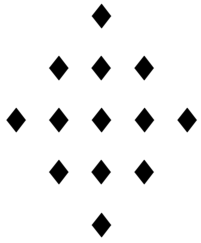
Chapter One



The Electromagnetic Universe

"There is a highly catalytic energy coming from deep space, which is striking the Great Central Sun (of your galaxy) and the Sun of your solar system... This deep-space energy that is affecting both the Sun and your Earth is essentially an energy of accelerating self-awareness and spiritual evolution."
Tom Kenyon, Shaman

Space Weather: The Arrival of Evolutionary New Energy

In March 1989, our modern technological world was given a major initiation into space weather, thereafter called The Great Magnetic Storm. Space weather researchers watched in amazement as a massive sunspot developed over two days and finally measured *54 times* the size of the Earth. This sunspot region was the most complex – both magnetically and structurally – that any of these scientists had ever seen [1]. On March 6, when the sunspot exploded, X-rays travelling at the speed of light reached Earth in 8 minutes and 20 seconds. Chaos ensued. The sunspot generated 195 solar flares, 11 of them classified as the most intense "X-class." The stream of radiation from the initial explosion lasted 10 hours where 30 minutes is considered the norm. Under those conditions, the magnetosphere, the cosmic shield made up of trapped radiation protecting us from the Sun's

harmful rays, was put under enormous strain. As energetic particles rained down from the Sun, the magnetosphere was squashed to less than half its normal size. On Earth the sky turned red and in parts of the world it was like night turning to day. The geomagnetic storm raged for 13 days and wrought havoc to sensitive electronic equipment.

During this historic event, military and commercial satellite communications failed and some dropped out of their normal orbit. The U.S. Air Force Space Command lost 1,300 of the 8,000 orbiting objects it was tracking in space [2]. The Global Positioning System (GPS) gave erroneous information, power surges burned out generators and caused blackouts as power plants shut down and oil platforms stopped drilling, as compasses became unreliable. Anything that could carry an electric current such as transmission lines, railway lines, pipelines and cables induced ground potentials and currents causing further problems. As you can imagine, the cost to repair the damage ran into billions of dollars. The polar aurora electrojet was pushed down over North America and reports of the aurora came in from brightly-lit skies in Portugal, Spain, The Netherlands, Britain and Hungary. In the Southern Hemisphere, the aurora australis was seen in New Zealand, Australia and South Africa. Mystified observers saw the aurora in Mexico, Cayman Islands, Honduras and Cuba. This was a major event. The world had received a major initiation.

In general, scientists calculate that the biggest solar flares are equivalent to a billion one-megaton nuclear bombs. When they occur, the initial explosion sends radiation to Earth in just over 8 minutes, then hours later, clouds of charged particles engulf the planet. In addition to the solar flares, there can be companion coronal mass ejections (CMEs), which shoot megatons of plasma (electrified particles) into space. CMEs occur when the lower atmosphere and surface of the Sun just lifts off and explodes into space, carrying complex magnetic fields that normally take three or four days to reach Earth after the initial solar eruption. Highly energized particles from CMEs disrupt satellite signals and power grids, sometimes for hours or days at a time. If the magnetic field of a storm is oriented opposite to our planet's protective magnetic field, gaps are created and radiation leaks to the planet's surface. This has the potential of threatening astronauts aboard the International Space Station, shorting out satellites, and even causing terrestrial power grids to fail. It must be stated that storms from the Sun are nothing new, but scientists are mystified because compared to historic records, energy coming from the Sun has shown unusual compositions [3].

The Solar and Heliospheric Observatory (SOHO) spacecraft launched in December 1995, is a joint project of the European Space Agency (ESA) and the

National Aeronautics and Space Administration (NASA), which seeks to understand the fundamental processes of the Sun–Earth connection. This mission has been highly successful and some of the SOHO images taken of the Sun over the last few years have been spectacular, but they have also raised many questions. One particular enigmatic image forces us to wonder and ask:

How do solar physicists explain the highly unusual coronal mass ejection that is clearly helical and looks like DNA? [4]

There have been attempts to explain this particular unusual CME occurrence (see figures 1.1 & 1.2). Some scientists have given vague suggestions that the "twist" was caused by magnetic variations generated from the fusion furnace at the Sun's core [5]. Another explanation comes from The Millennium Group (TMG), a group of independent scientists. They claim that two comets virtually simultaneously hit the Sun and they provide SOHO satellite images as evidence [6]. Regardless of how this event occurred, the spiral is a universal symbol throughout the world for ancient wisdom and the process of initiation.

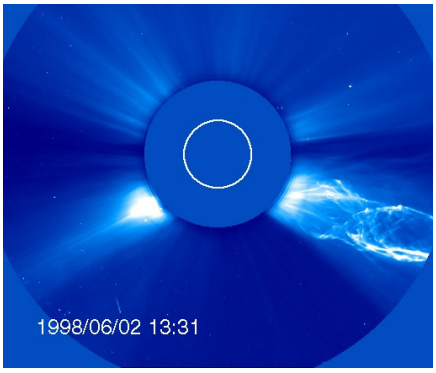


Figure 1.1 False color image of an unusual and clearly helical Coronal Mass Ejection (CME)

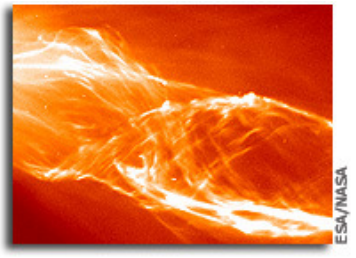


Figure 1.2 Close-up false color images of an unusual and clearly helical Coronal Mass Ejection (CME). Observed by the LASCO C2 coronagraph on June 2, 1998. Credit: SOHO/LASCO consortium; NASA/ESA.

On July 14, 2000 (Bastille Day), a monstrous full "halo" CME detonated from the Sun at nearly 1,800km per second, (4 million miles per hour) [7]. There was a full assault on Earth orbiting spacecraft, and the Earth's magnetosphere was hit 26 hours later with three shock waves that arrived twice as fast as expected. There were of course many satellite casualties, but this time space weather forecasters had issued warnings and alerts to industry to mitigate the damage on Earth. These increasingly furious blasts from the Sun are now

categorized as *Space Weather,* and the technological impact on communication systems and the power supply industry has become a major concern.

Every Planet in our Solar System is Undergoing Transformation

Every single planet in our solar system has undergone massive change in the last few decades and there are a few reports that suggest ALL the planets are undergoing "Global Warming" [8]. Here are the highlights:

- Mercury: "Surprise" polar ice discovered, along with an "anomalous" strong intrinsic magnetic field – for a supposedly "dead" planet.
- Venus: Oxygen formation, 2500% increase in auroral brightness, and substantive global atmospheric changes in less than 30 years.
- Earth: Substantial and obvious worldwide weather and geophysical changes. A new electrojet and the magnetic field weakening in parts of the world at an "alarming" rate. There is new nitrogen in the upper atmosphere and two unexpected populations of cosmic particles found in the Van Allen radiation belts. The Earth's atmosphere is now emitting gamma ray bursts into space!
- Mars: Doubling of atmospheric density, "global warming", polar melting of ice caps, and new appearance of planet-wide storms.
- Jupiter: Magnetic field intensity doubling and appearance of a "dark" spot. Over 200% increase in brightness of surrounding plasma clouds.
- Saturn: Saturn's famous ring spokes periodically disappear! 1000% increase in plasma toroidal field. Major decrease in equatorial jet stream velocities in only ~20 years, accompanied by a surprising surge of X-rays from the equator.
- Uranus: Massive growth of magnetosphere intensity. Vast increase of clouds and global cloud activity. Enormous changes in Uranian brightness. Magnetic polar shift.
- Neptune: 40% increase in atmospheric brightness and light spot dynamics in just several years. Magnetic polar shift.
- Pluto: 300% increase in atmospheric pressure and "global warming", even as it recedes farther from the Sun.

More and more scientists now debunk the commonly held views of the cause of global warming and the correlation has been made between increased levels of high-energy cosmic rays and climate change. Prominent scientist, Professor Jan Veizer, a geologist and paleoclimatologist from the University of Ottawa (now

retired) and Nir Shaviv, an astrophysicist at the Hebrew University of Jerusalem, conducted an extensive study. Their 2003 report states:

> "Independent empirical evidence suggests that the galactic cosmic ray flux (CRF) is linked to climate variability." [9]

The data shows that when the Earth periodically experiences swings in temperature, violent weather and precipitation, at least 66 percent of this "is likely due to solar system passages through the spiral arms of the galaxy." [9] Dr. Henrik Svensmark from the Solar-Terrestrial Physics Division, Danish Meteorological Institute, believes it is the interaction of the solar wind (a wave of charged particles from the Sun) and Galactic cosmic rays that determines the Earth's climate. This highly controversial theory was first popularized in 1997 by Svensmark and Eigil Friis-Christensen, but it was in line with the views of a growing number of scientists, including those who have influential positions at many of the world's most prestigious scientific institutions [10]. In June 2009, Svensmark et al. released a new paper titled, "*Cosmic ray decreases affect atmospheric aerosols and clouds."* The Abstract states:

> "Close passages of coronal mass ejections from the sun are signaled at the Earth's surface by Forbush decreases [A Forbush decrease is a rapid decrease in the observed galactic cosmic ray intensity following a coronal mass ejection (CME). It occurs due to the magnetic field of the plasma solar wind sweeping some of the galactic cosmic rays away from Earth.] in cosmic ray counts. We find that low clouds contain less liquid water following Forbush decreases (FDs), and for the most influential events the liquid water in the oceanic atmosphere can diminish by as much as 7%."

