, is grounded in a superior current of scientific thought, a current which has nearly disappeared from a modern science dominated by reductionism.



Radio image courtesy of NRAO/AUIand J.M. Uson

NGC 1316, also known as Fornax A. On the right is an optical image from the Hubble space telescope, and the left includes an overlaid radio image, showing the massive lobes of ejected material dwarfing the size of the galaxy.



M. López-Corredoira, C.M. Gutiérrez, 2002, "Two emission line objects with z>0.2 in the optical filament apparently connecting the Seyfert galaxy NGC 7603 to its companion," A&A, 390, L15.

The famous case of the Seyfert galaxy NGC 7603. A bridge of ejected material stretches out from the main galaxy to a smaller companion galaxy with twice the redshift. Two quasars with much higher redshifts also appear to have been ejected along with this bridge.

appear to correspond to distinct stages of galactic evolution, in which quasars may represent something akin to an embryonic stage, characterized by very high intrinsic redshift values, which then progressively decrease as the quasars evolve into full-fledged galaxies.[22]

Further insight into how redshift indicates an evolutionary stage, can be gained by looking at relatively small systems of galaxies understood to be physically associated with each other because of their similar locations in the sky and similar luminosities and sizes. These are called galaxy groups.

One of the closest and best studied groups is the M81 group, so named because its brightest and largest member is the galaxy M81. (See image.)

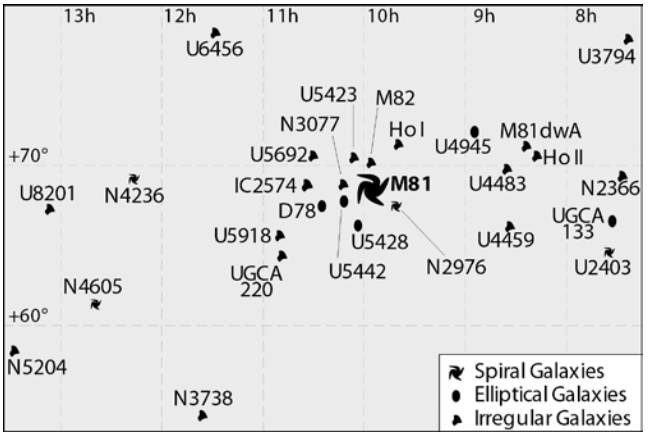
As Arp shows, if we take all the galaxies of the M81 group and plot them by their redshift we see that all of the companion galaxies surrounding M81 have a higher redshift than this parent galaxy. (See image.)

This phenomenon of smaller companion galaxies having consistently higher redshifts than the respective dominant parents of their group was confirmed in other groups studied, as well as in studies of the entire Virgo cluster of galaxies.[23] This adds further proof that the intrinsic redshift we measure is an indication of the stage of evolution of a galactic system, and that new galaxies are being created, developing, and growing.

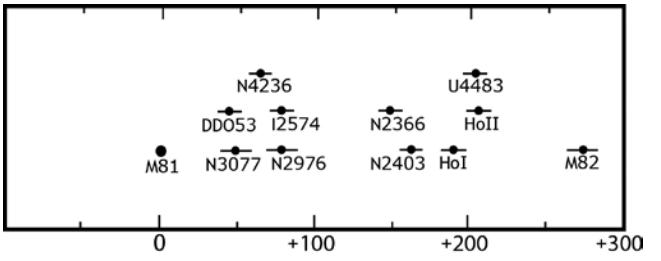
Looking back to our home, our own Local Group of galaxies, of which our Milky Way is a member, is no exception. For our Local Group, the dominant galaxy is the Andromeda galaxy (M31), and again, all of the major companion galaxies around it, including our own, have higher redshifts. (See image.)

Combining the M31 and M81 groups, and plotting the members by their galaxy type and by their redshift, we again see how the larger, older spirals galaxies (M81 and M31), have lower redshifts than their companions.

When we observe the Andromeda galaxy from the Earth, we see it as one of the rare galaxies with a negative redshift (blueshift). The standard assumption of attributing shifting spectral lines to the effect of relative motion has led to the popularly stated claim that our own galaxy and Andromeda are crashing towards each other, destined to collide in some 2 to 5 billion years. But we have already shown this to be an unfounded assumption.



Map of the M81 group as observed in the sky. Galaxy sizes are not to scale.



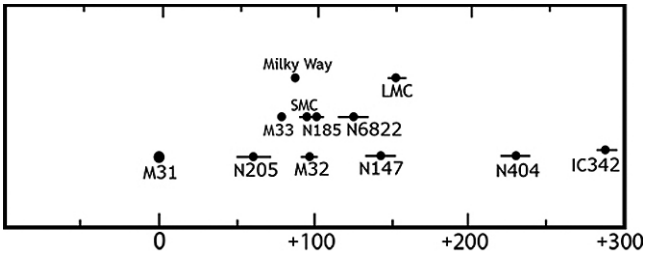
Main members of the M81 Group of galaxies plotted by their redshifts relative to M81 mapped along the x-axis. (See Arp, "Seeing Red," page 63.) With additional studies and the development of better telescopes, more members of this group have been identified since the 1998 publication of this study. These newly discovered members tend to be either smaller irregular galaxies or so-called "dwarf galaxies," and their redshifts are consistently higher than their parent, M81.

What does this then imply for our own Milky Way galaxy? Since our galaxy is a companion to Andromeda, the parent galaxy of our Local Group, we should have our own intrinsic redshift relative to our parent, indicating the continual growth and development of our own galaxy. This rate of development of our own Galaxy constitutes the baseline rate of development for survival within that Galaxy. If mankind does not maintain or exceed this rate of growth, we face the same fate as countless species before us, who were similarly outpaced by the increase in energy-flux density requirements.

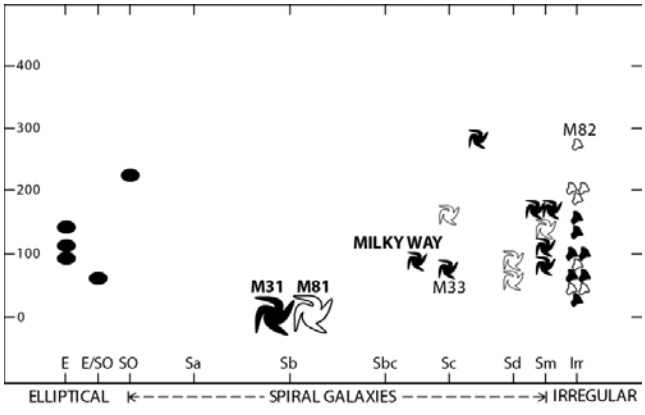
There was never any justification for a universal Second Law of Thermodynamics—we are not living in

22. There is also evidence that the values of the intrinsic redshift of galaxies sometimes tend to cluster around certain quantized values. This is not always the case, but there are numerous surveys of systems of galaxies in which certain values of intrinsic redshift are more common than other values.

23. The Virgo Cluster is composed of somewhere between 1,000 and 2,000 galaxies. For more on this study see: Arp, *Astrophysical Journal* 430, 74, 1994.



Main members of our Local Group of galaxies plotted by their redshifts relative to M31 mapped along the x-axis. See Arp, "Seeing Red," page 63. Again, more members of our Local Group have been identified since 1998, and their redshifts confirm that M31 has the lowest intrinsic redshift of the group.



Main members of the M81 group (outlines) and the M31 group (solids) plotted by their galaxy types and redshifts, again taken relative to the parents M81 and M31. Redshift is along the vertical axis. See Arp, "Seeing Red," page 66.

a giant box of gas cooling in empty space. We find our home in a developing galactic system, located amongst countless other developing galactic systems. The redshift case provides us with an insight into how the universe evolves into higher states of organization in the very large, and where we must locate the crafting of national and international economic policy to guarantee our continued existence within this system.

In other words, it's difficult to build a home that lasts, if you don't understand the changing grounds on which you build.

What does this galactic evolution look like, and how does it appear from the inside of a galaxy? What type of weather might a species living on a single body of that system experience as the entire system changes?

Mankind can never measure his existence against a fixed reference frame. The environmentalist doctrine of so-called sustainability is synonymous with extinction. Even maintaining a set level of economic activity requires that we continually advance technologically, just to maintain our relation with the progressing systems of the biosphere and of the galaxy. Economic progress is measured by the rate at which our rate of advance outpaces the changing universe, a reality which must determine how we shape policy as nations. From the fate of the dinosaurs, to redshift messages from entire galaxies, the universe is expressing the same unifying doctrine: progress or die.

2. The State of Galactic Spacetime

How is a galaxy able to act as a single system such that we observe this unified effect? That is, when we look at another galaxy, what we see is the result of light being emitted from millions to trillions of seemingly discrete stars,[24] yet we do not see a variety of redshifts: rather, we see one intrinsic redshift of the whole system.[25] Since the galaxy as a whole possesses this intrinsic redshift, how does each individual star of that galaxy know to emit light of the same intrinsic redshift? Or, more simply, since each star is emitting its own light, how do they all act in harmony to a single effect?[26]

This underscores the importance of eliminating the empty-space conceptions of our universe. We have to rid ourselves of the fallacy that a galaxy is simply an accumulation of stars held together only by gravitational attractions—stars which would otherwise be autonomous, discrete objects. The above considerations require that we understand that stars don't compose the galaxy, but the galaxy composes the stars.

Along with other observational anomalies (see Appendix 3: Galactic Harmonics), these considerations raise the question of how to investigate our own galaxy as a self-bounded, developing system, and what this implies for our own existence within our galaxy's solar system.

The work of Albert Einstein and Vladimir Vernadsky provide a fundamental basis for investigating this question.

24. In addition to the emissions from the stars there can be strong emissions from the galactic nucleus if it is active, as discussed briefly above.
25. There are some small deviations, but mostly on account of the rotational motion of the galaxy and its stars. The galactic system has one intrinsic redshift.
26. If we include the evidence that some galactic systems tend towards specific quantized values of redshift, then this adds another dimension to the question of how a galactic system organizes itself.

With Einstein's work on special relativity, it was realized that new causes for redshift were possible. In special relativity, objects travelling at extremely high velocities relative to one another, approximating the speed of light, observe each other undergoing a distortion of their respective measures of distance and time. Light emitted from such a "slower" time will appear to have a lower frequency. The observer who receives this light will thus experience it to be shifted toward the red end of the spectrum, just as with the Doppler redshift. This redshift, however, is in a sense native to the observed object, as it is a product of a transformation of the internal spacetime relationships that the object experiences.

What if there are other means to effect this sort of spacetime distortion? It is feasible that two adjacent objects, experiencing no relative motion between them, could yet manifest totally different redshifts due to a difference in their respective spacetimes. It is even conceivable that more intricate distortions of the expected spectral lines could arise, shifting the different spectral bands of different elements in distinct ways, such as those currently being attributed to a change in the fine structure constant.

(See Appendix 5: Fine Structure, Constant?)

In fact, such a heterogeneous spacetime is required by the later work of Vernadsky.

In the 1930's Vernadsky had reexamined the qualitative distinction between life and non-life (an area broached earlier by Louis Pasteur and then Pierre Curie) from the standpoint of the work of Bernhard Riemann, opening up an entirely new depth of understanding of this distinction.[27]

The product of this work is reflected in a trilogy of papers on the Problems of Biogeochemistry and On the States of Physical Space.[28] In these works Vernadsky demonstrates that the concepts of absolute space and absolute time must be thrown out. The physical properties of the space and time can not be brought in from outside assumptions, but are determined by the phase-space of the process itself, and thus become a subject of empirical investigation.

(See Appendix 4: Vernadsky's States of Space.)

All this combines again to make us ask: What actually are the spacetime properties of an anti-entropically developing galaxy? To what phase space do they belong? Are we justified in the assumption that they belong to the abiotic? Might they in fact belong to the biotic? The cognitive? Something else entirely?

This will only be determined by an investigation of the galactic system itself, and how it changes and develops.

Message from a Guest Star

Our own solar system, though billions of years old, is still a relatively recent addition to our evolving galactic home. Only a fraction of that relationship is recorded in the cycles of the development of complex life on our tiny planet over the past half-billion years, as discussed above. We are left to wonder, with the human species existing on this planet only for a few million years (not even the length of one complete cycle), how has our entire galaxy changed over the course of even just these "recent" galactic cycles?

Even much shorter than the period of the existence of our species, all of recorded human history becomes an almost infinitesimal slice of one of these galactic cycles. Yet, as just discussed, absolute time does not exist. The metric of physical action—changes in physical action, and changes in the potential for physical action—is where reality lies.

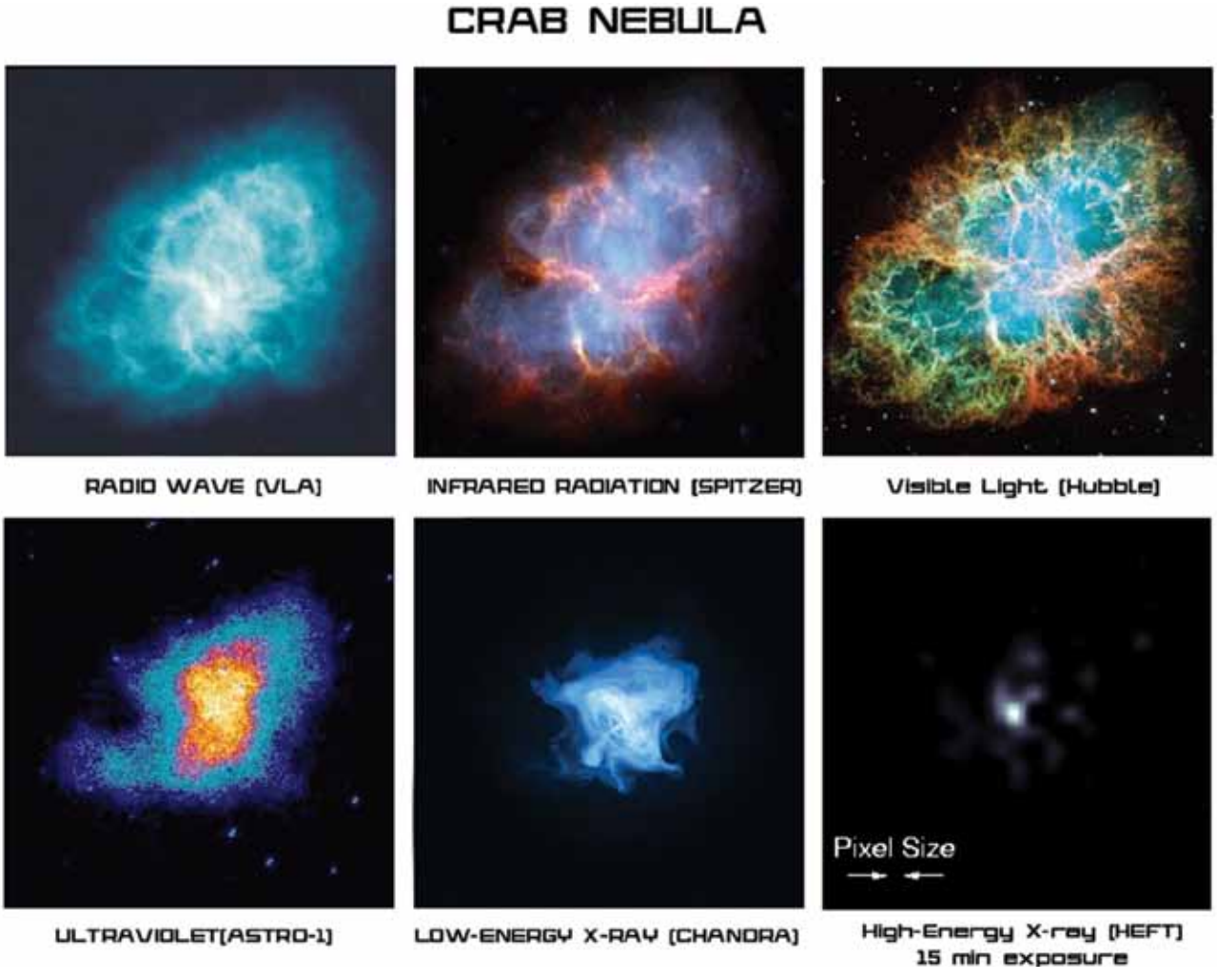
Probably the most famous expression of the constant development of our galaxy is the Crab Nebula. This amazing anomaly of the night-time sky is an incredibly recent addition. Though the nebula was first observed with a telescope in 1731, later taking the first place in the famous Messier catalogue, its location corresponds to that of a supernova observed by Chinese astronomers in 1054 AD. This gives the Crab a birthdate well within the limits of human history, less than a thousand years ago, more recent than the reign of Charlemagne.[29]

Since that recent date, the Crab has risen to become the most conspicuous character in our evolving gal-

27. The applicability of Riemann's work to the work of Vernadsky would make the spacetime effects more reminiscent of the sorts of phenomena that occur with general relativity. This would only approximate the ramifications of Vernadsky's later work, however, and a more thorough discussion will have to be undertaken in another location.

28. See, "The Problems of Biogeochemistry" I and II, and "The States of Space," available from *21st Century Science & Technology* magazine. (http;//www.21centurysciencetech.com/)

29. Though, if we take into account the great distance to the Crab Nebula —probably several thousand light years—the time of its actual birth, as opposed to the time its light reached Earth, might actually coincide more closely with the time of the flooding of the Black Sea, about 5,600 B.C. On this scale, however, time and simultaneity become rather tricky things, as we know.



axy.[30] Currently expanding at a rate of 1,000 kilometers per second, a transformation which is clearly visible in photographs taken over decades,[31] the Crab boasts, as one of the first shocks that it delivered to astronomers, the fact that its expansion is in fact accelerating rather than winding down—behavior rather uncharacteristic of a simple explosion or a dying star. Again, we see a universe whose character is in fact developing and growing, and this at accelerating rates.

