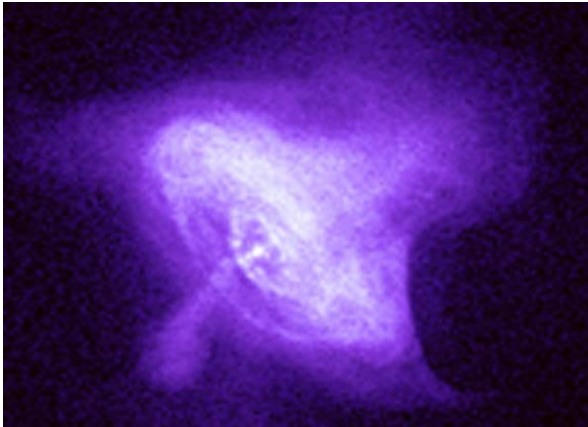


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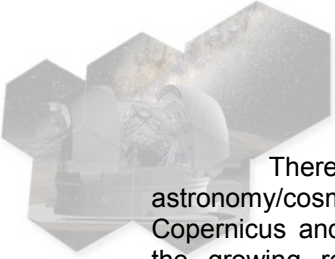
Electric Sky

***Donald E. Scott, Ph.D. (Electrical
Engineering)***

***Author of the book - The Electric
Sky***



The M1 Pulsar - X-ray Image by Chandra



There is a revolution just beginning in astronomy/cosmology that will rival the one set off by Copernicus and Galileo. This revolution is based on the growing realization that the cosmos is highly electrical in nature. It is becoming clear that 99% of the universe is made up not of "invisible matter", but rather, of matter in the plasma state. Electrodynamical forces in electric plasmas are much stronger than the gravitational force.

Mainstream astrophysicists are continually "surprised" by new data sent back by space probes and orbiting telescopes. That ought to be a clue that something is wrong. New information always sends theoretical astrophysicists "back to the drawing board". In light of this, it is curious that they have such "cock-sure" attitudes about the infallibility of their present models. Those models seem to require major "patching up" every time a new space probe sends back data.

Astrophysicists and astronomers do not study experimental plasma dynamics in graduate school. They rarely take any courses in electrodynamic field theory, and thus they try to explain every new discovery via gravity, magnetism, and fluid dynamics which is all they understand. It is no wonder they cannot understand that 99% of all cosmic phenomena are due to plasma dynamics and not to gravity alone.

When confronted by observations that cast doubt on the validity of their theories, astrophysicists have circled their wagons and conjured up pseudo-scientific invisible entities such as neutron stars, weakly interacting massive particles, strange energy, and black holes. When confronted by solid evidence such as Halton Arp's photographs that contradict the Big Bang Theory, their response is to refuse him access to any major telescope in the U.S.

Instead of wasting time in a futile battle trying to convince entrenched mainstream astronomers to seriously investigate the Electric/Plasma Universe ideas, a growing band of plasma scientists and engineers are simply bypassing them. A new electric plasma-based paradigm that does not find new discoveries to be “enigmatic and puzzling”, but rather to be predictable and consistent with an electrical point of view, is slowly but surely replacing the old paradigm wherein all electrical mechanisms are ignored.

This web site is dedicated to explaining the basis of this ongoing scientific shift. It also presents links to other sites where you can investigate the details of what is happening.

These pages are designed to be read through in order, starting with the Introduction. If you do this, the background information needed for understanding any given page will have been presented in an earlier page. However, each of the topics below is discussed in a reasonably self-contained way for anyone who just wants to pick and choose. Enter the site by clicking on the link to the [Introduction](#) below.



Introduction to the **Electric Cosmos**

What is wrong with present-day accepted astrophysics

It is not scientific. In today's world many people characterize themselves as being 'scientists'. Only those who always carefully follow the scientific method are deserving of that title. Modern establishment astrophysics fails the test in several ways.

The Empirical Scientific Method

Scientists are distinguishable from artists, poets, musicians, and others in that they use what is known as the 'scientific method'. It is not that 'inspiration' or 'the muse' is not valuable in science, it is - but it is **not the starting point** of what we call science. In the process called the scientific method a true scientist will:

- Observe nature - carefully record what is seen.
- Seek patterns in the observed data - put numbers on the data - fit equations to those numbers.
- Generalize those equations into a word description of the process - this is a **hypothesis**.
- Carry out **experiments** and/or gather independent data to see how well the

hypothesis **predicts** future observations and results. This is called "closing the loop" on your hypothesis.

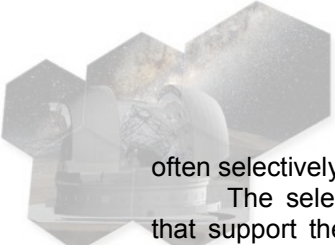
- **Reject**, or **modify** the hypothesis if the experiments show it falls short of success in these predictions.
- Only after the results of several experiments have been successfully predicted by the hypothesis, can it be called a **theory**.

If two different theories predict a given phenomenon equally well, the **simpler theory** is probably the best one. This principle is called **Occam's Razor**.