The paper concludes:

> "Our results show global-scale evidence of conspicuous influences of solar variability on cloudiness and aerosols. Irrespective of the detailed mechanism, the loss of ions from the air during FDs reduces the cloud liquid water content over the oceans. **So marked is the response to relatively small variations in the total ionization, we suspect that a large fraction of Earth's clouds could be controlled by ionization**. Future work should estimate how large a volume of the Earth's atmosphere is involved in the ion process that leads to the changes seen in CCN and its importance for the Earth's radiation budget. From solar activity to cosmic ray ionization to aerosols and liquid-water clouds, a causal chain appears to operate on a global scale." [11]

"Instead of thinking of clouds as a result of the climate,
it's actually showing that the climate is a result of the clouds,
because the clouds take their orders from the stars."
Dr. Henrik Svensmark, Physicist

Despite the opposition of those who believed that carbon dioxide (CO2) is responsible for global warming, Svensmark, has received considerably attention for his cosmoclimatology (cosmic ray cloud formation and climate modulation hypothesis) and there has been important new research in support. In August 2011, there were some huge sighs of relief when *Nature* published results from the important CERN Cosmics Leaving Outdoor Droplets (CLOUD) experiments that proved that ionization increases the nucleation rate of condensation nuclei. The CLOUD experiment was carried out using a custom-built chamber with ultrapure air and chemicals believed to seed clouds: water vapor, sulphur dioxide, ozone and ammonia. A team of CERN scientists then bombarded the chamber with protons from the same accelerator that feeds the Large Hadron Collider, the world's most powerful particle smasher. As the synthetic cosmic rays streamed in, the group carefully sampled the artificial atmosphere to see what effect the rays were having. After the results were published, a clearly delighted Nir Sharviv wrote the following:

> "The results unequivocally demonstrate that atmospheric ionization can very easily affect the formation of condensation nuclei (CNs). Since many regions of earth are devoid of natural sources for CCNs (e.g., dust), the CCNs have to grow from the smaller CNs, hence, the CCN density will naturally be affected by the ionization, and therefore, the cosmic ray flux. This implies that ion induced nucleation is the most natural explanation linking between observed cosmic ray flux variations and climate. It has both empirical and beautify experimental results to support it." [11]

Henrik Svensmark was quoted in the associated *Nature* news article *"Cloud formation may be linked to cosmic rays"*, but his victory speech was rather muted and he stated: "Of course there are many things to explore, but I think the cosmic-ray/cloud-seeding hypothesis is converging with reality." [11] For some balance, we must also add that some scientists expressed their dissatisfaction with reality and that the CLOUD experiment is "not firming up the connection", but the well respected science author Nigel Calder expressed his surprise that these 'excellent' results appeared and that the 'warmists' house magazine *Nature* is able to publish it…" So mounting evidence, does suggest that all the warming Earth has experienced in the past 150 years can be traced back to solar and cosmic factors and that human activity is not the sole cause of global warming.

In 1997, Dr. Alexey Dmitriev, the chief scientific member at the Siberian department of the Russian Academy of Sciences, released a paper titled *"Planetophysical State of the Earth and Life"*. In 1998, this paper was updated and translated into English, see Appendix I [12]. Dmitriev has impressive credentials as professor of geology and mineralogy, an expert on global ecology, and fast–processing Earth events. This highly informative paper tells us, "Geological, geophysical and climatical alternations of the Earth are becoming more and more irreversible". Furthermore, it announced, "high speed transformations" that are being caused by:

> "Highly charged material… which have broken into the interplanetary area of our Solar system. This "donation" of energy is producing hybrid processes and excited energy states in all planets, as well as the Sun."

We are informed that there is "a general reorganization of the electro-magnetosphere (the electromagnetic skeleton) of our planet" and the report goes on to say in a rather prophetic manner:

> **Each living representative on Earth will be getting a thorough "examination" or "quality control inspection" to determine its ability to comply with these new conditions**. These evolutionary challenges always require effort, or endurance... It is not only the climate that is becoming new, but we as human beings are experiencing a global change in the vital processes of living organisms, or life itself." [12] *[Bold added for emphasis]*

In conclusion, the paper makes some rather remarkable statements, indicating that human beings can directly influence and even lessen catastrophic events, associated with the transformation of Earth. Dmitriev informs us:

> "Our planet Earth is now in the process of a dramatic transformation; by altering the electromagnetic skeleton through a shift of the geomagnetic field poles, and through compositional changes in the ozone, and hydrogen, saturation levels of its gas-plasma envelopes. These changes in the Earth's physical state are being accompanied by resultant climatic/atmospheric, and biospheric, adaptation processes. These processes are becoming more and more intense, and frequent, as evidenced by the real time increase in "non-periodic transient events"; i.e., catastrophes. **There are reasons favoring, or pointing to, the fact that a growth in the ethical, or spiritual quality, of humanity would decrease the number and intensity of complex catastrophes."** [12] *[Bold added for emphasis]*

Dmitriev is not alone in his assessment. Russian specialists in climatology, geophysics, planetophysics, and heliophysics all cite a cosmic cause for what is happening. The comment about the need for the evolution of humanity to spare the Earth from the worst catastrophe, is indeed the main aim of this book to

explain. This report gives us fascinating detail into how the Earth is being reorganized, and will be discussed in more detail in the following chapters.

Magnetars: Extreme Space Weather

"They're solar flares on steroids"
Dr. Pete Woods, NASA Astronomer

On December 27, 2004, the Earth experienced the most extreme space weather event possible, when we were hit by a giant flare from a rare celestial object called a Magnetar. This is a type of neutron star distinguished by the size of its magnetic field and determined by astronomers to be the most extreme magnetic object in the universe (see the small section "Neutron Stars & Magnetars"). They are still considered rare but astronomers have now found twenty-three at the last count [December 2011], making up a very small select group. There are millions of neutron stars in our Milky Way but magnetars are in a class of there own because their magnetic fields are a thousand times stronger than normal neutron stars and a trillion (10,000 million) times stronger than those of the Earth—strong enough to strip information from a credit card at a distance halfway to the moon [13]. Here is how this event was described by Phil Plait, astronomer, lecturer, and author. He writes:

> "The scale of this onslaught is nearly impossible to exaggerate. The flood of gamma and X-rays that washed over the Earth was detected by several satellites designed to observe the high-energy skies. RHESSI, which observes the Sun, saw this blast. INTEGRAL, used to look for gamma rays from monster black holes, saw this blast. The newly-launched Swift satellite, built to detect gamma-ray bursts from across the Universe, not only saw this blast, but its detectors were completely saturated by the assault of energy… even though Swift wasn't pointed anywhere near the direction of the burst! In other words, this flood of photons saturated Swift even though they had to pass through the walls of the satellite itself first!
>
> It gets worse. This enormous wave of fierce energy was so powerful it actually partially ionized the Earth's upper atmosphere, and it made the Earth's magnetic field ring like a bell. Several satellites were actually blinded by the event. So what was this thing? What could do this kind of damage?
>
> Astronomers discovered quickly just what this was, though when they figured it out they could scarcely believe it. On that day, half a decade ago, the wrath of the magnetar SGR 1806-20 was visited upon the Earth." [14]

An international team of astrophysicists described the blast in the July 20, 2005 issue of *Astrophysical Journal Letters*, a research journal [15]. It was reported:

> "The burst produced vibrations in the star that generated quick fluctuations in the X-ray radiation it released into space. These pulses are emitted during each seven-second rotation of the fast-spinning star and reveal the frequency, or speed, of the star's vibrations.
>
> This explosion was akin to hitting the neutron star with a gigantic hammer, causing it to ring like a bell," said Richard Rothschild, an astrophysicist at the University of California and one of the authors of the report.
>
> Now the question is: what does the frequency of the neutron star's oscillations—the tone produced by the ringing bell—mean?
>
> …The quakes ripped through the star at a stupefying speed, vibrating the star at 94.5 cycles per second, researchers said. "This is near the frequency of the 22nd key of a piano, F sharp," said Tomaso Belloni of Italy's National Institute of Astrophysics, a member of the team who measured the signals." [15]

In reality, it was not just Earth's magnetic field that was ringing like a bell: our whole solar system and galaxy rang with the sound of this celestial bell! So, this did cause further debate about the esoteric meaning of the note F sharp amongst metaphysicians [16]. According to astronomer Bryan Gaensler, on the morning of December 29, 2004, he was alerted by an urgent message sent by email from a colleague at the U.S. space agency NASA [17]. In response, he quickly organized for the Very Large Array (VLA) in New Mexico – a group of 27 interlinked dishes that comprises the world's most powerful radio telescope – to point at the coordinates of this star. In the following few weeks, every available powerful telescope in the world was utilized to observe and record this event. Even astronomers on vacation were tracked down and told to train every telescope they could find on the position of this magnetar. This is how Gaensler described what happened:

> "Well it took us a few days to realise just what we were dealing with, but we now know that SGR 1806-20 had generated a kind of 'solar flare on steroids', resulting in the brightest explosion in the history of astronomy. Brighter than the powerful gamma-ray bursts produced when distant black holes are born, brighter than the once-in-a-century supernova explosions recorded by the ancient Chinese and often visible in broad daylight, brighter even than the full Moon. **This little magnetar gave off more energy in 0.2 seconds than the Sun does in about 200,000 years."** [17] *[Bold added for emphasis]*

Neutron Stars & Magnetars

In a supernovae explosion, a collapsed core will remain, this is normally about one and a half times the mass of our Sun but compacted into an area between 10 and 30 km across, these are collectively called neutron stars. Magnetars are distinguished by their ultra-high magnetic fields (10^{14}G -10^{15}G) but are listed in two different types; anomalous X-ray pulsars (AXP) that pulsate slowly in x-rays but not in radio waves, and soft gamma repeaters (SGRs) that generate light energy a notch above the most piercing x-rays. They rotate very rapidly—at least several times per second as they emit enormous quantities of high energy X-rays and gamma rays with a relatively short lifespan of about 10,000 years. Some scientists compare the atmosphere of a magnetar with the solar corona as being filled with plasma and complicated magnetic fields. A plasma instability called the 'tearing mode' on the Sun may also develop in the strongly magnetized plasma of a magnetar. Yet these events on the Sun only emit as much as 10^{32} ergs of energy. Flares from magnetars are about a million million times stronger, ~10^{44} ergs, benefiting their more intense magnetic fields. SGRs are, by a far, the brightest known celestial blasts which repeat. Supernovae and gamma ray blasts (GRBs) are much brighter still, but they are one-shot events, destroying the bursting star. Supernovae and GRBs are rare, occurring in our galaxy only once in few hundred years (supernovae) or once in perhaps a million years (GRBs). This means that almost all detected supernovae and GRBs come from other, distant galaxies.

On 19th February 2006, in St. Louis at the annual meeting of the American Association for the Advancement of Science (AAAS), Stanford electrical engineering Professor Umran Inan described what scientists had learned from this once rare and dramatic atmospheric disturbance [18]. In his presentation titled *"A Giant Flare from a Magnetar: Blitzing the Earth from Across the Galaxy",* this is what was revealed:

> "Enormous gamma-ray flares—such as this giant flare from magnetar SGR 1806-20—affect our lower ionosphere to such a massive degree that by simply watching and measuring its response to and recovery from the flare, we are bound to learn more about the dynamics of these upper atmospheric regions, which are ultimately so important for our quantitative understanding of space weather, as well as communication and navigation systems." [18]

Earth is under a continuous bombardment and due to the increase in magnetar events in such a fairly short period of time, we have real evidence that the predicted arrival of evolutionary energies can now be compared to real astronomical data [19].