This steady transformation of the Crab has not ceased. Beginning in 2009, the relatively recently launched Fermi Gamma Ray Space Telescope and also the Italian AGILE telescope began observing short, intense flare-ups of gamma rays possessing energies of

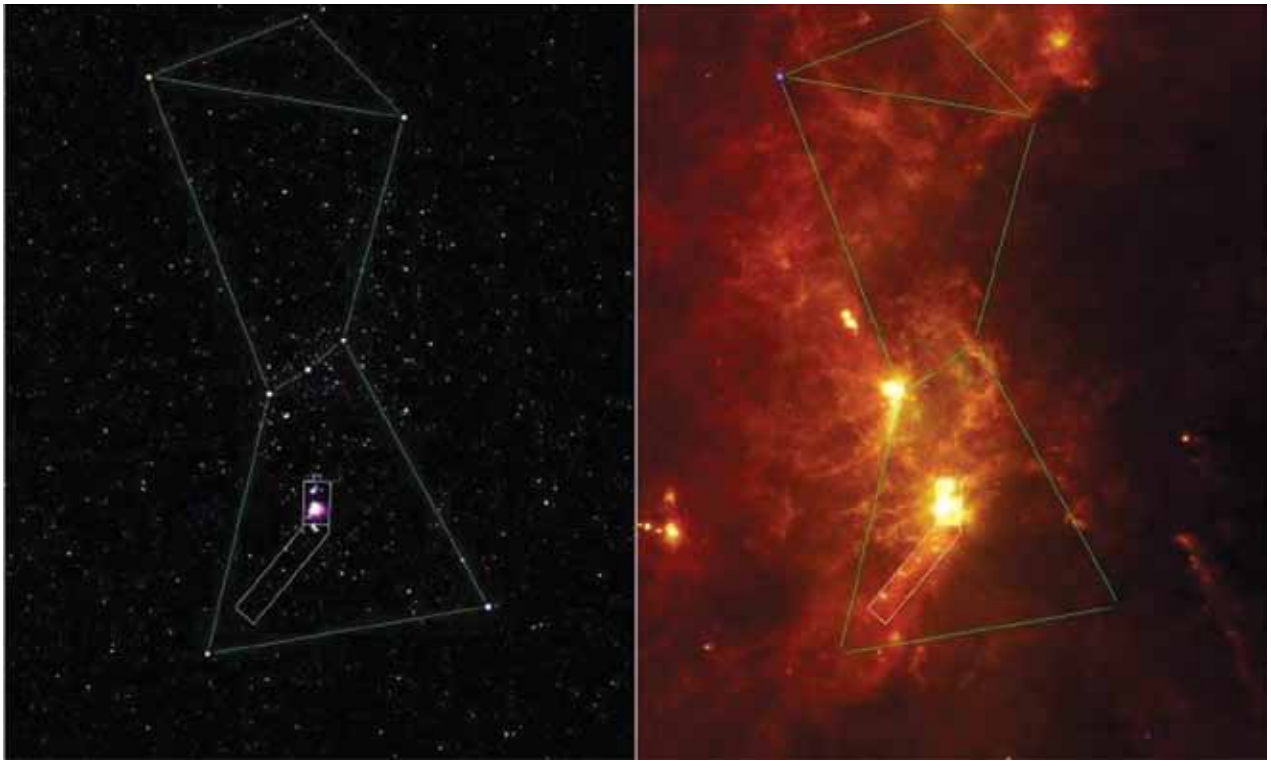
Our solar system relative to the Crab Nebula. Note the interesting alignment from the galactic center.

30. "The Crab has played a leading role in so many aspects of astrophysics that it was often said (at least by astronomers studying this object) that there are two branches of the field [of astrophysics]—studies that dealt with the Crab, and all the rest."—*The Sky at Einstein's Feet* by William C. Keel.

31. NASA's December 27th, 2001 Picture of the Day animates this change.

up to 10 quadrillion electron volts. But then, on April 12 and 16 of 2011, two "super flares" occurred which were over five times brighter than anything previously observed in our neighborhood. The source and cause of these flares are still entirely unknown. When the Chandra x-ray telescope was turned to observe the Crab on these dates, absolutely no changes in the x-ray structure of the Crab were recorded. In fact no changes in any other frequencies were observed by other telescopes.

The rate at which these gamma ray flare-ups occur and then die down precludes the possibility that these emissions could arise from any known method of heat-



Empty Space

The psychologist Wolfgang Köhler diagnosed the pervasive belief in Newtonian absolute space to be a mental illness which arises from an excessive belief in sense perception.[1] The limitations of our sense of vision cause us to tend to separate our visual field into "objects" and "background." Our extended electromagnetic sensorium, however, shows us that what we refer to as background is nothing of the sort.

Seen above is the constellation Orion. On the left, it is viewed in the familiar visible spectrum. On the right, it is viewed through the Spitzer infrared space telescope. The image on the right gives us a slightly better idea of the nature of the environment through which humans will travel during our colonization of outer space. Also, given the level of activity of this invisible medium, as documented in this report, it is not inaccurate to liken this medium to the cytoplasm of a cell—while less obvious than the organelles, it is nonetheless more primary. We should take advice from the Scottish poet Robbie Burns, and learn to "see ourselves as others see us:" Observers standing on the Orion nebula, using their own version of the Spitzer infrared telescope, would not see the Earth floating through empty space; they would see us interacting with a lively medium which looks very much like the image on the right.

1 Wolfgang Köhler, *The Place of Value in a World of Facts,* Liveright Publishing Corporation, 1938.

ing of the nebula's gases—the "cooling" phase would be far too rapid to be explained. However, if the suggested alternative is true, that electrons are being accelerated rapidly enough to produce the high-energy gamma radiation from their acceleration, these would be the highest-energy electrons connected to any known astronomical body. Add to this the fact that the largest flares occurred over the span of hours, and astronomers are at a complete loss for how such acceleration of electrons to such energies would occur. Is there perhaps some other possibility for the source of these flares?

Considered from the standpoint of the implications of our own galactic redshift, the more interesting likelihood is that we may not be able to explain the flare-ups by means of mechanisms occurring within the Crab itself.[32] In this case we must have recourse to a cause that is imposed upon the Crab, by its home galaxy, which renders the Crab a true expression of the development of that galaxy as a totality. Thus, what is usually discussed as a chaotic "explosion" actually displays some of the most remarkable expressions of change and development of our own galactic system—a process that we have witnessed over the course of relatively recent recorded human history.

Looking back to the Earth, we find our own home is as much an integral part of the intrinsic redshift-bound spacetime of our galaxy as the Crab nebula. What are the full implications of this for the inhabitants of our planet? As we will see below, the existential challenge—something only the human species has demonstrated the potential to address—is to define the needed science-driver program which will provide mankind with both a greater understanding of the totality of our relationship with our galactic system, as well as insights into how we can increasingly bring these interactions under our own control.

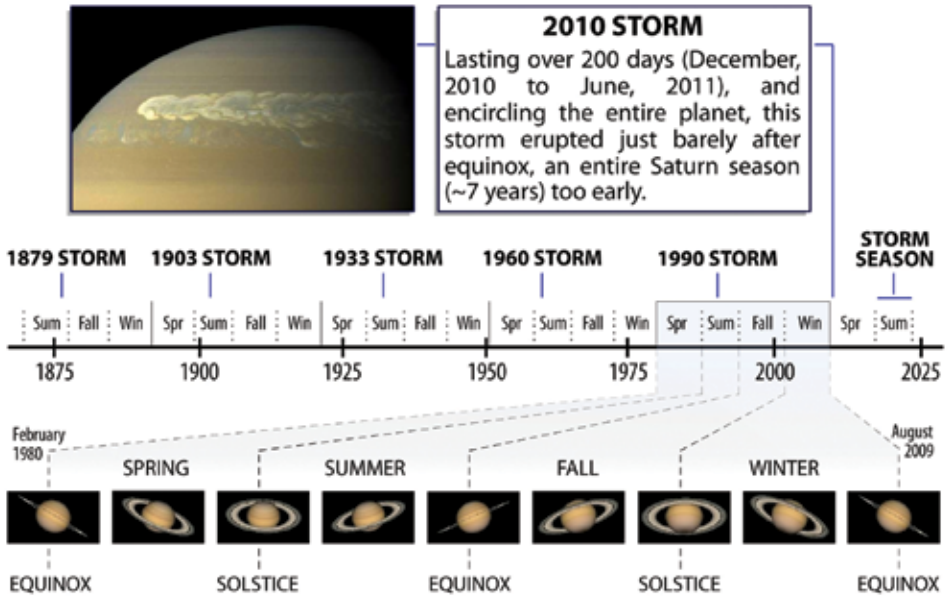
32. This would not make the Crab alone in this respect. It has been proposed that the peculiar character of our own Sun might be similar. The hottest region of the Sun is the solar corona, farthest from the Sun's center. As far as we can tell from our vantage point, the coolest regions of the Sun are within the sunspots—the closest we can yet observe to the Sun's center. This would imply a heating that moves from the outside in, rather than from the inside out. The current hypotheses about the centers of bodies such as the Sun and our Earth are just that, hypotheses. We have literally not even scratched the surface of any of these objects, including Earth. It is only Aristotelian prejudice that causes us to place the cause for their electromagnetic activities within the isolated bodies themselves, when so much evidence points to the primacy of their interaction and the medium which unites them. (See Box, p. 16.)

3. Local Weather from Your Local Group?

2011 gives us an intimation of what we may be in for. It all began with a gigantic blizzard in the American Midwest on Groundhog Day, which exploded as part of a dramatic, unforecasted shift within the atmospheric pressure regimes around the Arctic Circle. What followed was a series of deadly storms, earthquakes, and other major disasters, which now ranks 2011 as one of the most devastating years on record, globally, for natural disasters. Among the disasters: the massive magnitude 9.0 earthquake and subsequent tsunami in Japan; the extreme flooding in Australia; the six tornado outbreaks in the United States; the simultaneous evils of extreme drought in the south, and extreme flooding in the north of the U.S.; the deadly monsoon floods in Pakistan, China, and Southeast Asia, with almost 1,500 people in the Philippines being killed by one storm ; the active tropical cyclone cycle, including both Hurricane Irene and Tropical Storm Washi; the Alaska super-storm; the Halloween Nor'easter that dumped three feet of snow on parts of New England; the East African drought, which killed over 30,000 African children alone over the summer. The list goes on.

Throughout the year, as the disasters mounted, the British Monarchy's environmentalist attack dogs struggled to pin the blame on man-made global warming. Not only is their analysis unscientific, and just flat wrong, but the solution proposed by these genocidalists would far exceed the Final Solution attempted by Adolf Hitler, the previous manifestation of British green policy. It were wise to remember that an earlier employee of the British Empire, Thomas Malthus, advocated both the initiation of warfare, and the encouragement of famine, disease, and other natural disasters, to reduce the population to levels manageable by the empire. The attempt to halt scientific and technological progress, in order to address a straw man created by minions, not scientists, of the British Empire, would reduce the world's population at a rate that very well could lead to the extinction of our species.[33]

33. This is the immediate strategic intention of the British Empire, as the Queen's Royal Consort, Prince Philip, for example, has openly expressed such intentions to "cull" the vast majority of the human population. President Obama's acceptance of this policy of literal global genocide provides the grounds, and moral necessity, for his immediate



140 years of Saturn storms, with the anomalous 2010 storm indicated.

The British "humanity did it" dogma is not only wrong, but ignores the fact that our entire Solar System has erupted with unusual activity in the recent few years. For example, in December 2010, a massive, planet-wide storm flared up on Saturn, and lasted until July 2011. This is the largest storm we have ever observed on the planet, and nobody knows why it started now. Typically, large storms have been observed on Saturn every 30 years or so, which coincides with its orbital period. They have always developed right around the time that Saturn entered into its northern hemisphere summer, and may have a kinship with the tornado season that hits our planet every northern hemisphere spring. But, this time, the storm initiated much too early. Saturn shouldn't transition to the stormy season for at least another seven years—some other factor caused this megastorm. Perhaps there are some who might claim that human emission of carbon dioxide on Earth is causing this extreme weather, also?

The Sun, itself, is transforming dramatically, in a way we haven't seen for at least 400 years. All important indicators of solar activity are telling us that the Sun is going into a new phase of activity, a Grand Solar Minimum possibly like the great Maunder Minimum of the 17th Century. After coming out of an anomalous solar minimum, which lasted over two years, the Sun exploded with two large X-class, x-ray flares in early 2011.[34] This was followed by months in which several processes became decoupled. The northern hemisphere experienced surges of x-ray flares, while the southern hemisphere remained strangely quiet until later in the year. Seemingly independent of the flares, the Sun became amazingly productive in coronal mass ejections,[35] some of which struck the Earth. Although the solar maximum for this cycle is forecasted to happen in 2013, various indicators are now saying that the solar activity abruptly accelerated late in the year, and that we had already reached maximum by late 2011.

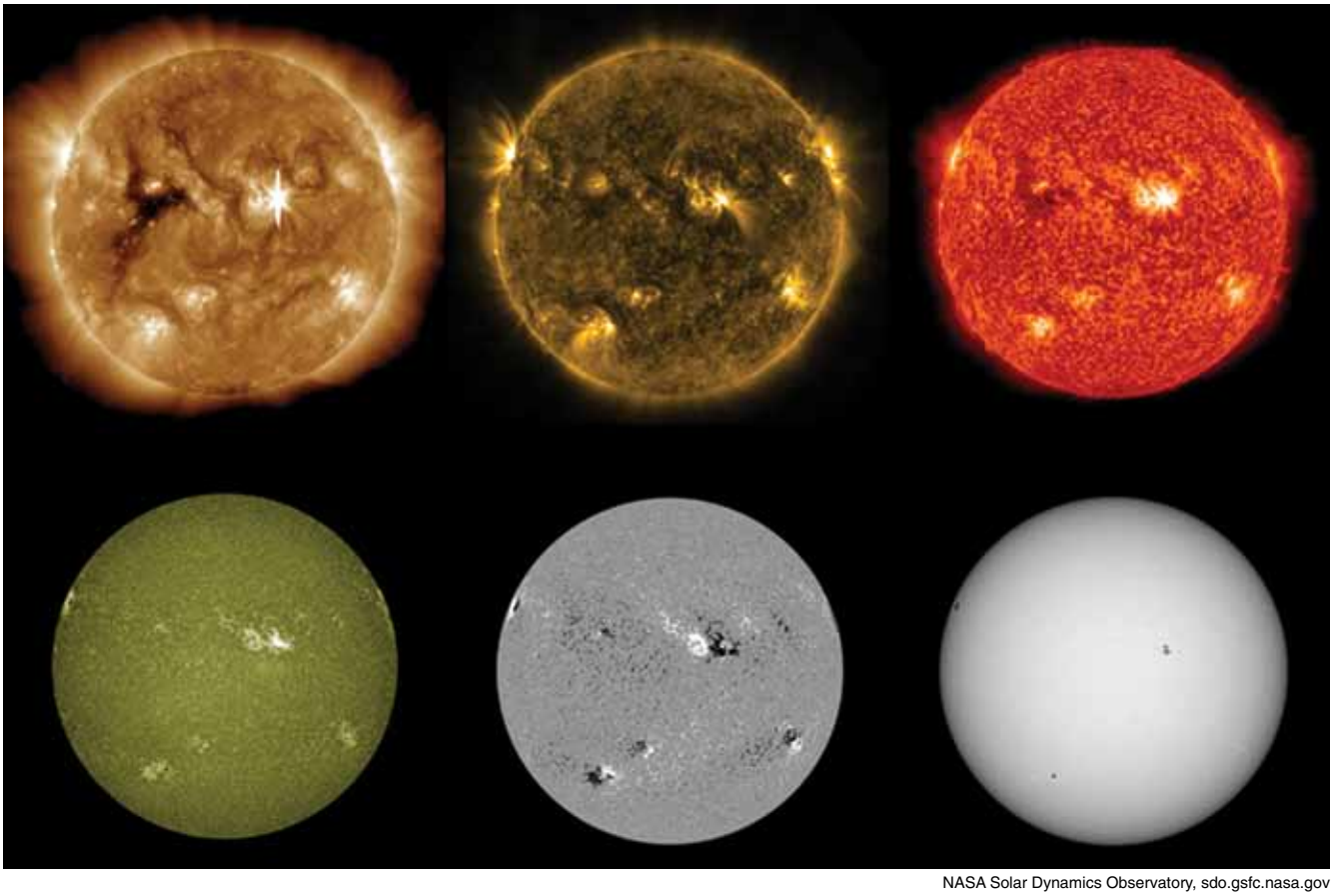
It is important to note here, that this poses a threat to human civilization in the near future. When a coronal mass ejection strikes our geomagnetic field, it can set off a geomagnetic storm, which, if powerful enough, could destroy electrical equipment through induced currents. The danger is that, should we suffer a direct hit by a large coronal mass ejection, it could blow out crucial elements of existing electricity transmission networks, crucial elements that can no longer be manufactured and replaced quickly by our devastated economy. Studies conducted to assess our vulnerability to such an event have shown that half the US population could be left without power for over a year, a situation which would lead to dark age conditions literally overnight.[36] As one person involved in the studies com-

removal from office. His intended healthcare "reform" has been drafted from exactly this same intention.

34. It may not be a coincidence, that both of these large flares occurred only a few days before two of the most deadly earthquakes of the year, the magnitude 6.3 in Christchurch, New Zealand, and the magnitude 9.0 in Japan.