The beginning of this chapter highlights new phenomena of space weather and as a consequence, there is a transformation underway of our planet and solar

system, of genesis-like magnitude. However, the remainder of this chapter is devoted to explaining *The Electromagnetic Universe* and plasma – energy that exists in the most fundamental state of matter. Basic knowledge of how the universe works is key to understanding what is happening to the Sun, our principal source of universal energies. Once the necessary background information is acquired, it will be far easier to appreciate how catalytic energy is being delivered to Earth and why there is change underway in our personal electromagnetic fields. Human beings are inextricably connected to the electromagnetic environment of Earth, our solar system and our galaxy. An appreciation of plasma physics will give new insights into many disciplines of science, history, and metaphysics and will unlock mysteries that have been in existence for thousands of years.

Electrical Engineers Love Astronomy!

This is not well known, but there is a quiet revolution taking place in astronomy. Progress is such that traditional astronomers privately worry their scientific field will be taken over, by electrical engineers! [20] This has been going on for a few decades now, but with the latest technology in the form of artificial satellites, space probes and powerful telescopes, traditionalists are getting a shock, literally! The evidence points to the universe being electrically *alive* and what is being observed can only be explained in terms of matter, in the highly energetic state of plasma. Some scientists have coined the phrase, *The Plasma Universe*, to reflect the discovery that in volume, 99.999% of all the observable matter in the universe exists in the plasma state. In recognition of the contribution of plasma science to cosmology, the Institute of Electrical and Electronics Engineers (IEEE), the world's largest scientific and technical society, announced that it would recognize Plasma Cosmology as an official discipline in science (see figure 1.3 for the official IEEE logo) [21]. The reason for this is simple. Electrical engineers and physicists, who have studied the behavior of plasmas in the laboratory since the beginning of the twentieth century, are applying their expertise

Figure 1.3 The official logo of the Institute of Electronics and Electrical Engineers (IEEE). The arrow represents an electrical current and the associated magnetic field is shown as an anti-clockwise swirl created by that current. Note that a diamond antenna surrounds the emblem, which is the geometry of an excellent emitter of electromagnetic radiation.

to the behavior of plasma seen beyond Earth. With the scalability of plasma events, laboratory experiments and supercomputer simulation, plasma specialists can replicate stellar and galactic evolution, including many enigmatic formations only recently discovered in deep space.

In 1979, Anthony Peratt, a highly respected senior plasma scientist at Los Alamos National Laboratory, was the first to accurately match observations of ordinary and radio galaxies with computer simulations, modeling the evolution of galactic structures under the influence of electric currents [22]. Laboratory experiments confirm that the same phenomena can be applied to currents from micro to mega-amperes – a range of a trillion-fold. Hence, the same basic patterns will be seen at laboratory, planetary, stellar, and galactic levels.

> **It is argued that a spark that lasts for microseconds in the laboratory may continue for years at planetary or stellar scales, or for millions of years at galactic or intergalactic scales.**

In contrast, gravitational models do not achieve the same level of success, and often completely fail. Yet traditional cosmologists still adhere to gravitational modeling, with principles based on Albert Einstein's theory of general relativity. As cosmologists once thought that space was an empty void, it is not part of traditional training to study how space filled with matter in the plasma state would behave, therefore they have no hope of understanding what they actually see. Hence, that is why many new astronomical discoveries are often described as "enigmatic", "puzzling", "unbelievable", "stunning", "surprising" or even "mind-boggling". Nowadays, everywhere that astronomers look, they see magnetic fields at work and electricity flowing in filaments across immense distances in space. Recently, NASA released "surprising" studies showing lightning thousands of miles into space. Astronomers were completely "stunned" by a photograph taken with NASA's Spitzer Space Telescope, of a cosmic tornado in space that was two trillion miles long! [23] Herbig Haro objects, or 'jetted stars' are an energetic outflow, known to be associated with the formation of young stars. The exact cause of the spiraling structure is described as "mysterious" by astronomers, but plasma physicists insist that the only force known to prevent a stream of plasma from rapidly dispersing in the near vacuum of space is magnetism, and only electric currents can generate magnetic fields. At both the stellar and galactic scales, astronomers are seeing features that defy their understanding of the Universe, that they believe is ruled by gravity, but these wonders can be easily compared to plasma discharge formations seen in the laboratory [24]. The truth is that these same discoveries can be predictable, if the true nature of the Universe is understood. Shifts in scientific opinion always start

with ideas that were once thought heretical and impossible, and so maybe it is not surprising to find that electric and plasma based theories of the cosmos have been around for a century. We will review the influence of two great Scandinavian pioneers whose contributions are only now being fully recognized.

Kristian Birkeland and The Early History of Plasma Physics

"We have actually touched the borderland where matter and force seem to merge into one another, the shadowy realm between the known and unknown ... I venture to think that the greatest scientific problems of the future will find their solution in this borderland, and even beyond; here, it seems to me, lie ultimate realities, subtle, far-reaching, wonderful."
Sir William Crookes, British chemist and physicist, 1879

The founder of experimental astrophysics and the grandfather of plasma physics is the great Norwegian scientist Kristian Olaf Bernhard Birkeland, (1867-1917). He was a Professor at Oslo University at age 31 and contributed many achievements in technology and applied physics. Today in Norway, Birkeland's image adorns the front of the 200 Kroner note. Below we see an image that captures one of Birkeland's most famous experiments, Birkeland's terrella, or "little Earth". This experiment produced artificial northern lights using a magnetized metal globe to represent the Earth (see figure 1.4).

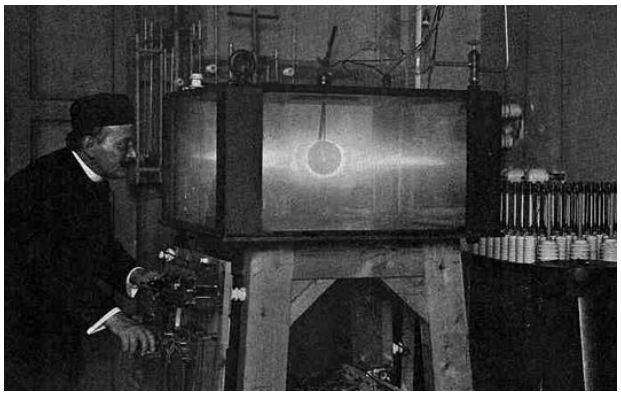


Figure 1.4 Kristian Birkeland works in his laboratory to simulate the aurora by shooting beams of electrons at his terrella or "little Earth". Photo from *The Norwegian Aurora Polaris Expedition*, 1902-1903, by Birkeland, published in Christiana, Norway in 1908.

At the end of the nineteenth century, Birkeland had laid out a compelling case – supported by theory, laboratory experiments, polar expeditions, and a chain of magnetic-field observatories around the world – that electric currents flowing

down along the Earth's magnetic field into the atmosphere were the cause of the aurora and polar magnetic disturbances [25]. Birkeland demonstrated that when plasma escapes from the Sun and travels through space, the Earth's magnetic field compresses it on the daylight side of the Earth and stretches it into a tail on the night side, ultimately producing the northern lights (see figure 3.3). Birkeland explained the auroras as "pencils of cathode rays from the Sun", namely plasma.

Like many discoveries in science, the identification of plasma as the fourth state of matter cannot be attributed to the inspiration and research of just one person. In 1816, the brilliant young student and experimentalist, Michael Faraday, lectured on "radiant matter", where he speculated about the existence of a state of matter that could exist beyond that of a gas. He referred to a state that was "as far beyond vaporization as that is above fluidity". Three years later he had evidence and arguments to support his startlingly hypothesis. In 1879, Sir William Crookes (1832-1919), who as a student had attended lectures given by Faraday, is remembered for delivering a lecture on his own research titled *"On Radiant Matter",* to the British Association for the Advancement of Science in Sheffield, England. Thus by the end of 19th century, there was a strong debate amongst top researchers who were investigating electrical discharges about the four states of matter. However, it was nearly 50 years later when in August 1928, Nobel laureate Irving Langmuir first coined the term "plasma", whilst studying plasmas in his laboratory following on from Birkeland's work.

The term "plasma" was chosen because it acted as if it were *alive.* These ionized gas clouds had self-organizing behavior in the presence of electrical currents and magnetic fields.

Birkeland also discovered the twisted corkscrew shaped paths taken by electric currents when they exist in plasmas. Today, these streams of ions and electrons are called "Birkeland Currents" and they are associated with a host of electrical phenomena in the plasma of our upper atmosphere. Birkeland believed that the electromagnetic influence of the Sun on near and distant space was as important as that of gravity. In an act of brilliance, he took the laws of electric and magnetic forces derived by Maxwell in the 19th century and applied them to space. It was a breakthrough in the understanding of the forces at work in the solar system. Some of his observations and theories have taken nearly a century to be verified, but Birkeland was totally vindicated in 1966 when a US Navy satellite observed magnetic disturbances on nearly every pass over the polar regions [26]. Today, his understanding that the same charged particles that cause magnetic storms also cause the Northern and Southern Lights is fully accepted.

The following quote shows us the depth of Birkeland's insight into the electrical nature of the Universe:

> "According to our manner of looking at the matter, every star in the universe would be the seat and field of activity of electric forces of a strength that no one could imagine. We have no certain opinion as to how the assumed enormous electric currents with enormous tension are produced, but it is certainly not in accordance with the principles we employ in technics on the Earth at the present time. One may well believe, however, that a knowledge in the future of the electrotechnics of the heavens would be of great practical value to our electrical engineers. It seems to be a natural consequence of our points of view to assume that the whole of space is filled with electrons and flying electric ions of all kinds. We have assumed that each stellar system in evolutions throws off electric corpuscles into space. It does not seem unreasonable therefore to think that the greater part of the material masses in the universe is found, not in the solar systems or nebulae, but in *empty* space." *K Birkeland, Norwegian Aurora Polaris Expedition 1902-1903 [27]*

It is over one hundred years since the great Norwegian scientist Kristian Birkeland claimed that electromagnetic forces played a role as important as gravity in near and more distant regions of space. Today, the physics of plasmas and electromagnetic forces introduced by Birkeland have finally emerged to prominence and are challenging how astronomers view the cosmic environment. Space satellites show indisputable evidence supporting Birkeland's ideas of a flow of electric particles (plasma) from the Sun. A flow of electric particles is simply an electric current and when they occur in space, they are called Birkeland currents, named after Kristian Birkeland who first suggested their existence.

In 1962, NASA's Mariner II spacecraft on its way to Venus, recorded the presence of particles traveling through space at speeds ranging from 300 to 700 kilometers *a second*. The Soviet Lunik 2 spacecraft had previously observed this phenomenon on its way to the moon, but western scientists arrogantly dismissed the Soviet data as unreliable. After Mariner, other craft were launched into space and soon it was acknowledged that "empty space" was not empty at all! Rather there is a million-degree Celsius plasma blowing off the Sun at 1.5 million and even up to 3 million kilometers per hour through the solar system, and now euphemistically called the solar wind! [28] Further, evidence of these currents was found in 1979, when the Voyager spacecraft recorded an enormous Birkeland current of three million amperes connecting Jupiter and its moon Io. Again, Saturn is one of the planets in our solar system known for its beautiful rings. Yet astronomers cannot explain why some of the rings are twisted! After decades of

study, we still have these headlines which read, *"Ring Riddles Baffle Saturn Scientists!"* [29] The blatant ignorance of the electrical nature of space was seriously exposed when Birkeland currents associated with Venus were described as "stringy things" [30]. A SOHO project partly sponsored by NASA, revealed that Venus has a tail which stretches some 45 million kilometers into space. This enigma has since been found repeated for comet Hyakutake, with its tail stretching half a billion kilometers across the solar system! A *New Scientist* article stated:

> "Standard physics says that narrow plasma streams are unstable and should dissipate fast. No one can yet explain how they hold together over tens of millions of kilometers." [30]

Unfortunately, Birkeland failed to be awarded a Nobel Prize in chemistry in recognition of contributions to science despite being nominated seven times. Birkeland was sabotaged by the scheming of his politically influential business partner, Sam Eyde who was not a scientist, yet he still tried to get a joint nomination to establish his own credibility. The Swedish Nobel Prize committee would not permit a non-scientist to receive an award and so, for the sake of maintaining friendly relations between the two Scandinavian countries, the idea of giving Birkeland the Prize was quietly dropped.

Hannes Alfvén – Nobel Prize Winner and Heretic

"It is only the plasma that does not 'understand' how beautiful the theories are and absolutely refuses to obey them."
Hannes Alfvén, Professor of Electrical Engineering & Plasma Physics, Nobel Lecture, 1970

The second great pioneer in the relatively unglamorous world of plasma physics is the Swedish Hannes Alfvén (1908-1995), winner of the 1970 Nobel Prize in Physics. Yet due to his many original ideas, Alfvén was regarded as a heretic by many physicists [31]. He made important contributions to astrophysics too, and his hypothesis formed in 1937 of a galactic magnetic field is the basis today for one of the fastest growing areas of research in astrophysics – Cosmic Magnetism. As with most pioneers, most of Alfvén's theories in astrophysics and plasma physics only gained acceptance two or three decades after their publication. Much disputed, many of his theories about the solar system were only vindicated as late as the 1980s through measurements of cometary and planetary magnetospheres by artificial satellites and space probes. Alfvén suggested that the galaxy contained a large-scale magnetic field and that cosmic rays moved in spiral orbits within the galaxy, owing to the forces exerted by the

magnetic field. This novel idea was criticized for being too intuitive and not grounded in enough rational thought. Moreover, his theory was dismissed on the grounds that interstellar space was known to be a vacuum and that it certainly could not support the electrical currents and particle beams he was proposing. This viewpoint was widely accepted because space *looked* that way, being viewed using telescopes at optical wavelengths [32]. At that time, the electrical currents proposed by Alfvén could only be detected in the radio portions of the electromagnetic spectrum, so they could not be observed with the then existing instrumentation, hence the skepticism that electric currents existed in space. Alfvén still argued his case by stating that there could still be a pervading magnetic field if plasma was spread throughout the entire galaxy. This plasma could carry the electrical currents and create the galactic magnetic field. Alfven's theories did start the scientific community thinking and so his ideas eventually became more accepted in the 1980s and 1990s. So despite the skepticism amongst astronomers, we know this property of space was acknowledged at the highest level, and the contents of various reports were 'classified' information. To name a few, in 1973 there was a report titled "*Geomagnetic Responses to the Solar Wind And To Solar Activity"* and in 1981, there was a report written for the Pentagon called *"Electric Fields in Earth Orbital Space"* [33]. In July 2006, NASA announced the award of space weather related contracts to investigate "Electric Fields in Space." This research is ongoing and today these kinds of reports are no longer deemed worthy of any kind of secrecy, but it does seem very strange when the astronomical community as a whole have refused until very recently to contemplate the implications of an electromagnetic universe.

Alfvén proposed a new form of electromagnetic wave that could propagate in a perfect conductor with no attenuation or reflection. The attributes of Magnetohydrodynamic (MHD) waves, were described in his book *The New Astronomy* (1948), after they were discovered in mercury experiments. Today these waves are now known as Alfvén waves, and have three characteristics; they produce (1) mechanical motion, (2) a magnetic field, and (3) an electric field. Scientists had always assumed that the movement of gases in stars obeyed the laws of hydrodynamics, as they apply to ordinary liquids and gases. Based on his mercury experiments, Alfvén realized that a magnetic field would drastically change the properties of dense stellar gases, implying that the current models of stellar behavior required serious revision. Alfvén also challenged the views of Sydney Chapman, the acknowledged leader in interplanetary and magnetospheric physics after the death of Birkeland. Chapman proposed, in opposition to Birkeland's ideas, that currents were restricted to flow only in the ionosphere of

Earth, with no down flowing currents. Chapman's theories were mathematically 'elegant' and so gained wide acceptance over Birkeland's theory. Alfvén, who became involved well after Chapman's ideas gained predominance, kept insisting that Birkeland's current system made more sense because down flowing currents following the Earth's magnetic field lines were required to drive most of the ionospheric currents. The issue was not settled until 1974, four years after Chapman's death, when Earth satellites measured down flowing currents for the first time.

"When a true genius appears, you can know him by this sign:
that all the dunces are in a confederacy against him."
Jonathan Swift, Irish cleric, political activist, satirist, author

Obviously, when you disagree with the prevailing view, the peer review system is a waste of time. Alfvén always had trouble, especially with Anglo-American astrophysical journals, but he never had any difficulty publishing with the Soviet versions! In retrospect, it is possible to explain the reason why Alfvén had difficulty getting his work accepted. Alfvén was an electrical power engineer and as such was considered an unwanted outsider. For 30 years, Alfvén and his colleagues proposed an alternative cosmology based on plasma physics, to both the Steady State and the Big Bang cosmologies. The Big Bang theory is rapidly losing credibility due to the numerous contradictions between observation and theory, especially over the last decade. In particular, the discovery of coherent structures of galaxies hundreds of millions of light years in length and the large-scale streaming of superclusters of galaxies at velocities that may approach 1,000 kilometers per second these present anomalies are difficult, if not impossible, to reconcile with the Big Bang theory. To Alfvén, the issues raised were not surprising and he is quoted as saying: "I have never thought that you could obtain the extremely clumpy, heterogeneous universe we have today, strongly affected by plasma processes, from the smooth, homogeneous one of the Big Bang, dominated by gravitation." In 1970, Alfvén used the occasion of his Nobel Prize acceptance speech to admonish the astronomical community for treating plasma in a way he had subsequently shown to be mistaken. He declared:

> "The cosmical plasma physics... is to some extent the playground of theoreticians who have never seen a plasma in a laboratory. Many of them still believe in formulas we know from laboratory experiments to be wrong. The astrophysical... crisis has not yet come." [34]

Maybe, we can take this as a warning from a visionary, that not understanding how plasmas behave could have dire consequences.

The Electric Power Lines in Space

"Jehovih rolleth up the heavens, and braideth the serpents of the firmament into His cyclic coil."
Oahspe, A Kosmon Bible

The universe is not "empty" it is made up of energy in the *fourth state of matter*. The first three states of matter are solid, liquid, and gas, which occur when plasma is cooled to make atoms and molecules. The fourth state of matter is composed of the basic building blocks, electrically charged particles of ions and electrons. Plasma exhibits characteristics not found in solids, liquids, or gases, and so it has also been called the "fundamental state of matter". Electric currents in plasma form filaments that attract each other at long distances and repel each other at short distances. These filaments tend to braid themselves into "ropes" that act as power transmission lines, with virtually no limit to the distances over which they can operate (see figure 1.5). For an actual example in space, the Cygnus Loop is thought to be a middle-aged remnant of a nearby supernova. However, it shows all the intricacy of twisted Birkeland currents with characteristics that support an Electric Universe interpretation, thus providing the definitive example of cosmic string in space! See figure 1.6 [35]. Plasma studies reveal that there are three distinct modes in which plasma can operate:

1. **Dark Current Mode** – Very low strength electrical current (flow of charged particles) within the plasma. As the plasma does not glow, it is essentially invisible. We would not know plasma was there at all unless we measured its electrical activity with sensitive instruments. The present day magnetospheres of the planets are examples of plasmas operating in the dark current mode.

2. **Normal Glow Mode** – Significant strength of the electrical current (flow of charged particles). The entire plasma glows, with the brightness dependent on the intensity of the current in the plasma. Examples being any neon sign, emission nebulae, the Sun's corona, atmospheric "red sprites" and "blue jets".

3. **Arc Mode** – High strength electrical current in the plasma, with the plasma radiating brilliantly over a wide spectrum. Some examples are from electric arc welding, electric arc furnaces, electric discharge machining, lightning, and the Sun's photosphere.