35. A coronal mass ejection, or CME, is an explosive ejection of a chunk of the Sun's atmosphere (corona).

36. See Laurence Hecht, "The Solar Storm Threat to America's Power Grid," *21st Century Science & Technology*. In 2008, a report was published from a National Research Council workshop (under the National Academy of Sciences). In January 2010, the Metatech Corporation issued a report (commissioned under the 2006 Executive Order 13407), "Geomagnetic Storms and Their Impacts on the U.S. Power Grid." In June 2010, a joint report was released by the North American Electric



NASA Solar Dynamics Observatory, sdo.gsfc.nasa.gov

Six images of the Sun taken at the same time, but in different wavelengths and using various imaging techniques. The corona is captured well in the top left image, with a dark coronal hole seen in the left center of that image. The bottom center image is a mapping of the magnetic polarity. Notice how the same sunspot appears differently in different images.

mented, imagine the aftermath of Hurricane Katrina, but happening simultaneously in 10-20 major cities, and lasting well over a year.

During the second half of 2011, we witnessed several coronal mass ejections that, had they happened only a few days earlier or later, might have been able to inflict such devastation. Some of the largest geomagnetic storms we suffered this year, were the result of grazing near-misses by some of these magnetic megablasts.

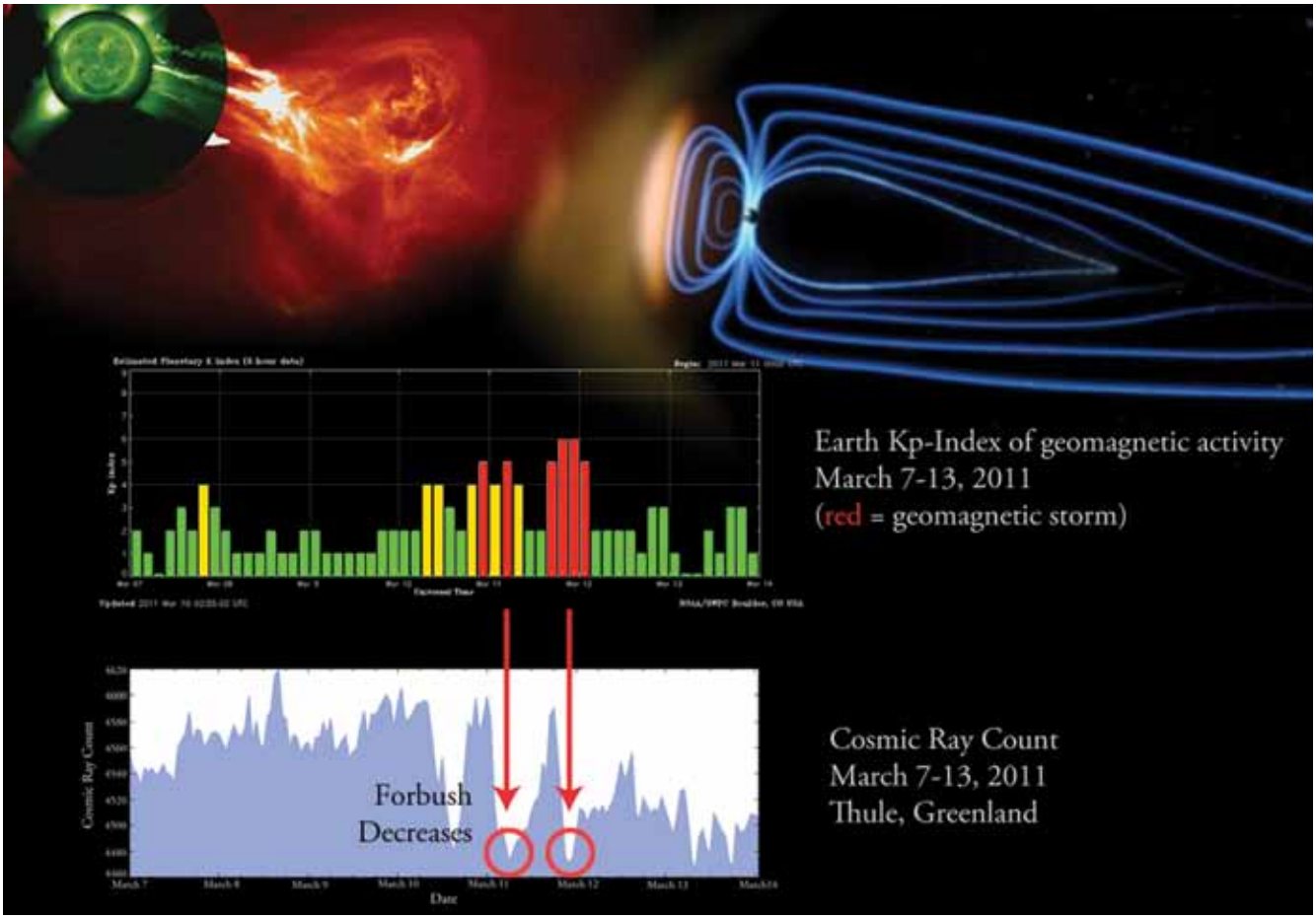
This "Fireball of Damocles," under which we precariously stand, is a very conspicuous reminder of how little we still know about our own solar neighborhood. The entire system is transforming, as a system. Within this context, the development of a true strategic defense policy means that we must understand what drives that transformation. This capability is what the genocidalist green agenda, spearheaded by the global warming hoax, is blocking.

Cloudy with a Chance of Cosmic Rays

The unscientific basis of current carbon-obsessed climatology has been most notably exposed by the work of Henrik Svensmark and others on cosmic rays and cloud formation.[37] Low level cloud formation can be catalyzed by ionization from incoming cosmic radi-

Reliability Corporation and the Department of Energy, "High-Impact, Low-Frequency Event Risk to the North American Bulk Power System." These have detailed some of the "knowns and unknowns" of the threats from intense solar activity.

37. It is widely acknowledged that the single largest source of uncertainty in climate models is the behavior of clouds, whose formation appears to be governed by various electrodynamic processes in the atmosphere, through which diffuse electrical currents constantly flow. This has been rather simplistically termed the "Global Electric Circuit," which actually refers to a set of processes representing the combined interaction of terrestrial (lithosphere and biosphere), solar, and galactic influences. See, for example, Carslaw, Harrison, and Kirkby, "Cosmic Rays, Clouds, and Climate," *Science* 29 November 2002: Vol. 298 no. 5599, pp. 1732-1737.



The Sun threw off a coronal mass ejection late on March 7, 2011. This CME (the fastest since 2005, at ~2,200 km/s) struck the Earth's geomagnetic field early on March 11, setting off a series of two strong reverberations over the next 48 hours (in red). Both of these strong geomagnetic storms were immediately followed by a sudden drop in cosmic ray flux, as meaured from the neutron detector in Thule, Greenland. These drops in cosmic ray flux, due to the sudden onset of geomagnetic storms, are called Forbush Decreases, after the man who discovered the correlation, Scott Forbush.

ation interacting with our atmosphere, playing a significant role in mediating a cooling and warming effect on Earth, as well as affecting precipitation. According to this theory, the influx of cosmic radiation catalyzing this process is mediated by galactic changes, galactic cosmic rays being the greatest known source of cosmic radiation, while solar activity plays a further mediating role. When the Sun is more magnetically active, the electrically-charged cosmic rays tend to get deflected from the Earth by solar wind. This includes outbursts from such events as coronal mass ejections, leading to so-called Forbush Decreases in galactic cosmic rays.

In 2008, scientists Sergey Pulinets and V.G. Bondur authored a paper called "Role of Variations in Galactic Cosmic Rays in Tropical Cyclogenesis," which examined a different manifestation of precisely this kind of effect on the Earth's weather systems, treating the case of hurricanes, specifically the 2005 Hurricane Katrina.[38] In the days prior to this devastating hurricane, the Sun unleashed a coronal mass ejection, which caused a geomagnetic storm here on Earth. Pulinets and Bondur showed evidence that the decreased cosmic radiation influx as the result of this solar event caused a decrease in atmospheric ionization normally caused by the cosmic rays. Condensation around these ions normally releases large amounts of latent heat. According to the authors, the sudden decrease in latent heat release high in the troposphere could have affected the atmospheric convection enough to cause an intensification and a change of the path of the hurricane, all ultimately po-

38. Bondur and Pulinets, "The Role of Galactic Cosmic Rays in Tropical Cyclogenesis: Evidence of Hurricane Katrina," *Doklady Earth Sciences,* 2008 Vol. 422, No.2, pp. 244-249.

tentially being driven by the change in galactic cosmic radiation interacting with the Earth's atmosphere.

The hypothesis of a significant cosmoclimatic effect is also supported by the recent CLOUD experiment at the CERN particle physics laboratory, which showed that cosmic ray ionization increases potential cloud condensation centers by at least a factor of ten.[39] This study also resulted in more questions than answers about the science of climatology, including the role of atmospheric gases in cloud formation—the study revealed that even the basic atmospheric aerosol composition of clouds itself is far from being understood. The promotion of the anthropogenic climate change agenda has thus increasingly revealed itself to be nothing more than a British imperial program to push for deindustrialization and depopulation, as well as a fraudulent excuse for the onset of famines and other weather disasters.

However, human-induced climate change itself is inevitable, and, in fact, necessary for a proper understanding of climatic processes. There have been longstanding experiments to induce rainfall, for example, largely through cloud-seeding. In recent years, a new approach to weather modification based on artificial ionization of the atmosphere has been gaining traction, drawing on the insights gained from cosmoclimatology.[40] This has the potential to give us greater leverage over key parts of the hydrological cycle. In combination with large-scale water management projects like the North American Water and Power Alliance (NAWAPA), which will increase the moisture available in arid regions, the direct manipulation of atmospheric parameters such as ionization can improve rainfall patterns, as well as mitigate destructive storms such as hurricanes.[41]

Investigation of atmospheric physics also gives us insight into processes deep below the surface of the planet.

We have renewed reason to conceive of seismic and weather phenomena, normally viewed as completely distinct kinds of processes, as different expressions of the same, much larger, environmental changes. This is typified by, but not limited to, the study of atmospheric earthquake precursors.[42] These atmospheric earthquake precursors are tied to the Earth's Global Electric Circuit, which is also the case for weather events such as thunderstorms and lightning. But on a broader scale, these different kinds of punctuated events also express changes occurring within our Sun, our galaxy, and beyond. Let's explore further the case of earthquakes and earthquake precursors.

The Fallacy of Simply 'Geo'-physics

Official seismology continues to treat megaquakes, such as that which devastated Japan in March 2011, as essentially random events. Indeed, every single one of the most deadly earthquakes of the past decade has been off the charts of the U.N.-sanctioned Global Seismic Hazard Assessment Map, which is based on statistical extrapolations of worldwide seismic data from roughly the last hundred years. In other words, megaquakes such as the one that struck Japan each came as a total surprise to seismologists. Clearly, statistics alone will fail in precisely those dangerous situations that depart from the assumed norm, with the price for such failure paid for in human lives.

This does not mean, however, that earthquakes are inherently unpredictable.

In fact, it has been clearly demonstrated by a number of scientists working in different countries, nearly all without government support, that large earthquakes are preceded by an array of measurable non-seismic precursor signals which could be incorporated into an early warning system. These precursors are the result of a complex and largely unseen process of physical preparation, of which the rupture of a fault zone is only the most dramatic manifestation.

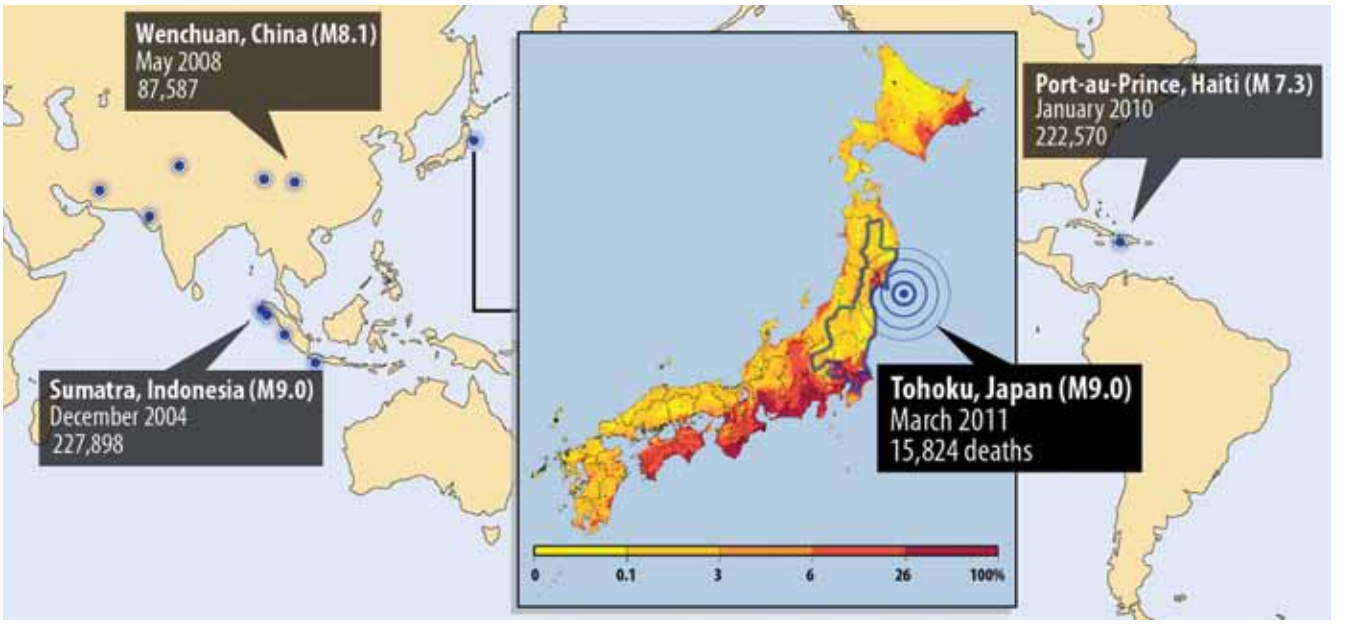
Many of these signals are projected as subtle electromagnetic fluctuations within the roughly 100-mile-thick curtain of atmosphere that extends from the weather-producing troposphere up to the electrically-conductive ionosphere, which interfaces directly with cosmic and solar radiation. For example, prior to the Japan quake, instruments registered atmospheric heat-

39. Jasper Kirkby et al, "Role of sulphuric acid, ammonia, and galactic cosmic rays in atmospheric aerosol nucleation," *Science*, 2011.

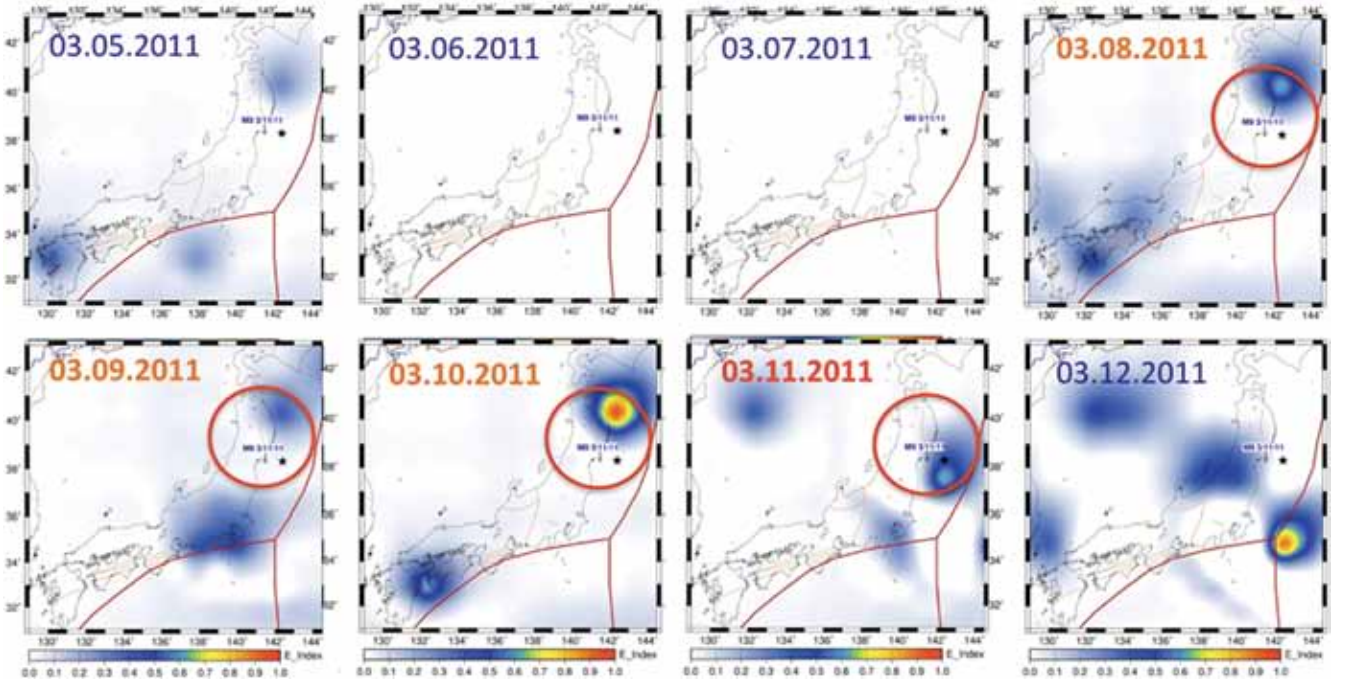
40. This technique has been pioneered by Russian scientist Lev Pokhmelnykh. See, for example, Sergey Pulinets, "Weather Control? Yes, it is really possible…" on recent experimental work on laser-induced condensation by Jerome Kasparian et al.