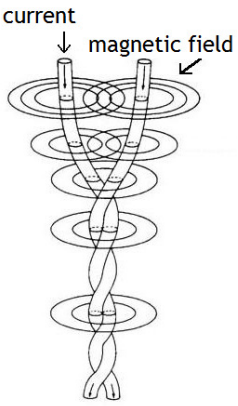


Figure 1.5 Birkeland Currents. Two filaments have been twisted into a single large filament. Credit: Unknown

Figure 1.6 Hubble Space Telescope image shows a tiny portion of the Cygnus Loop, a supernova remnant in the constellation of Cygnus, the Swan. The image taken by the Hubble space telescope illustrates the intricacy of the twisted Birkeland currents with characteristics that support an Electric Universe interpretation, including polarization of light, compression by magnetic fields, acceleration of relativistic electrons, and x-ray hotspots. Credit: ESA & Digitized Sky Survey (Caltech)

Universal Energy is self-directing and self-regulating ✧❖◆❖✧

One of the most important properties of any electrical plasma is its ability to "self-organize"– that is, to electrically isolate one section of itself from another. The (electrically) isolating wall between the two halves/parts of the plasma is called a double layer (DL) and it acts like a capacitor. No electrostatic force is felt by particles on one side of the DL, due to charges on the other side. The total electric current, however, is the same throughout the plasma (see figure 1.7 and the 'Cosmic Egg'). Plasmas form double layers between regions of different densities, temperatures or magnetic field strengths. The signature of electromagnetic forces at work is called "doubleness" because wherever there are multiple strands of electric currents, they prefer to interact in pairs. The reason for this derives from Ampére's Law or the Biot-Savart Force Law, which both state that current filaments or wires running in the same direction attract, while those in opposite directions repulse. For plasmas, instead of wires, there is a neutral force region where the filaments do not merge, but rather start a rotational motion around each other to form a vortex-like geometry. In the laboratory, this is

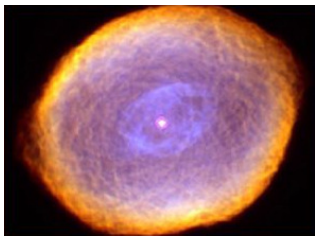


Figure 1.7 The "Cosmic Egg" (planetary nebula IC 418), shell and "yolk" composed of plasma and displaying "double layers". Credit: NASA/Hubble Heritage Team (STScI/AURA)

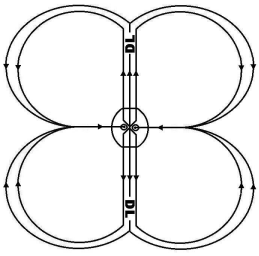


Figure 1.9 Galactic Circuit. Galaxy acting as unipolar inductor. Adapted from IEEE Transactions on Plasma Science (Vol. PS-14 No. 6). Dec. 1986

most often seen for the closest pairs of filaments but also for three filaments [36]. This results in a far larger ranging force of interaction than, say, the gravitational forces between two masses. Hence, this doubleness phenomenon is observed in the laboratory when very high currents, passing through a plasma, explode into electrical discharges called "pinches" that often interact in pairs. There is a tendency for these pairs to compress between them any material (ionized or not) in the plasma. When the electric current is strong enough, the plasma formed by these discharges, electromagnetically "pinches" into a string of "sausages", "donuts" and plasma instabilities. This "Z-pinch" effect explains "enigmatic" supernova structure and planetary nebula (see figure1.8). Plasma scientists explain pinch filaments as vortices of current – plasma whirlwinds. A vertical cross section of a galaxy is shown as a schematic in figure 1.9. The horizontal line at the center of the diagram represents a circular disk lying in the horizontal plane. The parallel vertical lines, (annotated as DL), along the galaxy's axis rotation represent the strong plasma current sometimes visible as jets. Double Layers (DL) within the jet plasma contain strong electrical fields that are the source of radio frequency emissions, representing the typical "double radio source" that is observed in many galaxies (see figure 1.10). The plasma cosmology viewpoint presents that a galaxy spinning in the magnetic fields of intergalactic space generates electricity, as any conductor does when it moves through a magnetic field. (This is the same principal at work in any electrical generator). The huge electrical current produced by the galaxy flows in great filamentary spirals toward the center of the galaxy, where it turns and flows out along the spin axis. This galactic current can short-circuit, driving a vast amount of energy into the galactic core. The galaxy then "blows a fuse" resulting in powerful electrical fields in the nucleus accelerating intense jets of electrons and ions out along the axis. The helical or braided vertical outburst of energy is known as a galactic jet [37].

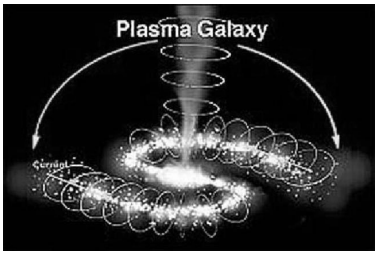


Figure 1.10 M82 Galaxy magnetic vector map. Credit: Holoscience.com

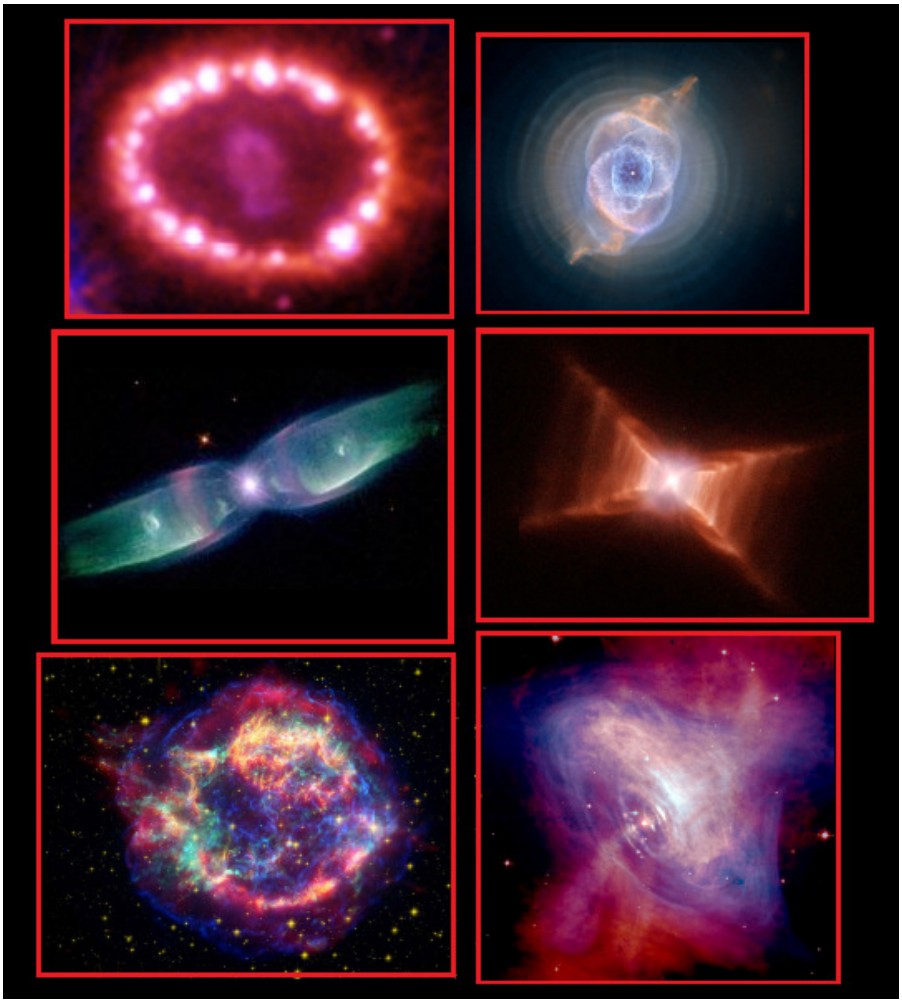


Figure 1.8 Enigmatic features in space top left to right:

1. The “Cosmic pearls” of the enigmatic and beautiful Supernova SN1987A with its three axial rings. Credit: NASA/STScI/CfA/P.Challis
2. “Cat’s eye” Nebula (NGC 6543) is one of the most complex planetary nebulae ever seen in space Credit: NASA/ESA Hubble Space Telescope
3. “Butterfly Nebula” M2-9. Clear demonstration of double layers and compression caused by the “Z-pinch effect”. Credit: NASA/AURA/STSCI
4. The “Red Rectangle” Nebula HD44179, “the most unusual nebulae known in our Galaxy”. Credit: NASA/ESA, Hans Van Winckel and Martin Cohen
5. Cassiopeia A supernova, a supposedly “dead” star that has shown recent signs of life! Credit: NASA/JPL
6. Crab Chandra showing the X-ray (blue), and optical (red) images superimposed, showing “jet” emission caused by plasma focus effect. Credits: X-ray: NASA/CXC/ASU/J. Hester et al.; Optical: NASA/HST/ASU/J. Hester et al.

The Most Powerful Force in the Universe is Electromagnetic!

The universe is everything that exists, from galaxies to subatomic particles, and that includes forces and energies, as matter is exchangeable with energy as denoted by Einstein's famous equation, $E=mc^2$. Whether matter or energy can be detected by our senses or sophisticated instrumentation, the universe is everything we can perceive and more. Cosmology is the science of the origins of the Universe and this is often represented by the popular but disputed Big Bang theory, which postulates that some 12-15 billion years ago, there was a suddenly expansion and explosion of all matter and energy out of an original point – out of literally nothing – and that not only space but even time began at this moment. This literally means that there was no previous space because space did not exist, there was no time at which this could be measured either – space and time are intrinsic properties of the universe rather than something absolute. Hence today, skeptics exclaim, "What banged?" The evidence is such that the universe presents many enigmas, which cannot be explained by the generally accepted laws of physics and Big Bang theory [38].

"The Force" is Electromagnetic! ✧❖◆❖✧

Scientists state that there are only four fundamental forces that rule the universe and gravity is believed to be the dominant force. Gravity is an attracting force that exists between all things with mass or energy. The electromagnetic force is associated with electrically charged particles, with oppositely charged particles attracting each other, and similarly charged particles repelling each other. The electromagnetic force binds negatively charged electrons to positively charged atomic nuclei and plays a major part in any chemical reaction, and of course, electrical and magnetic effects. The remaining two forces are the strong nuclear force, and the weak nuclear force. The latter two forces only play a role in the nuclei of atoms, where they are important for nuclear processes and radioactivity. The question arises: why do cosmologists think that gravity is the most powerful force in the universe? If we take the criteria of the effect of these forces changing with distance, the most important characteristic of electromagnetism is that it obeys the longest-range force law in the universe (see the small section "The Laws of Attraction") [39]. Gravity is a very weak force and we can prove this with a simple experiment, where a small iron object can be lifted against gravity from the ground with a small magnet. This means that the magnetic force of the small magnet is stronger than the gravitational force exerted by the whole planet Earth! Cosmologists argue that gravity is the most

The Laws of Attraction

When two or more non-plasma bodies interact gravitationally, their force varies inversely as the square of the distance between them. Hence for 2 unit measurements apart the attraction is 1/4; for 3 unit measurements apart, the attraction is 1/9; for 4 unit measurements apart the attraction is 1/16 and so on. When plasma as streams of charged particles interact electromagnetically, their force law varies inversely as the distance between them. Hence for 2 unit measurements apart the attraction is 1/2; for 3 unit measurements apart the attraction is 1/3; for 4 unit measurements apart the attraction is 1/4. So at 4 unit measurements apart the electromagnetic force is 4 times greater than that of gravitation, relatively speaking, and at 100 units, apart, the electromagnetic force is 100 times that of gravitation.

important force on the astronomical scales, because gravity can only attract whereas the electromagnetic force can attract and repel. This argument hinges on the concept that there is a balance of positive and negative electrical charges. If this is correct, it suggests that the electromagnetic forces of attraction and repulsion would even out at large scales and hence play no large role in how the universe operates. This scenario translates in scientific terms as the universe being electrically neutral. However, it does seem a fairly large assumption, especially when we discover that the electromagnetic force is 10^{39} times (a thousand billion, billion, billion, billion times) more powerful than gravity! This means that it does not matter if the universe is balanced overall, even a small variation in the distribution of electrical charge will override gravitational affects at a local level [39].