41. See video "NAWAPA and Biospheric Engineering" on LaRouchePAC.com, and other detailed material on the project at LaRouchePAC.com/infrastructure

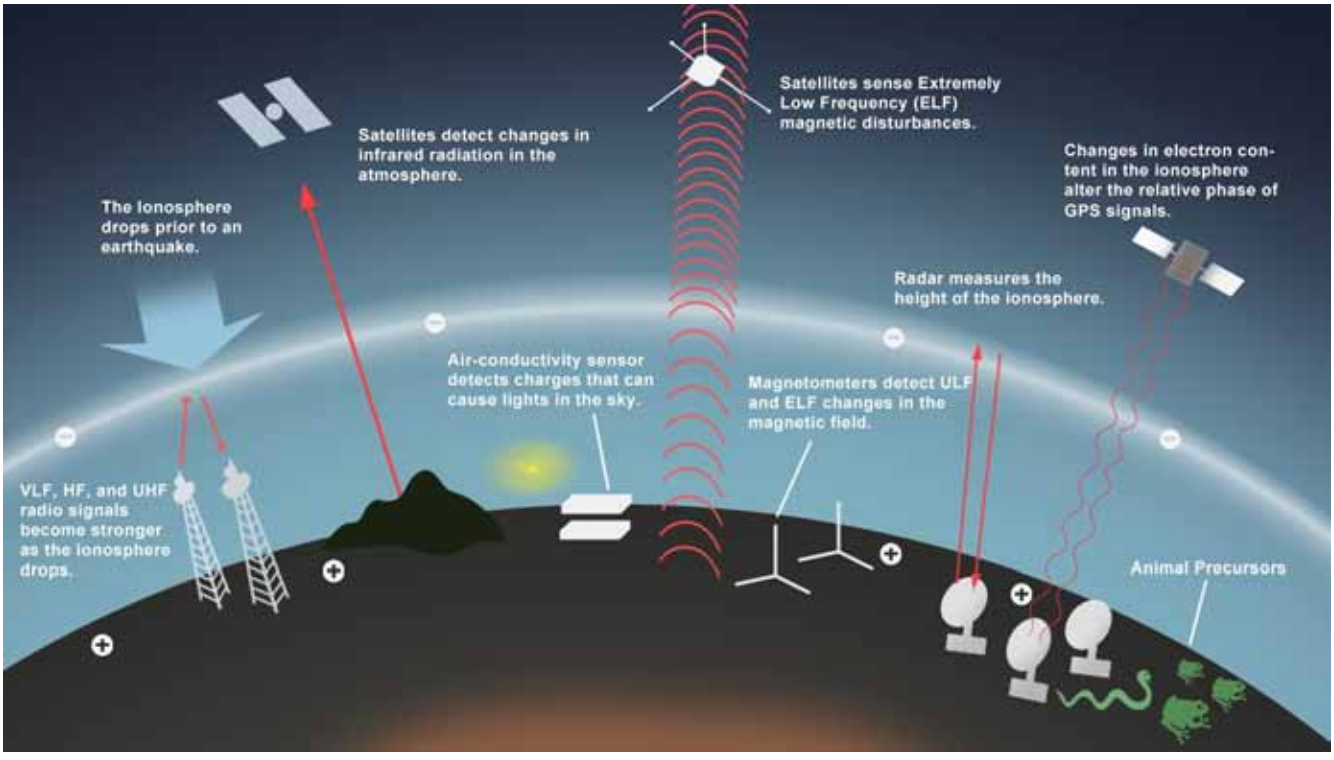
42. S. Pulinets, D. Ouzounov, "Lithosphere–Atmosphere–Ionosphere Coupling (LAIC) model—A unified concept for earthquake precursors validation," *Journal of Asian Earth Sciences,* Volume 41, Issues 4–5, 5 June 2011, pp. 371–382.



Between 2000-2011, the 12 deadliest earthquakes (11 are shown on the map) claimed some 700,000 lives. In every case, the actual seismic intensity of the earthquake exceeded the maximum predicted by the Global Seismic Hazard Assessment Program (GSHAP) map published in 1999, which is used as a standard government reference respecting building codes and emergency response. On the map of Japan, which has the densest network of seismometers in the world, the colored bars indicate the government's predictions of the probability of a "high hazard" or "very high hazard" (according to the GSHAP seismic intensity criteria) earthquake occurring within 30 years, beginning in January 2009. As can be seen from the blue outline, the region that actually experienced this level of seismic intensity from the March 11, 2011 earthquake was generally assessed as a relatively low-hazard region. Sources: Vladimir Kossobokov, International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Russian Academy of Sciences; Japan Meteorological Agency.



Satellite observations of anomalous infrared emissions starting three days before the March 11, 2011 Tohoku, Japan earthquake, and appearing near the epicenter. Source: D. Ouzounov et al., "Atmosphere-Ionosphere Response to the M9 Tohoku Earthquake Revealed by Joined Satellite and Ground Observations. Preliminary results," 2011.



LPAC

Various forms of non-seismic precursors to large earthquakes.

ing above the future epicenter, as well as perturbations in Very Low Frequency and Low Frequency radio signals in the ionosphere. With an adequate array of ground- and satellite-based remote sensing instruments (such as that called for in IGMASS and similar proposals[43]) and dedicated real-time monitoring of precursor signals, these "whispers from the Earth" can not only tell us of impending disasters, but hint at the possibilities for breaking down the artificial barrier between space physics and geophysics.[44]

For example, several studies have pointed to a correlation between earthquake activity and the 11-year solar cycle.[45] Most recently two researchers at Kyushu University, Japan, took the 4,108 large, shallow earthquakes from 1963-2010, and compared them with the phases of the last four solar cycles.[46] What they showed was that for each magnitude range there were consistently more earthquakes during the declining phase of the solar cycle through solar minimum, when compared with the ascending phase through the solar maximum. This discrepancy was most pronounced for the largest earthquakes.

43. The proposed Russia-U.K. collaborative project TwinSat is intended to be such a dedicated set of microsatellites searching for earthquake precursors, and has been proposed to be subsumed in the broader international IGMASS collaboration. The two satellites are planned to contain instrumentation to measure such electromagnetic effects in the ionosphere as have been observed to be related to earthquakes and other seismic phenomena. Separately, the Chinese plan to launch the first of three dedicated earthquake precursor monitoring satellites beginning in 2014, as part of a broader program of ground- and satellite-based precursor monitoring. The U.S. DESDynI (Deformation, Ecosystem Structure & Dynamics of Ice) natural hazard monitoring satellite was cut by the Obama Administration in 2011.

44. And, also, the possibility of acting directly on the seismogenic process. Beginning in the 1970s and 80s, Soviet Academician E.P. Velikhov pioneered the experimental use of magnetohydrodynamic pulses to induce electrical currents in the crust down to depths of tens of kilometers, which reportedly is capable of inducing small earthquakes. Such work could shed further light on the still poorly understood electrodynamic processes in the Earth's crust. See Novikov et al., "Discharge of Tectonic Stresses in the Earth Crust by High-power Electric Pulses for Earthquake Hazard Mitigation," 2nd International Conference on Urban Disaster Reduction, 2007.

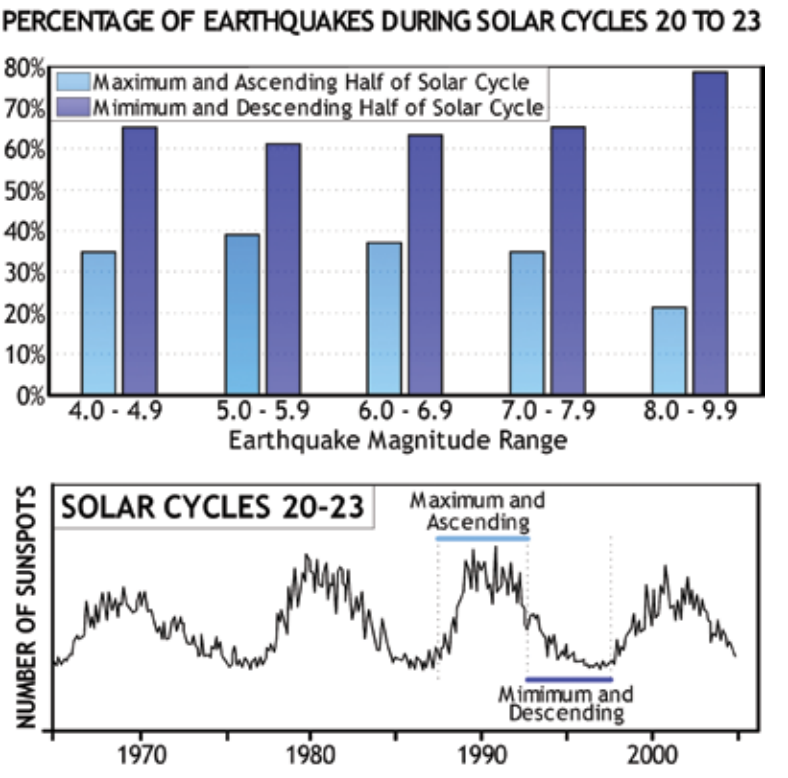
45. The solar cycle is measured by the approximately 11-year cycle of increase and decrease of the number of sunspots seen on the surface of the Sun, though the exact length of the cycle can vary. The cause of this cycle, and causes of the variations in the cycle, are not completely known.

46. "Large" refers to magnitude 4.0 and above, and shallow earthquakes have epicenters of 100 km or less. See, "Possible Correlation between Solar Activity and Global Seismicity," by Jusoh Mohamad Huzaimy and Kiyohumi Yumoto; proceeding of the 2011 IEEE International conference on space science and communication (IconSpace) 12-13 July 2011, Penang, Malaysia.

The last decade, which contained the longest solar minimum of the century, also saw the greatest number of magnitude 8.0+ earthquakes and of large volcanic eruptions of any decade over the past century.[47]

These relations should cause us to consider what types of similar activity might be occurring on other bodies of our solar system. Unfortunately, the best data we have is from the eight years during which we had operational seismometers on the Moon (1969-1977, left behind from some of the Apollo missions). During this operational window, out of the thousands of registered lunar seismic events, only 28 of them originated below the lunar surface (for example, not due to surface impacts by meteorites), and have been identified as "shallow moonquakes." Their very existence is a mystery, as there are no active plate tectonics on the Moon.

What is remarkable is that 23 of those 28 moonquakes occurred during the half of the Moon's orbit when the near side of the Moon (on which the seismometers were placed) was facing a specific direction relative to the fixed stars, indicating a relationship not even to solar activity, but, as the author of the study says, to something originating outside of our solar system.[48] (See image.)



Percentage of shallow earthquakes by magnitude occurring during the solar minimum and the descending half of the solar cycle, or during the solar maximum and the ascending half of the solar cycle. Analysis of the last four complete solar cycles from 1964-2008, indicated by monthly average of sunspots. Data from Yumoto et al., 2011.

In light of this evidence for extraterrestrial influences on earthquakes, the deployment of a network of planetary seismometers, beginning with the Moon, should be an included feature of any comprehensive natural hazard monitoring program.

Solar Cycles: Something To Sneeze At

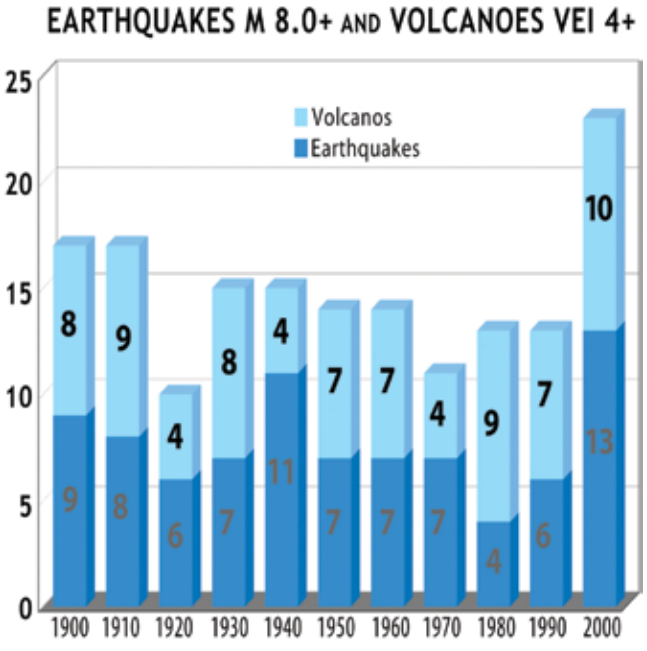
As with the deadly earthquakes discussed above, the challenges posed by our interactions with our solar system and galaxy are life or death issues for humanity. The potential already exists for monitoring atmospheric and ionospheric precursor signals of impending earthquakes to provide early warnings, a capability we must develop and expand with the needed satellite and Earth-based monitoring systems. But how might we expand such programs to incorporate the broadest range of threats?

For example, one of the largest periodic causes of mass death has been the outbreak of disease.

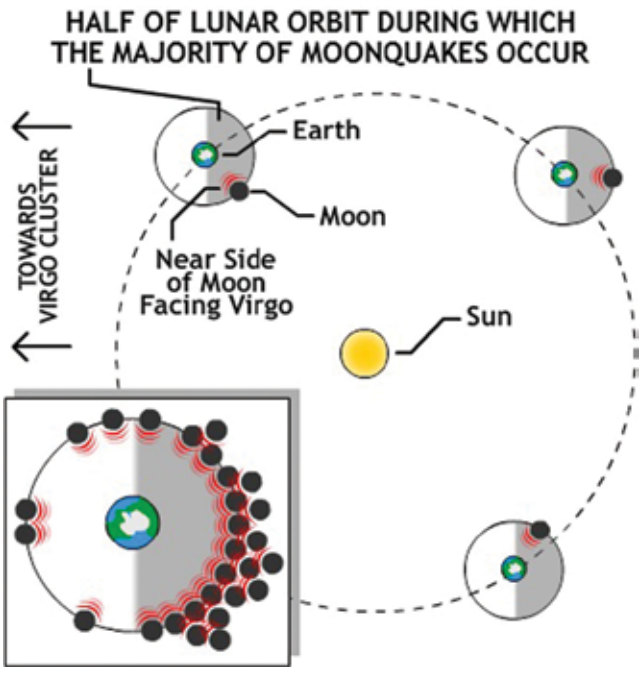
There is long-standing evidence showing that the incidence of diseases fluctuates with the Earth-Sun relationship. The most well known of these fluctuations is the seasonal flu pandemic. None of the conventional explanations for why influenza flares up during the northern hemisphere winter (environmental humidity, vitamin D deficiency, etc.) has yet been validated, yet the seasonal variations are very real. Further, this cycle

47. The argument is often made from the standpoint of thermodynamics that solar phenomena such as flares do not contain enough energy equal to that released in a seismic event here on Earth. This reasoning against a cause and effect relation between the two does not hold, however. A pointed stick may not contain the same energy as the difference between a sleeping bear and an angry bear, but it is nonetheless capable of bringing such a change about.

48. This study was led by a world expert on lunar seismic activity, Dr. Yosio Nakamura, sometimes referred to as Mr. Moonquake, of the University of Texas at Austin. While the data set of 28 moonquakes is admittedly small, the evidence is too provocative to ignore. See "Possible Extra-Solary-System cause for Certain Lunar Seismic Events," by Yosio Nakamura and Cliff Frohlich; *Lunar and Planetary Sciences* XXXVII (2006).



The decade-by-decade totals of "great" earthquakes (magnitude 8.0 and above), and large volcanic eruptions, measuring VEI 4 or greater (VEI = Volcanic Explosivity Index). Sources: USGS Earthquake Hazard Program; Smithsonian Global Volcanism Program; and Laurence Hecht, unpublished report.



Twenty-three of the 28 moonquakes recorded from 1969 to 1977 occurred when the Moon occupied the half of the lunar orbit during which the seismic network on the Moon's near side faced in a certain direction in the fixed stars. This suggests a yet unknown influence coming from outside the solar system.

of seasonal outbreaks is also a cycle of the evolution of the virus itself, a phenomenon which has not been explained by the standard models of mutation and selection. This seasonal variation would seem to imply a relationship between influenza outbreaks and the location of our planet with respect to the Sun. (See Appendix VI: Cosmic Contagion.)

In fact, looking beyond the yearly variations, the major flu pandemics of the past century exhibit an interesting pattern: the dates were 1946, 1957, 1968, and 1977, which imply a period of roughly 11 years, provocatively matching the sunspot cycle over this period.

Taking this back farther, if we map the major flu pandemics[49] against the cycles of sunspot numbers for the last 300 years we get the following plot.

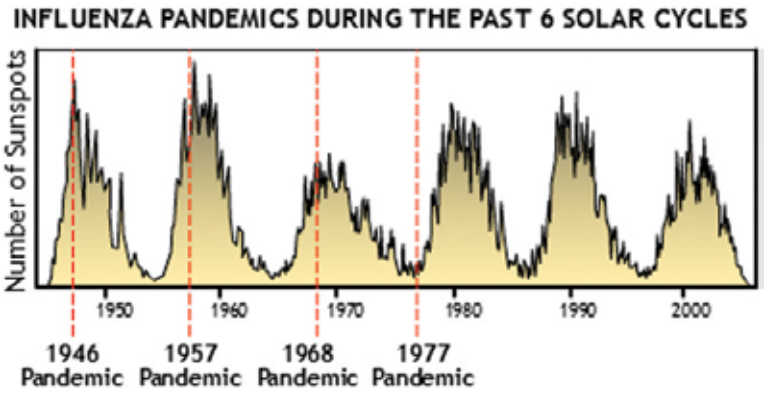
Here, you might not immediately see a correlation between specific solar cycle maxima and pandemics, but you can see that the pandemics occur in clusters. If we connect the sunspot peaks, which indicate how solar activity changes from one cycle to the next, then we see that the pandemic clusters occur during periods of more active successive solar cycles.

An initial hypothesis might be that such a correlation implies a relationship between some solar parameter, such as ultraviolet radiation, and influenza pandemics.

Notable exceptions to this correlation—specifically, the cases where pandemics fall on years of sunspot minima—point to a causal agent on a grander scale. Researcher Yu Zhen-Dong has shown evidence that pandemics occurring during solar minima show a close coincidence with bright supernovae and other sources of ground-level cosmic radiation.[50] This implies a galactic rather than solar driver of the phenomenon, with cosmic radiation influx from outside of our solar system as the main culprit, rather than incident solar UV radiation. That is, the changes associated with solar activity are

49. At the very dawn of viral studies, it was recognized already that viruses were sensitive to certain types of radiation. The example of UV radiation and lambda phage was elaborated by S.E. Luria, as in his "Radiation and Viruses" (1955). The work done by Alexander Gurwitsch on mitogenetic radiation, a unique kind of UV radiation produced by life, may enable the determination of even more precise effects.

50. Yu, Zhen-Dong, "Using the Information of Cosmic Rays to Predict Influenza Epidemics." NASA Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 5 pp 525-528 (SEE N85-34991 23-93) 1985.



The 1946, 1957, 1968, and 1977 pandemics shown over the last fix solar cycles. Source: Tapping, Matthias, and Surkan, 2001.

likely rather caused by the Sun's well-known role in moderating the influx of cosmic radiation into our solar system, mentioned above.

If we take into account the increasing recognition of the role of viruses, particularly retroviruses, in human and animal evolution,[51] we see a means by which the long-term development of life on our planet can be closely tied to such galactic cycles. This begins to point to the idea that what we currently call disease is instead simply a malfunction of a broader process of evolution. Many of the important biological traits in both humans and animals are seen to have a viral origin to them, when we look at the role of endogenous retroviruses (sequences in the genome thought to be derived from ancient viral infections).

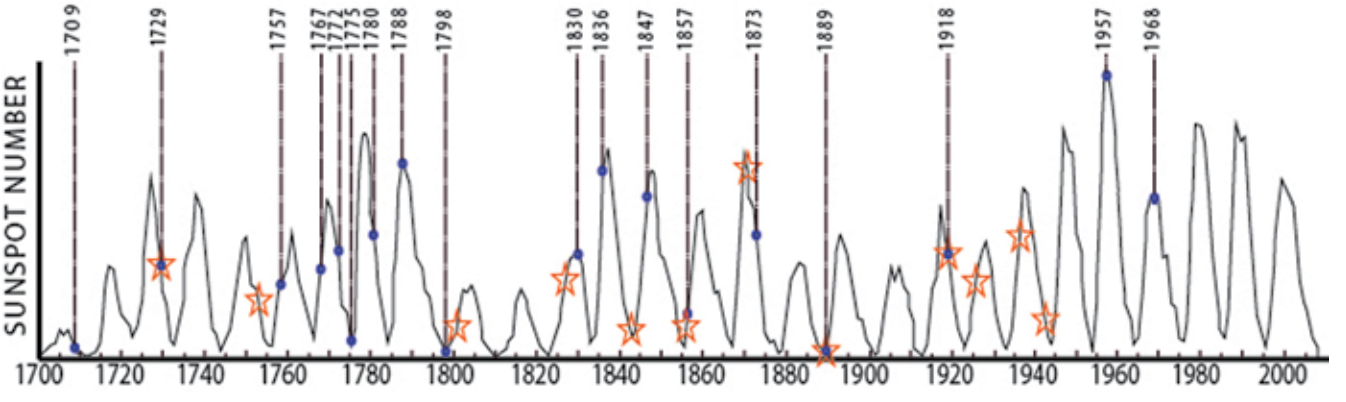
Further, real-time examples of the mediating role of viruses in the development and interaction of organisms is seen in the case of ocean viruses. By far the most abundant biological entity in the ocean, they play a very specific role in moderating the evolutionary development of life there. For instance, viruses have been discovered which contain all of the genetic material necessary for photosynthesis.[52] This material is not used by the virus itself, obviously, because viruses do not photosynthesize. It exists only so that the virus can "infect" some other organism with this capability for photosynthesis. In fact, 60% of all photosystem A genes are from viruses which infect bacteria, and it is likely that 10% of all photosynthesis globally is carried out by photosystems with a viral origin.[53] Likewise, the vast majority of viruses "infecting" humans are not causing any sort of illness.

The number of symbiotic viruses contained within the healthy human body is currently unknown, though a recent viral census of only the human intestinal tract uncovered 4,000 different viruses, 80% of which had been previously unknown. What role do these viruses play, if not as disease agents? In fact, compared to the relative infrequency with which a human being suffers

51. Villareal, L., "Can viruses make us human?" *Proceedings of the American Philosophical Society* vol. 148, no. 3, September 2004; and Ryan, F., "Virolution," Collins, 2009. Also see LPAC's recent video reviewing a case study of viruses and evolution: "Strategic Defense of Earth: What You Didn't Know About Viruses," Episodes I and II, LaRouchePAC.com.

52. Sharon, I., et al., "Photosystem I gene cassettes are present in marine virus genomes," *Nature* 461, 258-262 (10 September 2009).

53. Rohwer, F., "Viruses manipulate the marine environment," *Nature* 459, 207-212 (14 May 2009).



Pandemic influenza mapped against sunspot number and nova occurrences (mostly flare-ups of our near neighbor Nova Carinae) for the past 300 years.

from pathogenic viral infections (two to three colds a year), it would seem that the vast majority of viral infections are either innocuous or—as is the case with human gut bacteria—perhaps helpful and necessary. There may in fact be no means to control such processes of disease without taking voluntary control of such evolutionary processes in their entirety. Such control, tied as it is to larger-scale galactic processes, would evidently not be possible from our currently limited location here on the surface of the Earth. The research potential for the study of viruses is necessarily and greatly expanded when viewed in this context, and gives us another important application for any collaborative monitoring and defense system. How must we expand these global monitoring and defense systems in light of these considerations?

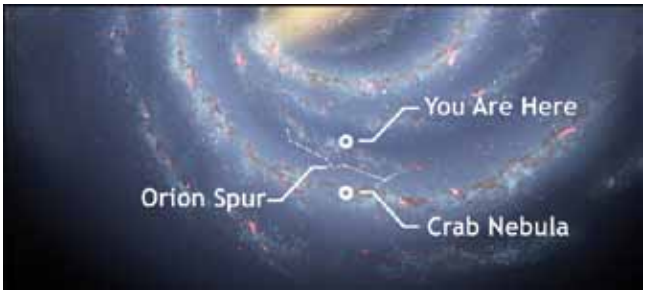
Remote sensing has already begun to be used to search for "disease precursors" on Earth. A 2009 paper titled "Using Satellite Technology to Model Prediction of Cholera Outbreaks," reported that remote imaging technologies developed by NASA "have been used to relate sea surface temperature, sea surface height, and chlorophyll A levels to cholera outbreaks." What we are discussing here is somewhat different, however. The role of viruses in such large-scale evolutionary processes and their relation to development on galactic and supergalactic scales presents us with the exciting but daunting prospect that, in order to control disease on Earth, mankind will likely have to take control of the very processes on a galactic scale which fuel such evolutionary development. Could Earth's cosmic radiation environment be consciously managed to such effect?

The Way Forward

The challenge now becomes to craft a policy outside of the fraudulent conceptions of empty space and absolute time. From extreme weather and large-scale, disastrous earthquakes, to the biological domain of disease outbreaks, and from the mystery of the moonquakes, to the harmony of atomic, chemical, and biological reactions, we have an array of seemingly independent anomalies, all of which point to one grand, integrated geo-solar-galactic process, invisible to anyone studying any one of these anomalies alone.

(See Appendix 7: The Very Large in the Very Small.)

On our single, tiny planet, mankind has walked, worked, and lived for merely a few million years, mostly unaware of the deep interconnection between what we register with our senses as, seemingly, different phenomena we experience "here," and the observed, or unobserved, activity "out there" amongst the stars. The continued existence of mankind demands that we rid ourselves of this ignorance. Our relatively short occupation of this planet comes nowhere near matching even one of the cycles of galactic change over the past half-billion years of the evolution of complex life, and there is no guarantee that we will escape the fate of countless other species which have gone extinct.



Note the position of our Sun with respect to the Orion Spur.

For example, our present journey into what astronomers call the Orion Spur, which appears to be an intense star-forming region which splits off from the Sagittarius-Carina arm, possibly sets for us the same challenge that faced the dinosaurs. But, we are not mere animals. As Shakespeare would agree, the fault is not in our stars, but in ourselves: mankind has demonstrated the ability to escape this inevitability through the application of his unique, self-conscious creativity. But, the application of creative discovery to secure the immortality of our species, is a willful act. This now re-situates the subject of strategic defense as a divine mandate.

4. The Extraterrestrial Imperative or Extinction

The idea that a person might be born, grow up, and die without ever leaving the confines of his or her village sounds today like a quaint relic of a primitive and superstitious past. In the same vein, future civilization will wonder at the parochialism of a humanity that once thought itself fixed within the confines of the planet Earth.

Our world, said the space pioneer Krafft Ehricke, is finite only to the extent that we limit ourselves to the pessimistic decay of a zero-growth ideology, and it is infinite to the extent that we embrace what he called

mankind's Extraterrestrial Imperative. "By expanding through the universe, man fulfills his destiny as an element of life, endowed with the power of reason and the wisdom of the moral law within himself."[54]

That imperative for man in space is dictated by the principles of physical economy. We require a constant net increase in applied energy-flux densities of production sufficient to outpace both the attritional effects of consumption, as well as evolutionary processes that have, in the past, imposed the penalty of extinction upon species which have failed to contribute to the rising requirements for energy throughput of the biosphere as a whole.

Put another way, the millennia of relatively stable environmental conditions humanity has enjoyed thus far, should be thought of as a grace period afforded us to develop the means of recreating habitable worlds away from the cradle of Earth.

The proving ground for this will be a manned mission to Mars, a goal which subsumes virtually all of the necessary breakthroughs at the horizon of science and culture visible today.

The Endless Frontier

Mars lies at the edge of the inner solar system, from which the Earth appears as nothing more than a bluish dot in the sky. Nuclear fusion propulsion will put our planetary neighbor within reach, by reducing transit times for human passengers to weeks or days, rather than the hazardous six-to-nine months it would take with chemical rockets.[55] The several decades lead time likely needed to develop this crucial technology, must meanwhile be expended in the industrialization of the Moon—our nearest neighbor, and the virtual front porch of our earthly home in the local solar neighborhood.[56]

With no atmosphere or magnetic field of its own to speak of, the lunar surface is exposed to a constant flux of meteoroids and micrometeoroids, cosmic radiation, and solar wind. These have etched into the lunar regolith a historic record of galactic evolution over the past several billion years as experienced by our solar system's travel through the galaxy, complementing and extending our geological and fossil record on Earth.

The Moon's exposure to cosmic and solar radiation has also left its surface laden with such readily available riches as the rare isotope Helium-3, a key fuel source for future thermonuclear fusion reactors, and—in what came as a major surprise in the last several years—a significant amount of water ice. The lunar regolith itself can be processed to fabricate building materials for research and mining installations, powered initially by nuclear fission. Projected back onto Earth, these achievements will have a special resonance for frontiers such as the Arctic and Antarctic. For example, life-support systems developed for the harsh conditions of space have already proved indispensable in designs for the planned self-sufficient Russian city of Umka, north of the Arctic Circle.[57]

Rather than simply leaping from one isolated body to the next, the goal of human expansion outward from Earth should be nothing less than what NASA's Apollo-era Administrator James Webb called "a total capability in space."[58] Anchored by lunar exploration, industrialization, and settlement, this capability will include everything from asteroid deflection and resource mining, to biomedical advances for extended deployments in zero- and reduced-gravity conditions, to accurate solar forecasting to warn of impending radiation storms.

54. Freeman, Marsha, *Krafft Ehricke's Extraterrestrial Imperative,* Apogee, 2009.

55. As a rough approximation, consider that the combustion of 13 tons (about the weight of a large school bus) of liquid hydrogen and oxygen, a commonly used rocket fuel, releases an equivalent amount of energy as 0.5 grams (the weight of a single Tylenol pill) of deuterium in a conventional deuterium-tritium fusion reaction. A more complete appraisal of the relative difference in energy-flux density would have to take into account the qualitative changes that come with the mastery of an entirely new set of physical principles—a concept foreign to President Obama, as shown in remarks he made in September 2010: "We wouldn't need new technologies. We wouldn't need to invent some fancy new fusion energy or anything. If we just took our existing building stock in homes and insulated them, had new windows . . . we could squeeze huge efficiencies out of that."

56. Video: "From Moon to Mars—The New Economics" I & II, both at LaRouchePAC.com.

57. Contrast these prospects to President Obama's April 2010 remarks justifying his cancellation of NASA's Moon-Mars Constellation Program: "I understand that some believe we should attempt a return to the surface of the Moon first, as previously planned . . . But I just have to say pretty bluntly here: We've been there before."

58. The lunar landing itself was the fruit of a vision that pre-dated the Cold War, promoted by a small group of German space enthusiasts, which included Krafft Ehricke and Wernher von Braun, the father of the Saturn V Moon rocket. Von Braun's 1960s design for the Apollo program saw the lunar landings as mere prelude to a manned Mars landing by 1984, a plausibility at the time, given President Kennedy's early support for the nuclear rocket program (which was terminated in the early 1970s).

NASA/Bruce MCall

Settlement of Mars will give humanity a foothold on the entire solar system.

Developed as Earth's "seventh continent," the Moon becomes not only the gateway to Mars, but the test of humanity's commitment to its own willful evolution. As Ehricke wrote in his *Lunar Industrialization and Settlement*:

"The Moon is the touchstone of the human future. Instead of searching for and speculating about life elsewhere, we will put it there. Forthwith, civilization will be three-dimensional, and life will be polyglobal. Living at the ethereal shores of heliocentric space, the Selenians will be the Cosmopolynesians of the solar system, navigating between worlds. They will build the bridge between a dim past under terrestrial skies, where the great legends of human emergence tower, and a deathless civilization in a stellar future whose shadows beckon and long to be given substance."

Indeed, if lunar colonization represents the childhood of humanity's maturation outside the womb of the Earth, then Mars colonization will mark its adolescence. With the transition to a fusion-powered physical-economic platform, the sphere of human civilization widens to encompass the entire inner solar system.

Think: "interplanetary infrastructure."

For example, by conducting interferometry between orbiting arrays of radio telescopes as far out as Mars, constructed and serviced by scientific teams based on the surface, we can essentially create an "eye" with a diameter equivalent to Mars' orbit, a scale befitting what should be our galactic ambitions as a species. After all, as the observational anomalies in astronomy discussed above should remind us, trying to draw certain conclusions about galactic and extragalactic processes without ever leaving Earth isn't much different than trying to map the New World without ever leaving Europe.

But the ultimate Martian experiment will be the planting of the first trees there—that is, the eventual transformation of the Martian surface into a habitable biosphere, a feat of planetary engineering whose achievement will bring to bear virtually the entirety of human knowledge. On Earth, humanity has increasingly modified existing biogeochemical flows of materials, such as the hydrological cycle, through such practices as dam building, large-scale irrigation, and industrial production. In a few cases, such as the production of biologically useful nitrogen, we have overtaken the natural cycle. On Mars, however, the biogenic migration of atoms (as Vernadsky called it) will have to be created virtually from scratch. This is not simply a question of a biochemistry experiment scaled up to planetary dimensions; rather, we will be faced with the conscious tuning of solar and cosmic radiation with the specific geochemical environment of Mars.[59]

Though such a prospect is many generations distant, the considerations involved in this challenge allow us

59. Given the the dependence of terrestrial life on the geomagnetic field for both radiation protection as well as regulation of such functions as circadian rhythms, we must ask: Might we need to create an artificial magnetic field on Mars? See, for example, Oyang Teng, "Onward to Mars: The Triumph of the Weak Forces," LaRouchePAC, 2010, on LaRouchePAC.com.

Fusion Energy Foundation/Christopher Sloan

Krafft Ehricke's vision for Selenopolis, the first city on the Moon. Depicted on the right is the construction of a giant tokamak (toroidal) fusion reactor, which is able to take advantage of the natural high vacuum of the Moon's surface as well as the abundant helium-3 fuel in the regolith.

to put weather modification on Earth in proper perspective. We spoke above about artificial ionization to enhance (or in some cases, mitigate) rainfall. This local modification of the global electric circuit could point the way toward the eventual planet-wide modulation of our electromagnetic environment, which will one day be an integral part of what is considered basic economic infrastructure.

It is perhaps appropriate that the greatest stimulus in our understanding of the Earth environment has come with the advent of the Space Age. Only with observations from orbit could we begin to measure the interaction of key terrestrial processes such as cloud cover and sea surface temperature in their global aspect, as well as begin to appreciate how much these processes depend on solar and cosmic radiations that were previously undetectable from the surface.

What of our broader environment in which we actually exist? When it comes to interplanetary space (not to speak of interstellar space),[60] how much are we like the early ocean explorers, blindly plumbing the depths with nothing more than weighted ropes thrown overboard?

In the face of such potential threats as asteroid collisions, coronal mass ejections, extreme weather, and earthquakes, including those we have yet to fully define, the question, "What's out there?" is more than a matter of curiosity; it is one of survival. It is one which cannot be met by any one nation, but requires the close cooperation of all.