Searching for the "Dark" Force

"Newton was unaware of plasma. Today his disciples spend years in training learning when and how to shut their eyes to it. It's not just the Big Bang, General Relativity, and Quantum Mechanics that are in trouble but the foundation of them all: Gravity is an exhausted and bankrupt concept."
Mel Acheson, Amateur Astronomer

It is no surprise that cosmologists face many problems explaining the titanic forces that are calculated to operate in the Universe, when they only consider the weak force of gravity. To illustrate this point, the beautiful Whirlpool Galaxy (M51) is typical of 70% of observed galaxies that display spiral arms (see plate 5). What is interesting is that only about 10% of the gravity necessary to hold the spiral arms together can be accounted for by known gravitational sources. This has led to the theorizing of dark (hidden) matter of exotic and unknown form, which would be responsible for the excess gravity [40].

Figure 1.11 M51 "Whirlpool" Galaxy with Spiral arms. Copyright: NASA

Gravity based models are inadequate, which means that astrophysicists are continually "surprised" by new data and are forced to "revise" their theories to maintain their validity. Astrophysicists have achieved this by creating invisible entities such as neutron stars, weakly interacting massive particles (WIMPs), strange energy, and black holes [41]. Surprised? Yes, even black holes are largely theoretical, and we find that the respected Princeton University cosmologist Jim Peebles is quoted as saying: "It's an embarrassment that the dominant forms of matter in the universe are hypothetical." In August 2001, *Astronomy* magazine cynically lambasted theorists. This is a snippet:

> "What's more, astronomers have gone to great lengths to affectionately name, define, and categorize this zoo of invisible stuff called dark matter. There are the MAssive Compact Halo Objects (MACHOs) – things like ... black holes, and neutron stars that purportedly populate the outer reaches of galaxies like the Milky Way. Then there are the Weakly Interacting Massive Particles (WIMPs), which possess mass, yet don't interact with ordinary matter - baryons such as protons and neutrons – because they are composed of something entirely foreign and unknown. Dark matter even comes in two flavors, hot (HDM) and cold (CDM)....."

> Astronomers and physicists have refined their dark matter theories without ever getting their hands on a single piece of it. But where is all of this dark matter? The truth is that after more than 30 years of looking for it, there's still no definitive proof that WIMPs exist or that MACHOs will ever make up more than five percent of the total reserve of missing dark stuff."

In review, Electric Universe theorist, Dr. Donald Scott, provided a new category for these "invisible" particles, which he described as, "Fabricated Ad hoc Inventions Repeatedly Invoked in Efforts to Defend Untenable Scientific Theories", FAIRIE DUST! Maybe, we can suggest that Astronomy magazine were expressing astronomical frustration at the failure of scientists to detect even a single WIMP after one year of trying! [42] The detector in question was developed by the Cryogenic Dark Matter Search (CDMS), a collaboration of 10 institutions and researchers from around the world. Five years later, it was reported in May 2004 that they still have not found any! In 2009, there were more rumors but no solid evidence and in September 2011, there was more talk of the 'hints' of dark matter. In 2003, The *Times* newspaper of the United Kingdom reported: "It remains possible that the WIMP is a phantom and does not exist, although this would require a revision of many fundamental theories of physics." In response, a researcher was quoted as saying, "One tries not to worry about that."

Big Bang Warfare

"*There are some ideas so wrong that only a very intelligent person could believe in them."*
George Orwell, Author

We now have a situation of "open warfare" in the astronomy community. The Australian plasma physicist Wal Thornhill puts it bluntly: "Forget the glossy astronomy books and magazines – the Big Bang is pure fiction" [43]. Critics have been seeing flaws in the Big Bang Theory for over 30 years. The famous astronomer Halton Arp, known for his classic work in *Arp's Atlas of Peculiar Galaxies*, became a modern day Galileo when he dared to contradict orthodox cosmology. For some forty years Halton Arp has been a keen observer of strange galaxies. He concluded that supposedly remote quasars (galaxies with extremely bright nuclei) are actually connected to nearby galaxies *by observable streams of plasma.* This news was not welcomed, and so he was branded a heretic and exiled from academia in the USA. His downfall came about because he exposed major weaknesses in prevailing theory, like redshift is not an indicator of velocity, quasars are not the brightest and most remote objects in the universe but

are nearby, and hence the reasoning behind redshifts and the Big Bang hypothesis immediately collapses. Arp found scientific asylum at the Max Planck Institute for Physics and Astrophysics in West Germany, but his reputation was such that he was still referred to as "the most feared astronomer on Earth" [44].

When Arp was refused telescope time and publication in standard journals, he responded by writing the books, *Quasars, Redshifts and Controversies* (1987), and *Seeing Red* (1998). This rebellion has been joined by other authors who have written titles such as *The Big Bang Never Happened* (1992) and *Bye Bye Big Bang – Hello Reality* (2002). The unorthodox are writing books, articles and setting up websites to demonstrate that something has gone wrong in the field of astronomy. Many widely held beliefs fly in the face of *observational evidence*. The Meta Research website keeps up to date "The top 30 problems with the Big Bang". The lead astronomer Tom Van Flandern states that his website "is dedicated to bringing some common sense back to this field [astronomy]" [45]. War broke out when a group of 33 "concerned" scientists signed, *"An Open Letter to the Scientific Community"* that was published in *New Scientist*, May 22, 2004 [46]. Of course, the subject of the skirmish was the Big Bang theory and the opening salvo started as follows:

> "The Big Bang today relies on a growing number of hypothetical entities, things that we have never observed – inflation, dark matter and dark energy are the most prominent examples. Without them, there would be a fatal contradiction between the observations made by astronomers and the predictions of the Big Bang theory.
>
> What is more, the Big Bang theory can boast **of no quantitative predictions that have subsequently been validated by observation.** The successes claimed by the theory's supporters consist of its ability to retrospectively fit observations with a steadily increasing array of adjustable parameters, just as the old Earth-centered cosmology of Ptolemy needed layer upon layer of epicycles*." [Bold added for emphasis]*

The accusation being made is that pure mathematicians, with little or no interest in experimental science and only a passing regard for direct observation, have indulged in "a carnival of speculation" [47]. In June 2005, a "Crisis in Cosmology" meeting took place in Portugal. The agenda was to highlight the inconsistencies between data and Big Bang theory. Special concern was directed at the properties of the Cosmic Microwave Background (CMB) – the so-called "echo" of the Big Bang – where theory and predictions was particularly difficult to reconcile [48]. It was reported that astrophysicists were unhappy that cosmologists have had to introduce weird concepts like dark matter and dark

energy to explain the universe. Others hit back, saying that they just needed to tweak the Big Bang model and tie up "loose ends". The question that needs to be answered is: when does the tweaking turn into a concerto, and what's more, when do we get the finale?

"The fact that an opinion has been widely held is no evidence whatever that it is not utterly absurd."
Bertrand Russell, Philosopher

Now that astronomers can peek into the womb of a newly forming star, they are astounded at what they see. Traditional cosmology says that stars are born by "gravitational collapse" of vast precursor clouds over great spans of time in dead cold conditions estimated at 400 degrees below zero Fahrenheit (minus 240 degrees Celsius). After millions of years, the collapse will cause the clouds to sufficiently "ignite the nuclear fusion" of a new star. Well, that's the theory, but what they actually observe is extremely high energies at work, strong enough to produce X-rays! This latest blow to orthodoxy was reported by NASA-funded research at the Goddard Space Flight Center. In March 2005, the "surprise" was reported as, "The detection of X-rays this early indicates that gravity alone is not the only force shaping young stars" [49]. As researchers watched the electrical birth of the new star R Corona Australis, they concluded, "some previously unrealized energetic process, likely related to magnetic fields, is superheating parts of the cloud, nudging it to become a star". Basic physics tells us that you cannot have a magnetic field without the electrical component, but this force is traditionally *never* considered in cosmology. Plasma physicists propose that you don't even need a cloud of hydrogen because space is nearly all plasma all that is required is a separation of charge. Positive ions and negative electrons will move, and because protons are a couple of thousand times more massive than electrons, the effects of any force—electrical, magnetic, gravitational, even mechanical—can cause some separation of charges. A weak electric field will drive an electric current, which will create a magnetic field, the whole thing will start to feed on itself and before you know it, a star is born! The electromagnetic force is doing the work and this explains why events can occur very rapidly, "10 times faster than gravity could account for". So let's think: why would the Universe use gravity when electricity is much more efficient?

Black holes that exist at the center of many galaxies are very much in vogue, but skeptics compare this belief along with Big Bang theory, as a form of religious mania [50]. Incidentally, the astronomer Fred Hoyle was the first to use the term Big Bang, it was used disparagingly, but ironically it stuck. Yet, looking at the contrary evidence, Big Bang orthodoxy does seem to be a matter of faith

for many scientists. In this regard, it is interesting to know that the idea was first proposed in 1927 by Belgian priest and astronomer, Abbe Georges Lemaître and in 1951 it even received the blessing of Pope Pius XII! What is agreed amongst astrophysicists is that there *is* evidence for the existence of highly condensed aggregates of matter that produce very strong gravitational fields. But the fact remains that what is taken to represent a black hole actually appears to be undergoing *explosive* activity rather than swallowing things up! [51] Another "surprise" occurred for European astronomers when they discovered a vast "jet-powered bubble" formed in the "gas" around a black hole in the Milky Way. This was reported as:

> "Remarkably, it also means that, after a massive star dies and turns into a black hole, it is still capable of energizing its surroundings, *by means of completely different mechanisms*. *[Emphasis added]*
>
> The importance of this result is that it demonstrates that black holes such as Cygnus X-1, of which there may be millions within our galaxy alone, do not swallow all of the infalling matter and energy, but rather redirect a considerable fraction of it back into space.
>
> We knew about jets from black holes and expected to discover some interaction of the jet's energy with the gas in our Milky Way, but the size and energy content of this bubble came as a surprise." [52]

Skeptics believe that the public is largely being fed with speculation and propaganda. Wal Thornhill suggests that, "Without the checks and balances of experiment and direct observation of black holes, astrophysicists long ago slipped their leash" [53].