In this light, it is all the more significant that, in the

60. If our own solar environment is still largely enigmatic, interstellar space is even more of a mystery. Voyagers 1 and 2 are the farthest objects sent out from Earth, launched in 1977 to study the outer planets and now sailing through the outer reaches of the heliosphere. They will be the first human objects to directly sample interstellar space, some 40 years after their departure from Earth.

fields of natural hazard monitoring and space exploration, China and Russia have made important commitments as matters of policy. Not only is an adversarial relationship between the United States and these two natural allies completely unnecessary; in a world of thermonuclear weapons, it is suicidal. The proposal from Russian government officials for war avoidance as well as asteroid defense through the Strategic Defense of Earth only typifies the potential framework for a fundamentally new quality of cooperation around the common aims of mankind.

A redefinition of the notion of strategic defense also implies a corresponding redefinition of the role of the military, the institution traditionally tasked with this mandate. Our republican military tradition, typified by the founding of the Army's West Point Academy as an engineering institution, was once dedicated to nation-building, by securing and defending the frontier. What might this entail for the frontiers of space?

These and other questions related to the strategic defense of the human species cannot be answered by simply projecting from present conditions. It is in the very nature of space science to operate at the very limit of knowledge, in which the most important gains to be made are not on tasks we can already foresee, but in the new questions that invariably arise when those limits are pushed. By committing to our extraterrestrial imperative, we give ourselves ever-expanding capabilities to answer these questions.

Such is true economics. Such is true strategic defense.

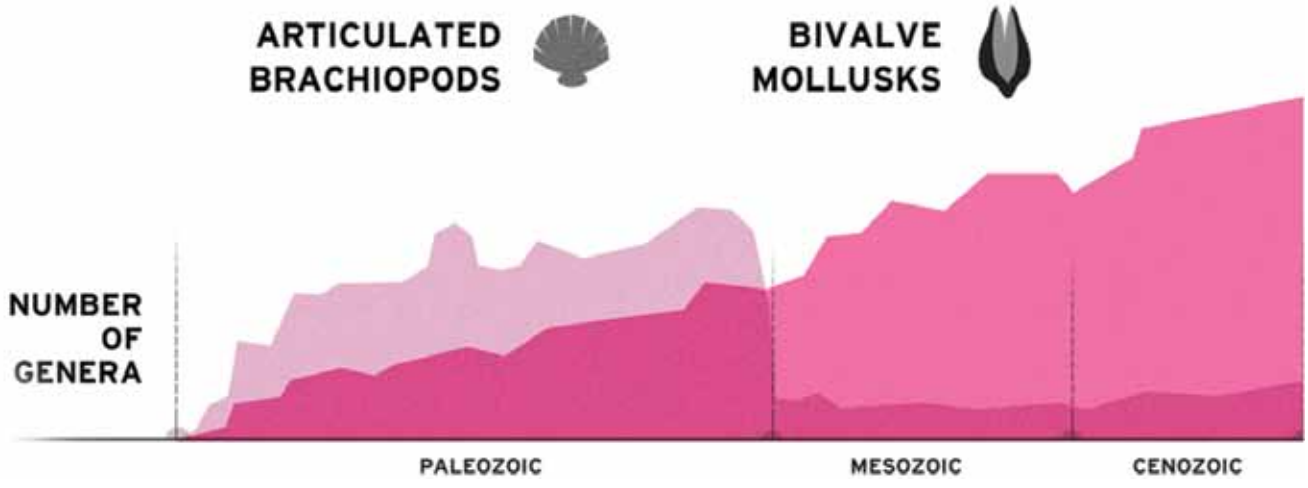
APPENDIX I
The Principle of Evolution

As Vladimir Vernadsky first demonstrated, living organisms act as the driving force in the utilization of solar and cosmic radiation for the continuous transformation of the planet Earth, generating energetic and chemical conditions on which further life depends.[61] Over the course of evolutionary history, life has always created pathways for higher and higher levels of energy-flux density, increasing the rate at which it transforms the surface of the Earth, and expanding the extent of its reach.[62] We witness this development in the fossil records uncovered in the layers of the Earth's crust, which also express the development of the galactic environment which life on Earth has experienced over this period.

In this process we see that the species that are fixed to lower levels of energy-flux density, and are incapable of adapting to a higher system, are wiped out. Periodic extinctions, and even mass extinctions are necessary

61. See *The Biosphere,* and his trilogy of essays, "The Problems of Biogeochemistry I and II," and "The States of Space." *The Biosphere* (Complete Annotated Edition), Springer, 1998. *21st Century Science & Technology,* Winter 2000, Winter 2005, & Winter 2007.

62. A classic example is the case of life's creation of a free oxygen atmosphere, a high state of disequilibrium, which would disappear in a geological instant if life were to stop acting. For more on the Basement team's study of the history of life, see the video reports on the LPAC Evolution webpage: larouchepac.com/evolution.



Biodiversity levels of articulated brachiopods and bivalves, measured in the total number of Families existing at the indicated times over the past 600 million years. Image based on records provided by Gould and Calloway, 1980.

consequences, as the system of life moves forward.

To highlight one illustrative example, examine the tale of two forms of shelled sea creatures: "articulated brachiopods" and "bivalve mollusks."

Despite the fact that these two types of sea creatures clearly have a very similar general structure, composed of two half-shells hinged together on one side, protecting a fleshy creature inside, according to the standard biologist's "tree" of life they are in completely different phyla and are not at all closely related. In fact, according to this standard view, their "closest common relatives" existed over 600 million years ago (creatures which did not visually resemble either of these two examples), and they are said to have since evolved separately, independently coming to have similar physiological structures. This is referred to as a case of "convergent evolution."

They also occupy similar positions in the food chain. They are generally of the same size, can live in similar locations, eat the same types of food, and are preyed upon by similar predators.

Whereas the brachiopods were extremely diverse and prolific during the Paleozoic Era (lasting from ~540 to ~250 million years ago), they are much rarer in our modern times, in which the bivalves dominate (for example, clams, oysters, mussels, and scallops are all bivalves).

For years the ascendancy of the bivalves was assumed to be a classic case of "survival of the fittest," by which one type of organism gradually replaced another through competition. However when paleontologists uncovered a clear enough reading of the fossil record, it was seen that this was simply not the case.

Instead, despite sharing many physiological characteristics, as well as occupying the same general location in the food web, the mass extinction of the Permian-Triassic boundary selectively devastated the brachiopod populations, but hardly affected the bivalves.

Top-level experts in applying lazy reasoning to the field of paleontology claim that there is no overall structure to this process, and that it simply played out this way because one form just happened to be eliminated instead of another.

What the record shows is that the Permian-Triassic mass extinction (which is estimated to have resulted in the extinction of ~96% of all marine species), is one of the largest inflection points in the rising energy-flux density of the system of the biosphere as a whole. The periods following the P-T extinction are characterized by the dominance of qualitatively more energy-dense forms of life, as well as an overall increase in the energy of the biosphere as a whole, supported by qualitative transformations in the photosynthetic activity in both the oceans and on land.

As an expression of this, we see that the bivalve mollusks are characteristic of a biosphere of a higher rate of energy-flux density, when compared with the articulated brachiopods. The bivalves have a metabolic rate roughly 10 times greater, contain a significantly greater relative amount of fleshy biomass (even when the shells are the same size), and are overall more active and mobile.

References:

"Clams and Brachiopods—Ships that Pass in the Night," 1980, by Stephen Jay Gould and C. Bradford Calloway; "Seafood Through Time: Changes in Biomass, Energetics, and Productivity in the Marine Ecosystem," 1993, by Richard K. Bambach; Video: "The Ecology of Anti-Entropy" at LaRouchePAC.com.

APPENDIX II
Laplace's Fraud

For those who think you do not know Pierre Simon Laplace, you do. The philosophy which Laplace propounded is so prevalent in scientific education and otherwise today that it has infected everyday reasoning.

Kepler's revolutionary work firmly established that only a Platonic/Pythagorean worldview was capable of accounting rigorously for the phenomena of the physical universe, because only that worldview was capable of accounting for the hidden causes which lay behind the illusions presented to us by our sense perceptions. Kepler held Mind to be a central principle in physical phenomena, not as a mystical cause, but a manifestation of the fact that final causes—something akin to intention—always governed what the reductionist viewed as a collection of bottom-up efficient causes.[63]

63. This difference between final and efficient causes is best illustrated by Plato's Socrates in his *Phaedo* dialogue, where he discusses Mind as cause (final cause) in contrast to the bones and muscle (efficient cause of the Laplacian sort): "I found [Anaxagorus] altogether forsaking Mind or any other principle of order, but having recourse to air, and ether, and water, and other eccentricities. I might compare him to a person who began by maintaining generally that Mind is the cause of the actions of Socrates, but who, when he endeavored to explain the causes of my several actions in detail, went on to show that I sit here because my body is made up of bones and muscles; and the bones, as he would say, are hard

After Kepler's death, two projects were launched with the intention of destroying this Pythagorean conception of knowable causes, and replacing them with the type of a priori assumptions favored by imperial worldviews. The first, launched in Europe, was the promotion of the philosophy of René Descartes. The second, was the refurbishing of Descartes' philosophy and its subsequent redeployment into England under the name of Isaac Newton. As Gottfried Leibniz quickly realized, the goal of Newton's "philosophy without hypotheses" was exactly the opposite of that which it claimed. Under Newton, science was separated from any notion of ultimate causes, and physical phenomena were instead reduced to the actions of pieces of impenetrable matter upon one another, by means of unexplainable "forces."

This view did not immediately take hold in continental Europe, however, where the successive work of Gottfried Leibniz[64] and Abraham Kästner defended Kepler's ideas and prevented the Newtonian fallacies of absolute space, absolute time, mysterious forces and impenetrable matter from swindling a credulous population, despite the fact that a project to popularize Newton was launched by Voltaire in 1730, upon his return from England. As Newton's contemporary John Flamsteed quickly realized after reading the first published edition of Newton's *Principia,* for most practical astronomers Newton's theory of gravitation remained exactly that: a theory, with little or no practical application otherwise. Its actual intent was the effect to which it was deployed in Europe by Voltaire: to promote the spread of the vicious anti-human pessimism of the Enlightenment. Newton's world of unknowable causes and mechanical effects formed the perfect basis for the claims of the Enlightenment philosophers that Mind and morality were to be shunned as archaic notions.

It was not until after the death of Kästner, and with the work of Pierre-Simon Laplace, that the promoters of Newton were able to work up the audacity to finally claim victory for the Newtonian worldview. Laplace's five-volume *Méchanique Céleste*, which began to appear in 1799, consolidated and refined earlier attempts by both Euler and Lagrange to reduce celestial phenomena to the kind of soulless mechanical processes which the Newtonian worldview demanded.

Take for example, an excerpt from the beginning of his *Méchanique Céleste*:

"A body appears to us to be in motion, when it changes its relative situation with respect to a system of bodies supposed to be at rest; but as all bodies, even those which appear in the most perfect repose, may be in motion; a space is conceived of, without bounds, immovable, and penetrable by the particles of matter; and we refer in our mind the position of bodies to the parts of this real, or ideal space, supposing the bodies to be in motion, when they correspond, in successive moments, to different parts of this space.

"The nature of that singular modification, by means of which a body is transported from one place to another, is now, and always will be, unknown; it is denoted by the name Force. We can only ascertain its effects, and the laws of its action."

Laplace follows this with several hundred pages of kinetically detailed calculations of these "forces." What else is there to investigate or discover in cosmology, or anything, when cause cannot be inquired of? This last statement of Laplace's is the kernel of modern reductionist thinking.

Laplace presents two aspects of the same philosophy. First, that space just is. That is, processes and objects of the universe don't compose space, rather they are in it, technically placing space outside the universe. Secondly, since objects are now floating in empty space, no action of one could possibly act on the whole, but can only act kinetically, like billiard balls, on each other. Thus, aside from these immediate interactions, the processes which govern lawful action or change in this imagined, dead and arbitrary

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and have ligaments which divide them, and the muscles are elastic, and they cover the bones . . . and as the bones are lifted at their joints by the contraction or relaxation of the muscles, I am able to bend my limbs, and this is why I am sitting here in a curved posture: that is what he would say, and he would have a similar explanation of my talking to you, which he would attribute to sound, and air, and hearing, and he would assign ten thousand other causes of the same sort, forgetting to mention the true cause, which is that the Athenians have thought fit to condemn me, and accordingly I have thought it better and more right to remain here and undergo my sentence … There is surely a strange confusion of causes and conditions in all this. It may be said, indeed, that without bones and muscles and the other parts of the body I cannot execute my purposes. But to say that I do as I do because of them, and that this is the way in which mind acts, and not from the choice of the best, is a very careless and idle mode of speaking. I wonder that they cannot distinguish the cause from the condition, which the many, feeling about in the dark, are always mistaking and misnaming."

64. Leibniz's explicit amplification of Plato's argument in the *Phaedo* above can be found in his *Discourse on Metaphysics*, among other locations.

space, if there is anything at all governing, cannot be known.

Far from some naive hypothesis, what Laplace presents here was an intentional fraud.

Laplace was the most extreme proponent of Newton's reductionist worldview, insisting that all phenomena in the world were reducible to forces between particles of matter. His opposition to Kepler's program was spelled out in the title of his *Méchanique Céleste—Celestial Mechanics*. The concept of intention, and thus Mind, was alien to this universe of Laplace. In his book, *A Philosophical Essay on Probabilities*, Laplace sophistically attacks Leibniz's notion of intention, or Final Cause.

Laplace's view of causality requires that the cause for any effect be found only in the state which immediately precedes it, temporally. A universe which contains free will, however, is incompatible with such a domino-like causality. It requires, as in human activity, that the future be able to act efficiently back on the present, at the same time that action in the present is being taken to affect the future. This quality of time is an artifact of what we experience as intention.

Laplace then makes a brief, delphic attack on Leibniz by name, where he attempts to equate Leibniz's principle of sufficient reason with Laplace's own mechanistic causality, despite the fact that Leibniz himself associates his principle of sufficient reason with the top-down, final cause causality expressed in Plato's *Phaedo* dialogue. Laplace then formulates in opposition to that notion of Final Cause, the argument which came to be known as Laplace's Demon:

"We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes."

The importance of such an attack on final cause is difficult, if not impossible to overestimate. It forms the basis for all of the flaws inherent in modern cosmology. If all of your actions to be taken a moment from now are derivable (in fact, calculable, by Laplace's "intelligence") from the current state in which you find yourself, then the phenomenon you experience as your mind is simply an illusion. Your "free will" is only the mechanistic unfolding of pre-existing conditions. Similarly, Mind is banished as a force in the universe, as well.

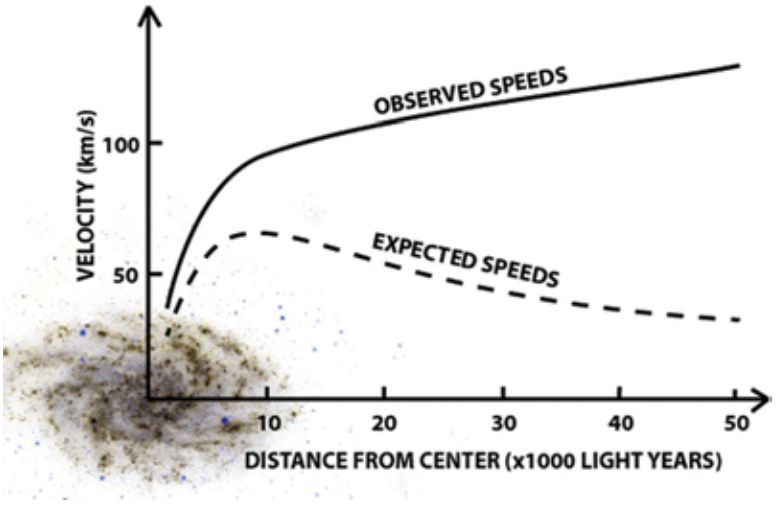
For Kepler and Leibniz, however, like Vernadsky and his conception of the Noösphere later, Mind is an efficient force which pervades the physical universe. There is nothing mystical at all about this notion, any more than the recognition of human creative reason is mystical. It simply requires a different notion of time and causality than that espoused by Laplace's simplistic Newtonian mechanism. And in fact, such a reworking of the notion of time is to be found in the works of Vernadsky, and later in the economic science of Lyndon LaRouche.[65]

APPENDIX III
Galactic Harmonies

The contradictions inherent in the Newtonian-Laplacian ideology are easily avoided by returning to the fundamental concepts of the ideas of Johannes Kepler, which they were meant to overthrow. Looking at the interplanetary medium and its relationship to the singular events which occur within it should remind the reader of Kepler's work on his *Harmonice Mundi*. Kepler described a universe which was not put together by the point-to-point interactions among isolated bodies. Rather, it was a system in which the necessary harmonic relations presaged the bodies themselves. These harmonics of Kepler were not the simple harmonics of vibrating strings or simple resonances, but were rather the types of creative structures we find associated with actual classical musical composition. Kepler saw Mind acting on this scale, and derived his laws of planetary motion explicitly from this principle.

The increasing recognition of the role of the interplanetary and interstellar medium in celestial phenomena puts Kepler's program squarely back on the table. In looking for the role of musical harmonies in the Solar

65. It is worth noting, that such a notion of physical time will tend to agree with the peculiar sorts of causality that seems to pervade so-called quantum phenomena. A reworking of the notion of time from Vernadsky's standpoint will not only put cosmology back on its proper course, away from the misdirection effected by Laplace—it also promises to clear away the train wreck known as "quantum mechanics," and replace it with a new, more substantial physical science.