The recent observation of copious emissions of X-rays and gamma rays in space, initially puzzled conventional astronomers, but now new theories are emerging, offering this initial "surprise" as evidence of black holes. Here are the differing explanations for the recent discovery of high energy in the form of gamma rays and X-rays in space:

Plasma Electro-Dynamics – Plasma physicists gloat that they can recreate the same effects in the laboratory, and they simply suggest it is the way that nature concentrates electrical power in a plasma to produce the powerful beam of gamma and particle radiation seen *coming out of* what have been described as black holes. This is a known effect and is termed the 'plasma gun' or plasma focus. This effect explains the spectacular pictures of quasar ejection from the core of active galaxies (see plate 6). These produce 'jets', with velocities of more than 99.995 per cent of the speed of light! Black holes are not needed to explain

this phenomenon and are dismissed as imaginary. According to Los Alamos National Laboratory a slightly more technical view would be:

> "Plasma tends to separate into regions according to temperature, density, magnetic field strength, chemical constituency, and other physical properties. Wherever these regions are in relative motion, they are coupled by electrical currents that they drive in each other. Like all electrical currents, the circuit paths are closed, sometimes over very great distances. Thus plasmas in relative motion in one part of the universe can produce prodigious amounts of electrical energy. This energy may be transferred over many billions of light years to burst suddenly from a very small and localized region representing the circuit load." [54]

Gravity Dynamics – Gamma ray emissions from black holes were a "surprise" to researchers, so at the Max Planck Institute for Astrophysics, they have been busy developing new relativistic models. Theorists now believe the gigantic energy source, which powers gamma-ray bursts is caused as follows:

> "…a rapidly spinning black hole, which forms when the central core of a dying star becomes unstable and collapses under its own gravity. This newly formed black hole then swallows much of the infalling stellar matter and thereby releases enormous amounts of energy in two "jets". These expand "highly relativistically", i.e. with almost the speed of light, along the rotation axis of the star. Before they break out from the stellar surface, they have to drill their way through thick layers of stellar material, thus getting collimated into very narrow beams with an opening angle of only a few degrees." [55]

The Max Planck approach is a good example of an old idea being revamped to fit observation, which is not strictly scientific. A good theory is one where predictions can be made and the theory can be tested, if possible, by experiment and eventually validated by data and/or the predictions being observed. Anything else can be viewed with suspicion. For those who want to judge the merits of what have been called black holes, if you need a reminder, gravity is a very weak force! It would also appear from these accounts, that to fully understand the universe and universal energies, we have to understand the properties of plasma and

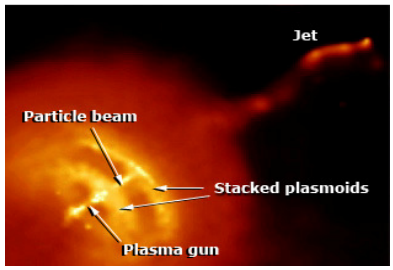


Figure 1.12 The Vela Pulsar is a supernova remnant 800 light-years from Earth. It was first detected at gamma-ray energies and modeled as a spinning magnet, which generates a powerful electric field. According to plasma physicists the "jets" are an electrical discharge of plasma at the center of an intense electric field. Credit: NASA/PSU/G. Pavlov et al.

the science of electromagnetism. Thus, a recent discovery by astronomers at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, US, has led them to believe that black holes do not exist and are in fact "bizarre" compact balls of plasma called "Magnetospheric Eternally Collapsing Objects" (MECOs) [56]. Incredibly, these scientists have come up with a scientific theory that completely negates the current paradigm and is much more closely aligned to standard plasma cosmology. In July 2006, *New Scientist* magazine reported that scientists had probed the structure of a quasar in much finer detail than is normally possible. Quasars are usually described as "a bright, compact object, whose radiation is usually thought to be generated by a giant black hole devouring its surrounding matter", but the report stated:

> "According to the MECO theory, objects in our universe can never actually collapse to form black holes. When an object gets very dense and hot, subatomic particles start popping in and out of existence inside it in huge numbers, producing copious amounts of radiation. Outward pressure from this radiation halts the collapse so the object remains a hot ball of plasma rather than becoming a black hole."

Despite the dominance of black hole theory, we cannot make the assumption that it is correct. Nobel Prize-winning chemist Irving Langmuir, insisted that we must be cautious of scientific conclusions and he coined the term "Pathological Science", which is defined as a psychological process in which a scientist, originally conforming to the scientific method unconsciously veers from that method, and begins a pathological process of wishful data interpretation [57]. Maybe this explains why most scientists appear to be willfully ignoring the facts, regardless of the data staring them in the face. Not understanding that the electromagnetic force rules the Universe, has now reached pathological status.

The Inside Info on Cosmic Power

Since the 1980s, astronomers have been mapping the universe. They knew that galaxies are concentrated into enormous clusters, but observers also discovered that the clusters are themselves concentrated into vast sheets, or walls. In between the walls are giant voids almost free of galaxies. The size of the cosmic voids ranges from tens to hundreds of millions of light years. On these scales, the universe looks like Swiss cheese or a sponge, more hole than substance. Astronomers have since struggled to explain the origin of these observed structures and hence are starting to propose new theories to explain the precise distribution of the clusters and voids, which some refer to as "The

Honeycombed Universe" [58]. Yet, there is plasma theory, and so we find this explanation from Hannes Alfvén, who writes:

> "Space is filled with a network of currents which transfer energy and momentum over large or very large distances. The currents often pinch to filamentary or surface currents. The latter are likely to give space, as also interstellar and intergalactic space, a cellular structure.
>
> One of the notable characteristics of space plasma, revealed by satellites and space probes, is its tendency to form *sharp boundaries* between plasmas with different properties. This tendency towards "*cellular structure"* can have profound astrophysical implications such as generating electric fields in space and providing sources of energy for driving electric currents over very large distances." [59]

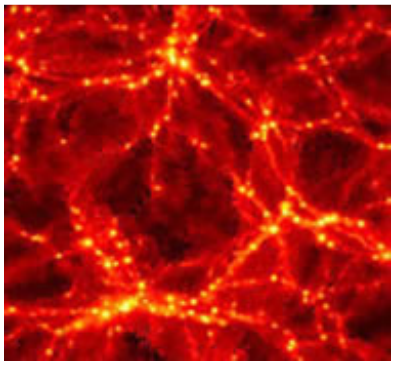


Figure 1.13 The Cosmic Web
Credit: Uri Keshet

The computer simulation image shown in figure 1.13 represents the large-scale structure in the universe, known as "The Cosmic Web". Galaxies line filaments of matter like pearls on a string, and galaxy clusters arise where filaments meet. According to plasma physicists, this image is distorted because the galaxies have been placed by the computer at their redshift distances [60]. However, galaxies do form linear chains, but such structure is not expected from gravity-driven formation of the Universe however, it is expected from plasma cosmology, where galaxies form at the intersection of two intergalactic Birkeland current filaments. In metaphysical circles, there is much talk of *Energy,* and this is attributed to the "sea" of invisible energy that is accessible to every human. The mystic Lee Carroll has given structure to this invisible realm he has called, "The Cosmic Lattice". We are told that this energy source can be considered the common denominator of the unified energy source of the Universe. Carroll states:

> "Everything that you can see and everything you cannot see contains The Lattice. From the smallest particles of your physics, and from the electron haze forward, the Cosmic Lattice is present. The Cosmic Lattice is what you would call the consciousness of God, yet it is physics and it is energy and it contains conscious love. [61]
>
> The Cosmic Lattice is now responding to something it never did before on your planet. Energy is being created and time is being altered — all through

> human intent. There is no greater power in the Universe than human intent and love, and we have told you this fact repeatedly…This is the night we finally have to correlate and equate it with the physics of love!
>
> Now you begin to understand why New Age energy facilitators can do so much! They are tapping into The Cosmic Lattice. There is no longer mystery regarding this, instead it will be someday… replaced with good solid science... God given, and Universal.
>
> I will not be the only channel to bring forth this principle, and it will be known by many names, and will be the source of tremendous power—actual physical power—power that you can use for travel and energy... power that you can use for life sustenance… There is no cleaner power anywhere than the lattice. This is physics, and it is known even by the enlightened that travel from here to there within the cosmos... **in fact they often "ride" the lattice strings**.
>
> We brought you the concept years ago of The Cosmic Lattice. I want you to take a look at the lattice for a moment. **Gaze into that vast area of strings connected to strings**. The Lattice is profound in its shape. Energy is connected to energy – everyone to everyone – everything to everything – every planet to every planet – every solar body to every solar body." [62] *[Bold added for emphasis]*

The string*s* of the Cosmic Lattice are now indirectly observed in space, appearing at vastly different scales. Scientists searching for missing matter predicted that this material could be in giant cosmic strings in dark mode connecting superclusters in approximately straight lines [63]. In the search for "missing" matter, it was theorized that a reservoir of hot gas would organize into a web of filaments, like those seen in computer simulations of structure formation. Largely, undetected by current instruments, the description given is "The Hot Cosmic Web". Scientists admit that the existence of strings would provide the answer to many astrophysical enigmas. Cosmic strings are thought to be a consequence of the emerging Universe, as it expanded and cooled rapidly, from the original Big Bang. It is postulated that this event would have created features known as "topological defects", which can be compared to how ice on a freezing pond forms plates with zig-zag boundaries between them. Theory holds that these defects would create cosmic strings, curiously microscopic and massive at the same time. The theory has credibility because the processes can be simulated in the laboratory and what's more, as astronomical measurements are refined, its predictions can be tested by observation [64]. For further insight, see Appendix II, "The Cosmic String Tutorial". The Cosmic Lattice is also envisaged as "a celestial superhighway" and "a network of tubes crisscrossing through the solar

system." This is achieved by studying the mathematics underlying subtle gravitational interactions between planetary bodies. At the same time, engineers are currently designing trajectories to send spacecraft along these routes to make voyages that were previously unimaginable. Thus, we find:

> "Unlike terrestrial highway systems, the interplanetary superhighway is not static. The Earth-Sun Lagrange points and tubes, for instance, are stationary only when considered in the Earth-Sun rotating frame. In reality, the tubes flail about "like streams from a crazy garden sprinkler,… and the patterns of highway interchanges keep shifting." [65]

Even more surprising, scientists speculate that the web in space could be used for extraterrestrial communications as a galactic internet! Amongst scientists, CETI refers to Communications from ExtraTerrestrial Intelligences and is distinguished from SETI, Search for (or Signals from) ExtraTerrestrial Intelligences. SETI assumes that the ETs have set up a beacon to attract our attention. CETI assumes that the ETs don't really care whether or not they attract our attention, but are busily communicating among themselves and that we might be able to eavesdrop on their conversations! So we find that scientists think: "The network of tubes of light would be a natural foundation for the ETs to build on to construct their galactic CETI Internet." [66] In 1963, U.S. military Vela satellites were launched with the intention to monitor Soviet compliance with the nuclear test ban treaty. Instead, they picked up gamma ray bursts (GRBs), but it took until 1967 to realize that the gamma rays were originating from space. So in the usual manner, this information was not made public until 1973 [67]. In the report *Gamma Ray Bursts and CETI,* from 1993 it states, "If GRBs are the gamma ray CETI signals from such a galactic Internet, then the duration of each message is ~30 sec, and there are about 2 messages/day." [66]

Diamonds in the Heavens: As Above, So Below

Galaxies are defined as large groupings of stars, planets, moons, comets, asteroids, nebulae, dust, neutron stars, and black holes, in fact most of the objects that cosmologists study in space. Since most of the space between galaxies is thought to be empty, a galaxy is essentially an oasis in space. Our own solar system is located within a galaxy that we call the Milky Way, which consists of over 100 billion stars. The Milky Way is a gigantic spiral disk, with a bright, central bulge, and our solar system is located about 3/4 of the way out from the center in one of the galaxy's spiral arms. The stars and our solar system within the Milky Way are revolving around the central core.

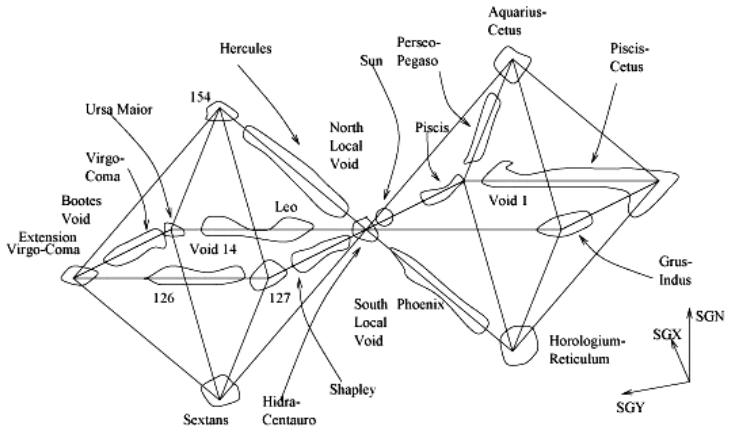


Figure 1.14 The two largest supercluster diamonds closest to the Milky Way. Battaner and Florido, 1997 Credit: Battaner et al

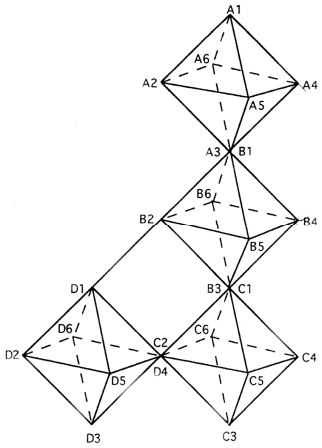


Figure 1.15 The Supercluster "Diamond Lattice". Schematic outline showing 'A' and 'B' 3-D octahedra superclusters closest to us, while 'C' and 'D' are farther away. Credit: Battaner et al.

There is nothing static in the universe, and our Milky Way, seems to be moving, spreading away from other galaxies at tremendous speeds. There are billions of galaxies in the universe, but they are not randomly distributed at all and the universe appears to have an overall shape and structure on the large scale. Galaxies tend to be part of groups called clusters and our Milky Way is part of a group of about 40 galaxies known as the Local Group, which is actually quite a small grouping. Most clusters tend to be part of larger groupings called superclusters and our Local Group is part of the massive Virgo supercluster, which contains over 2000 member galaxies. Now, as astronomers map the locations of these galaxies, an amazing big picture is emerging. What was once assumed to be random distribution of galaxies is now revealing its self to be a complicated design. Large galactic superclusters are gathered around what appears to be giant voids or bubbles, which reveal an octahedron structure on a huge scale (see figures 1.14 & 1.15). Thus, what

astronomers have actually discovered is *The Diamond Lattice of the Universe!* Astronomers give many names to what they see and we have already mentioned the "honeycomb", "Swiss cheese" and "sponge-like" arrangement, of the galaxies. In the paper *The Egg-Carton Universe*, Spanish scientists Drs. E. Battaner and E. Florido, write:

> "The distribution of superclusters in the Local Supercluster neighborhood presents such a remarkable periodicity [i.e. ordered pattern] that some kind of network must fit the observed large-scale structure. A three-dimension chessboard has been suggested. The existence of this network is really a challenge for currently-suggested theoretical models... In this case, however, the identification of real octahedra is so clear and the network is so noticeably well-defined that a direct inspection is straightforward." [68]

Scientists are now busy trying to explain what they see as the fractal nature of the universe. They see diamonds within diamonds within diamonds [69].

"So the Cosmic Microwave Background Radiation is not the afterglow of some mythical 'Big Bang', in which all matter and energy, and even and space time, were created out of nothing, but the signature of the ongoing generation of matter out of the aether."
David Pratt, Metaphysician

There was also another "surprise" for scientists who were looking for validation for the Big Bang theory from the Cosmic Microwave Background (CMB), the so-called "echo" of the Big Bang. Analysis has shown that even the most basic predictions of the Big Bang theory were contradicted by the data. Big Bang predicts that tiny fluctuations in radiation intensity would be randomly scattered across the sky as a leftover from the original Big Bang. In March 2003, it was announced that the CMB was anything but random and measurements displayed symmetry (see figure 1.16). These are comments from Dr. Max Tegmark, of the University of Pennsylvania, US, who processed the WMAP satellite data of high resolution data and produced images of the radiation intensity across the sky [70].

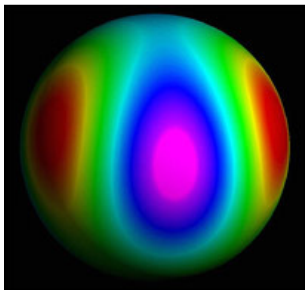


Figure 1.16 Diamond in a sphere: The symmetry of the Cosmic Microwave Background, this image shows the quadropole components only. Credit: Dr. Max Tegmark, University of Pennsylvania, US

> "We found something very bizarre; there is some extra, so far unexplained structure in the CMB. We had expected that the microwave background would be truly isotropic, with no preferred direction in space but that may not be the case.
>
> The octopole and quadrupole components are arranged in a straight line across the sky, along a kind of cosmic equator. That's weird.
>
> We don't think this is due to foreground contamination. It could be telling us something about the shape of space on the largest scales. We did not expect this and we cannot yet explain it."

This latest discovery has set the astronomical community alight and the phrase "axis of evil" has been coined to describe the apparent "warping" of the cosmic background radiation [71. But seemingly, it also provides confirmation for scientists who do not believe in the existence of hypothetical "dark matter" and propose simpler theories based on geometry and the frequency of vibration (sound). The "axis" is just one way of illustrating data and can be compared to the two-dimensional, flat representation of a diamond (see figure 1.17). According to a NASA commentator:

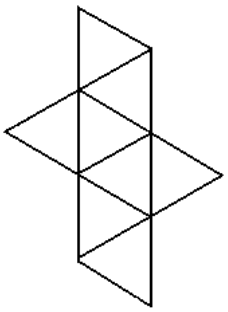


Figure 1.17 Diamond layout in two dimensions.

> "A visual image of the Universe reveals only the superficial appearances, but plasma studies will reveal the invisible structure of space and the processes that may have formed the solar system from dust and plasma." [72]

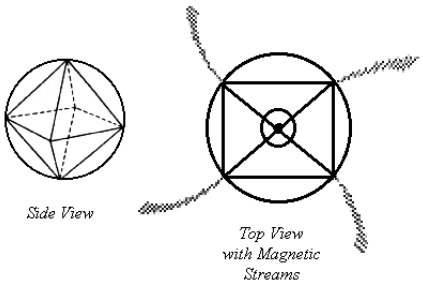


Figure 1.18 Diamond energy pattern within the Sun. Credit: David Wilcock

So is there evidence of other diamonds at a star and planetary level? Well, the Sun demonstrates an octopolar magnetic field when it is most active (see figure 1.18). There are four evenly-spaced points along the equator of the Sun that are known to emit showers of charged energy particles like a slowly-rotating lawn sprinkler. Four times each month, the Earth passes through another wave of

these particles, which are either positively or negatively charged. The four coordinate points of this energetic emergence along the Sun's equator and its North and South Pole define an octahedron. The energy streaming out of all of its points are where plasma/aetheric energies are the most focused [73]. We find that a consortium of fifty astronomers known as the Whole Earth Telescope Group reported the discovery of a carbon planet with a huge cosmic diamond interior [74]. For more than four decades, astronomers suspected that the interiors of white dwarfs – the name for a star that has used all up its internal nuclear fuel – become crystallized. A pulsating white dwarf called the Diamond Star is the first direct observational evidence and was found to have a crystal interior the size of our moon. Physics theory makes the assertion, "Once a white dwarf becomes crystalline, it lives forever." From a metaphysical point of view that is quite interesting! At vastly different scales, the universe displays diamond geometry. Here, we have discovered one of the rules of the universe and this same diamond geometry can be found much closer to home!

It has to be understood that these new discoveries are occurring at exactly the same time that many theories, even the most sacrosanct, are being challenged. For example, the suggestion that gravity is just an electromagnetic side-effect is being seriously considered [75]. An article with the following headline seems to be some acknowledgement:

> "Gravity may not be working as advertised. Spacecraft hurtling through the Solar System have been behaving so bizarrely that some scientists wonder whether our theories of gravity are wrong." [76]

Today, even as many gravity-based theories abound, they are gradually losing steam in the face of cosmic features, which defy conventional beliefs. The importance of this has to be underlined, as electrical conditions in our solar system change. For instance, previously stable comets break up for reasons that are totally inexplicable by conventional theory. Yet plasma cosmology can offer us a simple explanation [77].

This all adds up to illustrate a few themes that run through this book. We are still learning! Brilliant minds, decades ahead of their peers, are normally proven right—eventually, but usually in their time were ignored or treated with skepticism. Mathematics, or any field of science that "appears" to work on paper, is not the same as the whole picture of theoretical, observational and experimental evidence. Ideology can become entrenched and minds can be closed, so that the obvious can be ignored, even in the face of incontrovertible evidence. Sudden paradigm shifts can occur, but often truths are suppressed to maintain the status quo, taking decades to become established. In this situation,

truth seekers have to be proactive and use intuition as well as knowledge to gain new insights.

> *"Suddenly, the 'big picture' has changed. For decades we believed that gravity alone rules the macrocosm. Then a crescendo of space age discoveries revealed one of the great surprises of the twentieth century--a universe driven by electric currents and punctuated by cosmic violence."*
>
> *"From the smallest particle to the largest galactic formations, a web of circuitry connects and unifies all of nature, organizing galaxies, energizing stars, giving birth to planets and, on our world, controlling weather and animating biological organisms. There are no isolated islands in space."*
>
> *David Talbott & Wallace Thornhill, 'Thunderbolts of the Gods'*