Rotation curve for Triangulum galaxy M33; speed of stars measured against their distances from the center of the galaxy. The observed rotation curve for M33 is contrasted to that expected for any galaxy, according to current theories.

System, Kepler quickly realizes that they will not be discovered in solid matter, but rather in processes of motion and change. If we recognize that there is in fact no such thing as empty space, but a highly structured and dynamic plenum of electromagnetic and other phenomena, we can recognize celestial objects as simply singularities in this plenum. This might remind us of a living cell, whose organelles function only as singular expressions of the relatively invisible cytoplasm in which they exist.

The existence of celestial structures which defy explanation by forces "in the small" is indicative of this kind of harmonic organization of a plenum in the large. In most cases these structures in the large are accounted for by invoking fictional forces, such as those of "dark" energy, or "dark" matter. One example of this is seen in the anomalous nature of what are referred to as the "rotation curves" of galaxies (see image). In our solar system, planets farther away from the Sun travel more slowly. In a galaxy, the inverse seems to be true. The farther away from the center, the faster the stars and gas travel.

Simply put, the speed of rotation seen in the stars of many galaxies is too fast to be accounted for by the amount of matter that has been detected in the galaxies. The problem becomes worse, the farther from the center of the galaxy we look, creating a remarkable discrepancy between what we observe on the one hand, and what we can explain on the other.

The only way to attempt to fit this huge discrepancy within the textbook laws of gravitation is with the invention of a new form of invisible matter, which does not interact with electromagnetic radiation (e.g., light) in any way, and as such is undetectable—the mystical "dark matter." For many cases, in order to pull on each part of the galaxy in just the right way to get the equations to work, this dark matter would have to be distributed in a massive, but very specific spherical distribution well outside the bounds of the galaxy.

Instead of resorting to the creation of fictional new forces in attempting to save the absurd empty-space conception of the universe, we already have Kepler's demonstration of a harmonically ordered universe, a concept that gains new depth once we include the work of Vladimir Vernadsky, as we have seen in the body of this report. [66]

APPENDIX IV

Vernadsky's States of Space

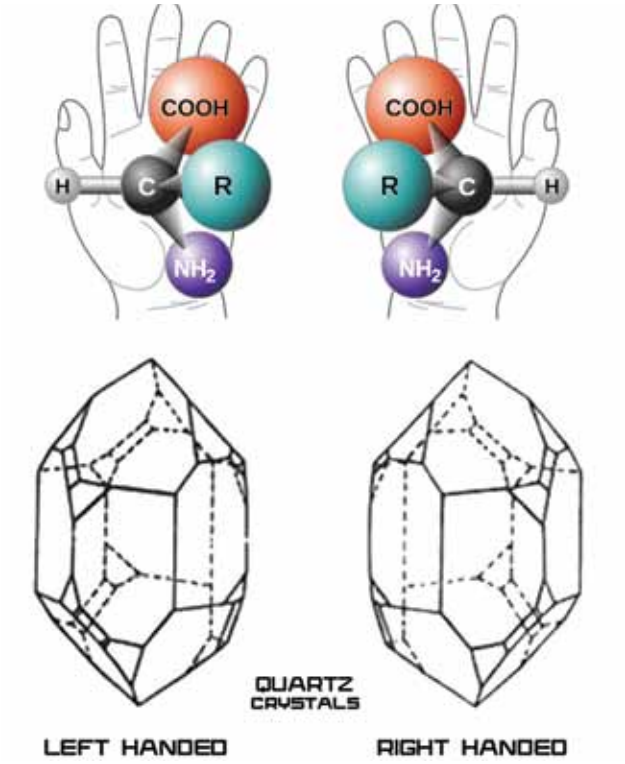
Russian-Ukrainian biogeochemist Vladimir Vernadsky used the experimental work of Louis Pasteur to draw the conclusion that the spacetime characteristics of life are fundamentally distinct from the space and time of the mathematician or geometer. Such a concept of a malleable space and time is probably best known from the work of Albert Einstein, but Vernadsky's application of such an idea to the field of life is instructive for the investigation of unique physical spacetimes of other processes, even at the cosmic level.

Immanuel Kant wrote on the problem of handedness, and concluded that left and right were fundamentally the same, except for an arbitrary choice in choosing their names. Outside of that choice in naming, there would be no way to distinguish a priori, with geometry and without referring to other objects of reference,[67] a left from a right hand. However, living processes disagree with the world of Immanuel Kant.

Louis Pasteur showed the unique preference which a living organism has for either the left or right hand, or

66. E.g., not the simple "harmonics" with Jupiter's orbital period that are currently used to explain the Kirkwood gaps in the asteroid belt.

67. That is, without comparing to something like the letters L and J, or on which side of your chest your heart is found.

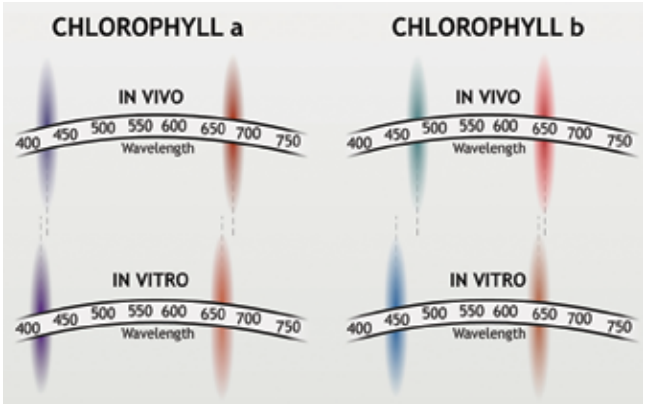


Top: Generic structure of an amino acid. The left-handed form is predominant in life. Bottom: Left-handed and right-handed quartz crystals.

enantiomer, of a given chemical compound when the compound exists in such a handed form. The rotation of the plane of polarization in polarized light either to the left or right by an organic solution prompted Pasteur to investigate at what level this handedness existed.

For the organic compounds, it could not have been at the level of the larger crystal structure, since quartz crystals (a non-organic compound) will rotate the plane of polarization in their crystal form, but will not do so when dissolved, whereas the organic compounds do rotate the polarization in their dissolved form. This led Pasteur to hypothesize a unique molecular asymmetry of living matter, such as the right-handed character of naturally occurring tartaric acid. It is now known that with few exceptions, sugars used by living organisms are right-handed and amino acids are left-handed.[68] Any variation has shown the opposite handedness to have a completely different physiological effect, such

68. There are various conventions for defining "left" and "right" handedness for chemical compounds. Here, by left and right we refer to the L/D naming convention which compares the structure of a molecule to that of glyceraldehyde. This is not the same thing as dextro- and levorotation of polarized light.



Here we see two cases of a biological redshift for chlorophyll pigments. The top left shows the mean absorption wavelengths for chlorophyll-a in vivo (435, 675 nm), and the bottom left, in vitro (420, 660 nm). On the right we have the same for chlorophyll-b in vivo (480, 650 nm), and in vitro (453, 643 nm). Notice that the magnitude of the shift is not the same. The same irregular shift (and occasionally, a splitting of the mean wavelength) exists for other pigments.

as the case of rare left-handed sugars and right-handed amino acids.

There are also notable cases of medications which show the effect of a change in handedness, such as dextromethorphan (Robitussin), the well-known cough suppressant, whose mirror-image levomethorphan, an opiate painkiller, will have no effect on your cough. The sense of smell also registers the difference between two enantiomers, caraway and spearmint being two among many examples, chemically identical except for their effect on our noses.

However, Kant's original question remains: If, in Euclidean space, it is impossible to privilege left over right, what metric do organisms use to make such a radical distinction? If this a priori distinction does not in fact exist in Euclidean space, might it exist for some other geometry?

This problem coincides with yet another, which might at first seem distinct. Just as Euclidean space is incapable of distinguishing a priori between left and right, the simple linear time of Newton and Laplace is incapable of distinguishing between progress and regress. It was just this problem that drove Ludwig Boltzmann to his premature death by suicide. Life, however, seems to encounter no such problem in making this distinction. Space and time measurements, as we now know well from Einstein, are also fundamentally linked to one another. If the space of life has fundamentally unique properties, would not the tempo-

ral characteristics also require the same?

These unique characteristics of the physical spacetime of life ought, however, to express themselves in other ways. In particular, we might expect that such variations in spacetime geometry ought to manifest in a distinct behavior of electromagnetic radiation, just as we see in special and general relativity, usually manifested on an astrophysical scale, but perhaps more intricate—a sort of biological redshift.[69] The difficulty here would seem to be observing the spectral lines produced by a compound while it was still within a living process[70] and then comparing those to the ones produced by the same compound while it was no longer part of a living process. In fact, such an experiment can be carried out using the biological process of photosynthesis.

Within a given organism (in vivo), the responsiveness of a photosynthetic pigment like chlorophyll to specific types of light can be measured by observing its effects on the organism's metabolism. The same pigment can then be measured outside of the organism (in vitro) by the usual methods. We observe that it is in fact the case that a given mean absorption wavelength of light of a photosynthetic pigment is shifted (and at times split) when inside versus outside of the organism. This is a shifting of the spectral lines more reminiscent of what we observe in what is now being attributed to a change in the fine structure constant (see Appendix 5: Fine Structure, Constant?).

References:

L. Pasteur, "On the Asymmetry of Naturally Occurring Organic Compounds," *The Foundations of Stereochemisty*, (Am. Book Co., 1901)

Pierre Curie, *Ouevres*, and *Pierre Curie*, by Marie Curie.

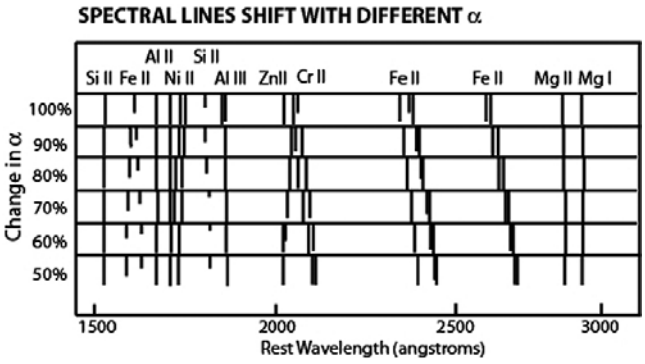
Kant, "Concerning the ultimate ground of the differentiation of direction in space," 1768.

Uwe Meierhenric, "Minority Report: Life's Chiral Molecules of Opposite Handedness," *Amino Acids and the Asymmetry of Life* (Springer, 2008)

Eugene Rabinowitch and Govinjee, *Photosyntheis*.

69. The unique characteristics of the physical spacetime of life, such as its handedness, were hypothesized by Vernadsky and Pasteur before him to have important implications for the study of spiral galaxies and the intrinsic structure of cosmic space. After their time, the case of redshift in a biological process, something generally only studied in cosmology, indicates how the study of biological space time which they pioneered can also inform astronomical investigations.

70. A living squirrel, placed in a Bunsen burner, unfortunately ceases to be a living squirrel.



Alpha is the fine structure "constant." The top row gives the absorption spectra of various elements as measured in the laboratory. Source: John Webb, "Are the Law of Nature Changing with Time?" Physics World, April 2003.

APPENDIX V

Fine Structure, Constant?

In addition to intrinsic redshift, there is another peculiar property of galaxies worth noting. A recent study of the absorption lines of distant galaxies yielded yet an additional shift, this one of an unusual character. Once the overall redshift from these objects is normalized, an irregular distribution becomes clear. That is, the amount of redshift of various spectral lines can not be completely attributable to a simple red- or blueshift (see image). The hypothesis of the investigators is that this might correspond to the irregular shifting of spectral lines associated with a change in the fine structure constant, a physical constant which is derived from a study of the interaction of electromagnetic radiation and matter at the atomic scale.

Since we have already discussed the existence of an intrinsic redshift effect as expressive of the stage of evolution of a galaxy, might this also be an intrinsic effect? It would be indicative of the physical spacetime which characterizes these objects. As we've discussed above, Vernadsky's work might give us other potential sources for such an irregular variation. In fact, it may be similar to the sort of irregular spectral shifting that we see with chlorophyll.

APPENDIX VI

Cosmic Contagion

The flu has a curious—as yet unexplained—behavior pattern, although it is one to which we have become accustomed. Every year, it appears to circle the world,

appearing and disappearing with the seasons. Upon every return, the virus has transformed itself enough that it is entirely unrecognizable to our immune systems. Therefore, although catching the flu or receiving a vaccination in one year is enough to keep you from catching it again that year, by the next year it has transformed so much that, as far as your body is concerned, it is quite a different illness.

This would imply a rapid rate of mutation during the epidemic season, since a virus can only mutate while being replicated, that is, during an infection. Investigations have revealed very little mutation during the epidemic period, however. This would suggest that the flu, if it is mutating, must be doing its mutating during its "off season."

However, being seasonal, the off season for the flu is simply an epidemic season elsewhere in the world. As the Earth orbits the Sun, its inclination towards or away from the Sun changes on a yearly cycle, due to its slight tilt. This tilt causes what we experience as seasons. But when the Northern hemisphere is tilted towards the Sun (our summer, and therefore no flu) the Southern hemisphere is tilted away, experiencing its winter. And in fact, genetic analysis of successive flu outbreaks between the Southern and Northern hemispheres would seem to give an evolutionary cycle for the flu which appears to oscillate back and forth across the equator

In other respects, though, the flu does not behave as though it is a travelling virus.

First off, in order for a virus to travel, it requires either a host, a sick individual, or some sort of vector, such as an animal or insect. Today, we might expect that such a vector might be provided by air traffic across the equator. However, these epidemic patterns existed long before rapid transit of human beings. In fact, studies show that epidemic patterns for the flu have not changed in Great Britain for over four centuries.

Furthermore, a study of 25 successive flu epidemics in France and the United States, showed that not only was the onset of the flu simultaneous in the two very different populations, but the peak of the epidemic always occurred within a mean of four days of one another. This would imply that the entire life cycle of the flu, and not just its transmission, is governed by some sort of outside cue. It's significant that none of this depends on running out of potential victims. As we know, not everybody who could catch the seasonal flu will catch it before it vanishes. It simply leaves when it's time to leave, not because it ran out of things to do.

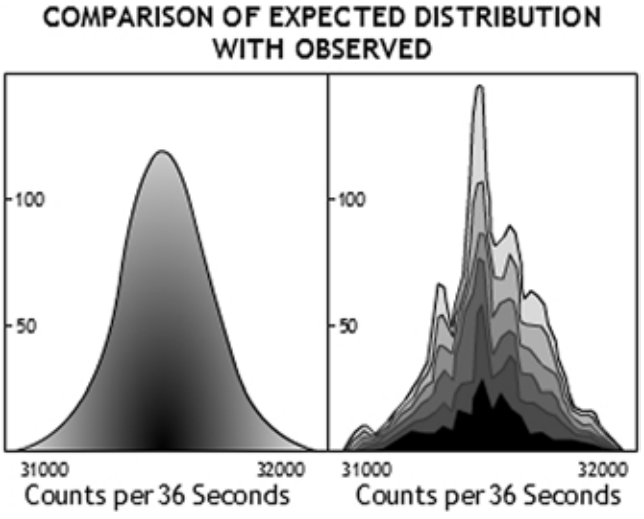
And finally, laboratory experiments have shown that it is actually incredibly difficult to intentionally infect healthy people with the flu, even when a combination of bronchial and nasal mucous from feverish, bedridden patients is directly sprayed into the nostrils, throats, and eyes of healthy individuals. (In this particular experiment, none of the healthy volunteers became ill.)

From this, we might conclude that the cyclical nature of the flu behaves as though it is ordered by a causal factor which lies entirely outside of the process itself, rather than by any point-to-point transmission, daisy-chain style, over long distances, nor dependent upon something which lies in the seasons themselves.

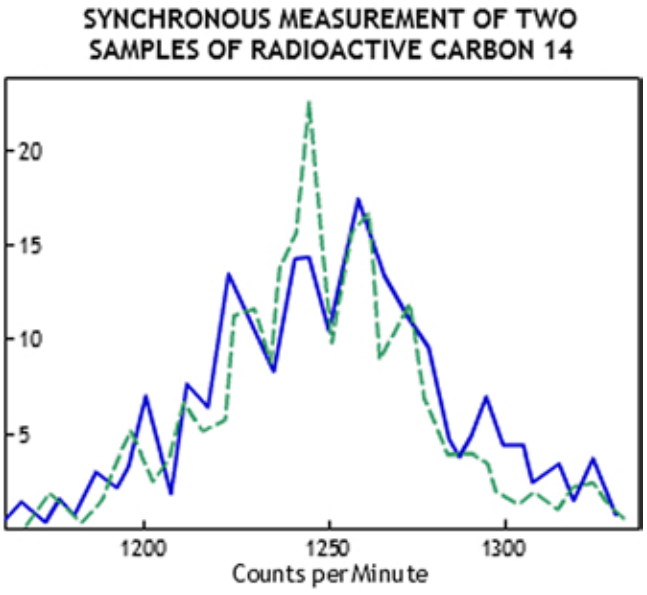
APPENDIX VII

The Very Large in the Very Small

Over the past few years an apparent interplay between the astrophysical and submicroscopic domains has been revealed in the relationship between nuclear decay rates and solar activity. Conventional physics dictates that the decay rates of radioactive elements are



The left shows a (Gaussian) distribution curve. If the process were completely random, an increase in the number of measurements would lead to a histogram cumulatively approaching this curve. However, the real histogram on the right shows the results of 1,200 consecutive measurements of the decay rate of a sample of iron-55, each measurement lasting 36 seconds. Successive samplings are shown in different shades of gray. Notice on the right how the peaks and troughs of the distribution become more exaggerated as the data set gets larger (with each layer representing 200 measurements), rather than more smoothed out. The experiment was conducted in Russia, on Feb. 18, 1982. Source: Shnoll et al., 1998, Figure 1.

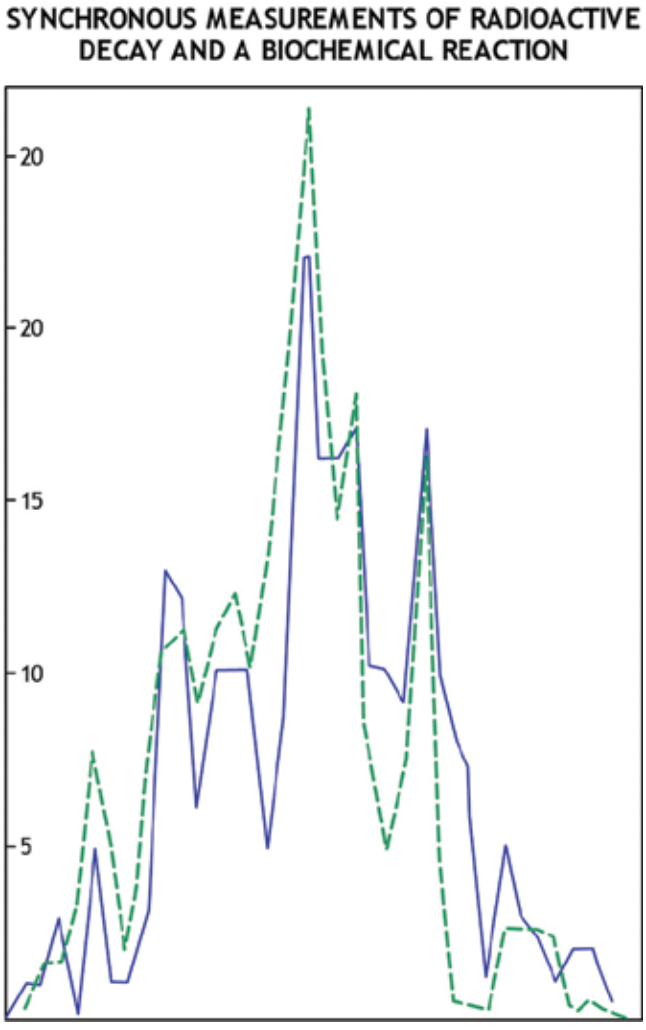


Synchronous measurements of the radioactivity of two separate samples of carbon 14, using two independent measuring stations. Notice how similar they are to each other, but how they differ from the image above. Source: Shnoll et al., 1998, Figure 9.

supposed to be an intrinsic property of the nucleus, not influenced by any outside factors. However, within the last four years, a series of studies have been published showing that the decay rates of samples of Radon-226 and Silicon-32 varied on a yearly cycle, corresponding with the changing Earth-Sun distance.[71] A follow up study showed that singular solar outbursts also can have an effect, as the decay rate of a sample of Manganese-54 was shown to have dropped at the same time as a significant solar flare in 2006.[72]

Despite the fact that these studies are still being fiercely contested by ardent reductionists, it is not a real surprise. Indications of even more interesting extraterrestrial influences on radioactive decay have been demonstrated by experiments over the past half century.

A team led by Russian researcher Simon Shnoll has published a series of studies based on over five decades of observation of the non-random fine structure of decay



Synchronous measurements of the rate of beta decay of a sample of carbon 14, and the reaction rate of vitamin C with the chemical DCPIP. Source: Shnoll et al., 1998, Figure 10.

rates and other processes.[73] They were not measuring the long-term variation in decay rates over time as in the above study, but were instead examining the fine structure of fluctuations over scales of seconds or minutes. It was expected that there would only be random variations in the rate of activity, averaging to a random distribution curve. However, what they found was remarkable.

71. See J. H. Jenkins, et al., 2008, "Evidence for Correlations Between Nuclear Decay Rates and Earth-Sun Distance."

72. It is also interesting to note that when the flare occurred it was in the middle of the night for the lab which contained the Manganese samples, meaning that if the variation in decay rate was an effect of some form of solar radiation, then the radiation would have had to travel through the Earth to affect the lab on the night side of the Earth. See J. H. Jenkins and E. Fishbach, 2008, "Perturbation of Nuclear Decay Rates During the Solar Flare of 13 December 2006."

73. This reference to Shnoll's work on the "fine structure" of decay rates and other processes is not the same subject as the changes in the "fine structure constant," which is discussed elsewhere in this report. Hopefully, no confusion arises from the similarity of the names chosen for these two subjects. For more on Shnoll's work see, Shnoll et al., 1998, "Realization of Discrete States during Fluctuations in Macroscopic Processes"; and "Russian Discovery Challenges Existence of 'Absolute Time,'" by Jonathan Tennenbaum, Summer 2000, *21st Century Science & Technology*.

They did not get random distribution curves, but curves with specific peaks and troughs which would become more and more pronounced as the measurements went on (instead of averaging out, as expected).

This non-random signature alone was interesting, but was only the very beginning of the story. It was shown that these fine structures would change over time. However, when two independent samples where measured at the same time—despite the fact that they were independent samples, measured by independent instruments, and could even be in different cities—they showed extremely similar fine structures.

Still, this relationship goes even beyond separate samples of the same radioactive element, as different elements, even with different types of decay, show similar fine structures, when they are measured at the same time. Even completely different types of reactions, such as radioactive decay and biochemical reactions, will show similar fine structures when compared with each other if the reactions are occurring at the same time.

These remarkable results indicate the need for a revolution in our basic understanding of the context for physical, chemical, and biological reactions. Despite the vast difference in the types of activity, the energy levels involved, and the scales (from macromolecules to atoms), Shnoll shows an intimate connection between the fine structures of their activity.

Could this indicate an intimate connection with the entire galaxy as well?

The fine structures for these reactions change with time, and when Shnoll compared different fine structures separated by intervals with no physical significance, say 11.5 days for example, they showed no similarity. But when the intervals between measurements did have a physical significance, such as one day, one year, or 27 days (perhaps either relating to the rotation of the Sun, or the orbit of the Moon) then they again showed remarkably similar fine structures! This indicates the influence of these large astronomical cycles on activity in the small.

So what were supposed to be purely random fluctuations of the rate of atomic, chemical, and biological reactions (all seemingly distinct types of reactions), actually express a harmony with each other, and with astronomical cycles.

To add to this wonderful anomaly, the daily period in the fine structure was found not to be a perfect 24 hours (the period of the Earth's rotation relative to the Sun), but ~23 hours and 56 minutes, a very precise match with the period of rotation of the Earth relative to the fixed stars—pointing to a relation outside of our solar system, and into our galactic environment.

Shnoll and some of his colleagues suggest that this indicates that time itself is heterogeneous, that each moment is different from another.[74] Might we be seeing in the very small the expression of the physical spacetime of the entire galaxy, perhaps relating to what the redshift case implies?

APPENDIX VIII
Redshift

When an element, say hydrogen, is heated, it will emit light. If that light is sent through a prism, we see that the element did not emit colors evenly through the entire spectrum. It instead sent out a set of specific colors which, taken together as a signature pattern, is called its emission spectrum. Like a characteristic finger print, each element has its own particular set of colors unique to it.[75]

Whenever we examine the emission spectrum of a given element on the Earth, we see the same set of colors. When we examine the emission spectrum of something like the Sun, we see an enormous mess of spectral lines. These lines can be untangled to reveal which elements exist in the solar atmosphere. In this way, the light from our Sun, and other astronomical bodies each give us their personal spectral fingerprints. However, in viewing more distant bodies, such as other galaxies, we find familiar spectral line sequences get shifted towards the red end of the spectrum. What causes this phenomenon, called the redshift?

One thing we know is that a simple Doppler effect, due to a recessional motion between the emitting object and the observer, causes the light waves to be stretched.[76]

Because the more distant objects have greater redshift, this would imply that the farther a galaxy is from us, the faster it must be moving away from us. The pe-

74. This heterogeneity of time is different from, but complementary to, what Vernadsky refers to as a "heterogeneity of spacetime."

75. Also, if a continuous spectrum of light is shined through a cold gas, say hydrogen again, the gas will absorb the same particular set of colors characteristic of that element. Analyzing the affected light shows an absorption spectrum, as opposed to the emission spectrum.

76. This is how a radar gun operates.

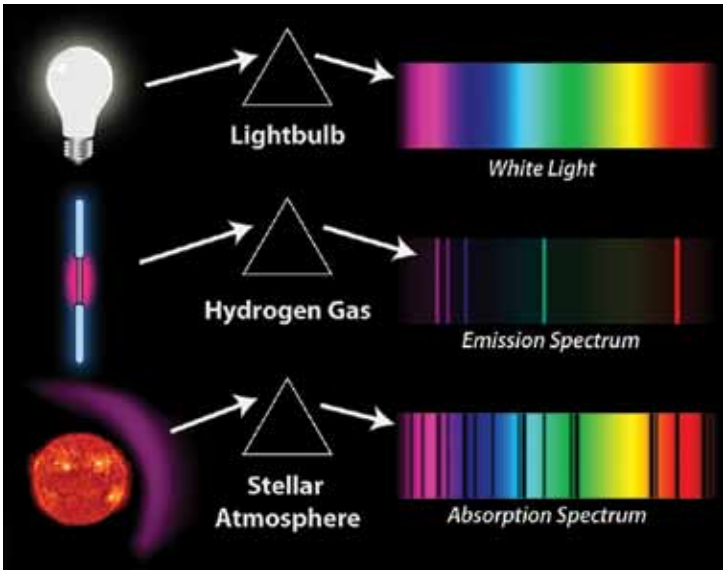
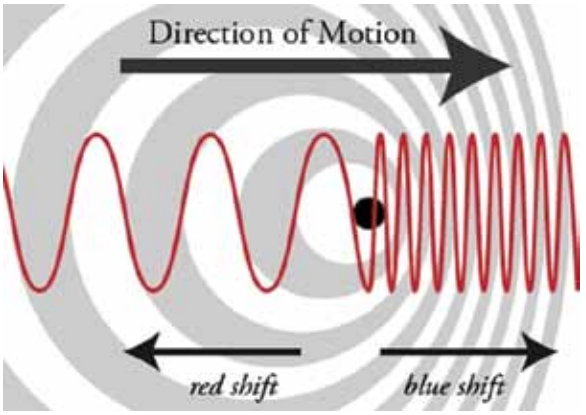
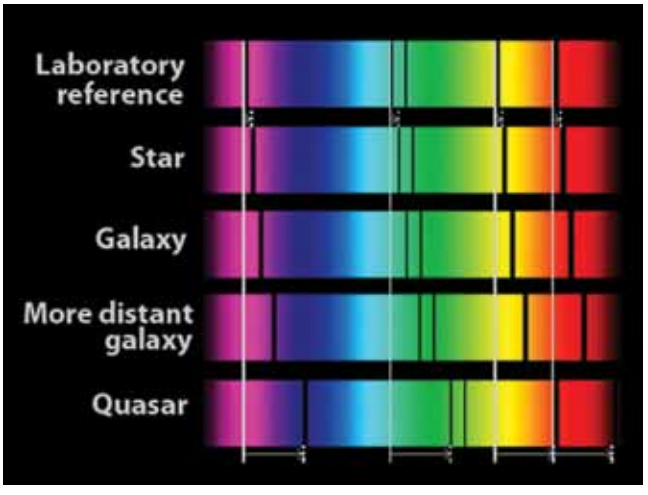


Illustration of spectral lines.



When an object that is emitting electromagnetic waves travels away from an observer, the waves that reach the observer will have been stretched out. The observer will thus sense light that is more red than does an observer moving along with the object. If the object is moving towards the observer, the waves will be compressed, and will be seen by the observer to be more blue. This is called the Doppler Shift, after the man who first described the effect.



Heuristic example of redshifts.

culiar fabulist, Edwin Hubble, used this evidence to claim that all the matter in the universe was rapidly moving outward, from an initial event that others ridiculed with the name "Big Bang." However, the redshift evidence also fit with an earlier mathematical derivation from Einstein's General Theory of Relativity, not relying on simple recessional arguments, which said that the spacetime of the universe, itself, was expanding. This expansion of space is claimed to stretch the light traveling through it, also causing a redshift effect. Thus the further the light traveled, the greater redshift it should have by this theory, regardless of how fast the actual light-emitting bodies were moving relative to each other.

Thus, according to this framework, redshift must always correlate with distance. Whenever there is an object observed with a very high redshift, then it must necessarily be very far away, such that the space through which its light traveled could be stretched enough to account for the redshift measured.[77]

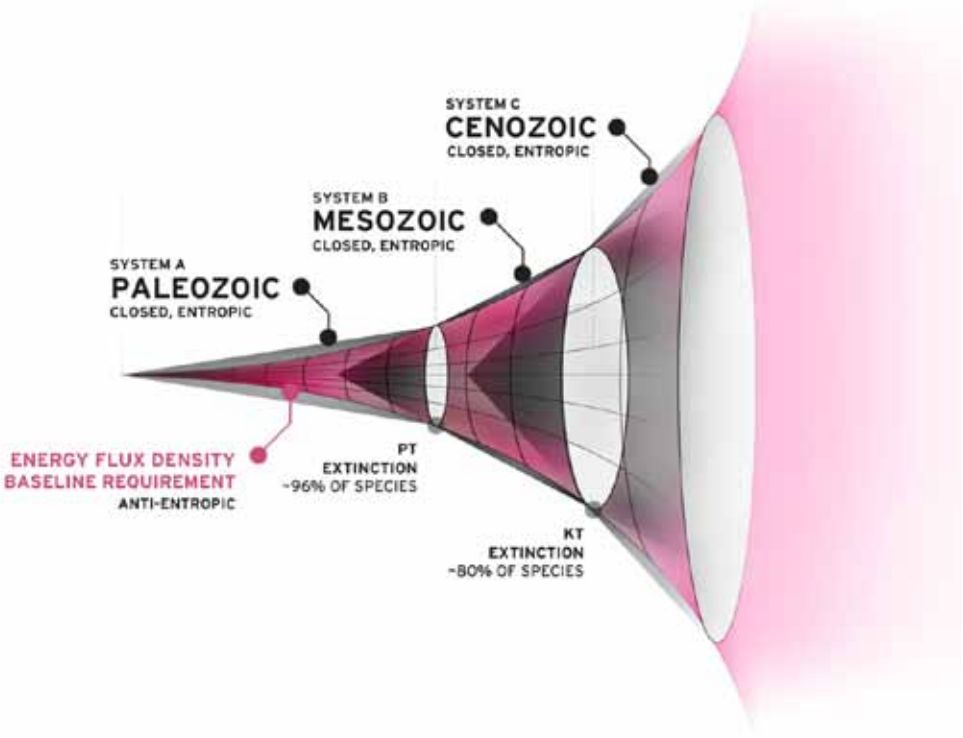
A fundamental corollary of this, is that there should never be two galaxies with dramatically different redshifts located physically near each other. However, contrary to all presently taught cosmology, this is exactly what we do see, as seen in the body of this report.

APPENDIX IX
Energy-Flux Density

If we define time by means of physical phenomena, rather than positing an a priori geometric conception, we find a way to escape the pseudo-paradoxes of Laplacian determinism. The time of physics is a derivative quantity, like all of the so-called "fundamental

77. There can also be some additional motion of the observed galaxy, which is not due to the expansion of space, but to the motion of the galaxy through the space. This can add an additional Doppler shift to the cosmological redshift. This additional motion is referred to as the peculiar motion, and accounts for a minimal amount of the total redshift in objects with very high redshifts.

units" of physics. Rather than describing processes as occurring "in" space and time, we ought to derive distinct models of space and time from distinct processes. This is, in fact, the methodological approach followed by Einstein in developing his special and general theories of relativity, though, as Vernadsky expressed this repeatedly, the geometrical notion of space and time there is applicable only to the specific phenomena of physics from which it was derived. Observations of the unique spatiotemporal properties of living and cognitive processes should yield distinct notions of these "fundamental units," in the same way as the attempt by Einstein to reconcile mechanics and electromagnetism led to the redefinition of space-time and matter-energy.



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Studying biological time in all of its various expressions—particularly morphogenesis, the succession of generations, and evolution—gives us a texture of anti-entropic development which distinguishes itself sharply from the linear models of time which have been successful in most areas of physics (though problematic already when applied to quantum phenomena).

Dividing biospheric history by functional systems rather than "time periods" allows us to identify a unique texture to such anti-entropic processes. This texture is operative in these processes at any resolution where successive distinct systems may be identified, but certain of its properties are most clear with the division given above, into the systems of the Paleozoic (old life), Mesozoic (middle life), and Cenozoic (new life) flora and fauna. Each closed system is characterized by a specific mode of operation which can be termed its "energy-flux density," in essential agreement with the economic concept introduced by Lyndon LaRouche. The energy-flux density of each system is well represented in these particular cases by the metabolic character of the dominant predator in each of these periods, which serves as a singular expression of the energy throughput of the biosphere as a whole. Each system develops until an upper limit is reached, at which point an extinction event ensues, on the other side of which a subsequent system, operating at a higher energy-flux density, rises to dominance.

Additionally, it is possible to extract from this model an underlying continuous curve, which we have here termed our energy-flux density baseline. The question is: Does this baseline actually represent something physical, or is it simply an artifact of our model? The answer to this question lies in returning to our earlier discussion of the correlation between evolutionary cycles and processes on a galactic scale. We do have an external metric of progress against which the anti-entropy of life must measure itself: It is the anti-entropic development of galaxies as a whole which has been the topic of this report. It is likely on that scale that we find the origin of our baseline, which defines the requirements for energy-flux density increase required at any moment to avoid the extinction of both animal and human systems.