Theories can never be proven to be correct - some other mechanism entirely may be the cause of the observed data. But theories can be **disproved** if they fail to predict the outcomes of additional experiments. Such theories are termed to be **falsified**. Sometimes the scientific method as described above is called the **empirical** method.

The Deductive Method

As an alternative to the empirical method, there is a method of deriving theories from **assumed** generalizations about the universe. This is called the deductive method. In this process one starts with a "law of nature" or "obviously correct" generalization about the "way things work" and **deduces** (reasons out - derives) its consequences in detail. A hypothesis arrived at via this method is promoted to the status of being a Theory if a large enough body of experts 'accept' it. Thus, in this method, a vote of the experts determines if a theory is correct. Once such a theory has been accepted it is not easily rejected in light of conflicting evidence; it is, however, often modified - made more complex - and, unfortunately, new data is



often selectively chosen to support it.

The selection and publication of only the data that support the accepted theory is expedited by the "peer review system". If the experts who have accepted a given theory control both the funding of future research and also what gets published, there is little chance for conflicting viewpoints to develop.

Pseudo Science

Some hypotheses, when presented by august, well established scientists, are given credence without anyone questioning whether the hypothesis has been developed using the scientific method. Yet in most cases it is not difficult to check whether or not the scientific method has been used correctly. For example, consider the hypothesis that "There are gnomes in my garden that always make themselves invisible when anyone tries to observe them." Clearly, no conceivable experiment or observation could falsify that statement. This is evidence the hypothesis comes from a pseudo-scientific source. Legitimate theories must be **falsifiable**.

The Problem Faced by Modern Astronomy is that Experiments Are Not Possible

Because the stars are light years away, we cannot hope to be able to go there and perform experiments on them. Until relatively recently even the planets were out of our reach. Thus, cosmologists never get to complete the scientific method. We cannot 'close the loop' in cosmology. But, if we **cannot test our hypotheses**, how can we reject or modify them? The answer, of course, is that astrophysicists, more than those in any other branch of science, must be exceedingly careful to continually examine their hypotheses **in light of any new data**. It is the contention of the author of these pages that they have not been doing this.

Einstein was a purely theoretical physicist - he never went near a physics lab. He conducted only 'gedankenexperimenten' - thought experiments - in order to arrive at his general theory of relativity (GR). This is a perfect example of the deductive method at work. Its use is exceptionally dangerous in an area like cosmology wherein it is difficult to falsify any theory. Now that the GR Theory is accepted by establishment astrophysics, any new data (such as photographs of the astronomical object known as the "Einstein Cross") are discussed only within the framework of this complicated theory.

The images of the four small objects in the Einstein Cross when looked at only from this viewpoint, are considered to be supporting evidence for the GR Theory. However, they could just as well be interpreted as being evidence supporting a much simpler cosmological theory.

Evidence contradictory to the accepted Big Bang Theory, such as images of connections between objects that have widely different red shift values, are dismissed as being mirages.

False Assumptions in Astrophysics

Most of today's accepted astronomy/cosmology is a set of deductively arrived at hypotheses precariously based on two **false assumptions** :

1. Electrical fields, currents, and plasma discharges are not important in space. **Only** gravitational and magnetic fields are important.
2. If the light from an object exhibits redshift, the object **must** be speeding away from us. And its distance from us is directly

proportional to that speed.

Both of these assumptions are demonstrably wrong. They have been, and continue to be, contradicted by actual observations of the sky. Those observations tell us that

- i. The universe is highly **electrical** in nature.
- ii. Redshift is more a measure of an object's **youth** than its velocity.

The continued refusal of astrophysicists to re-examine their hypotheses in light of these new observations is the focus of these pages.

Invisible Entities Invented To Patch Up Failing Theories

The theories that have sprung from these faulty, overly complicated mathematical models have given birth to such arcane notions as: curved space, neutron stars, WIMPs (and now WIMPZILLAS), MACHOs, several different types of black holes, superluminal jets, dark energy, and magnetic field lines that pile-up, merge and reconnect. All of these inventions are fictions put forth by astrophysicists in desperate efforts to defend their theories when faced with contradicting observations. None have ever been observed or photographed. Many of them are demonstrably impossible. But their existence is repeatedly invoked to explain new observations and measurements that contradict the enshrined theories of modern astronomy without resorting to the use of electrical principles.

We continually hear statements such as, "There must be a black hole at the center of that galaxy." (Otherwise we cannot explain its level of energy output.) "There must be invisible dark matter in that

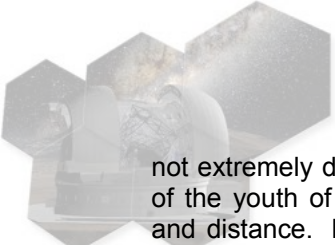
galaxy." (Otherwise we cannot explain how it rotates the way it does.) "Ninety nine percent of the universe is made up of dark energy." (Otherwise the Big Bang Theory is falsified.) "Pulsars must be made up of strange matter." (Otherwise we might have to look for an electrical explanation). We are also asked to believe that two objects (like galaxy NGC 4319 and its companion Markarian 205) are not connected together even though we have photographs of the connection. So, we are told **not** to believe in the things that we can see, but that we **should** believe in the existence of the magic entities that their theories require - even though we cannot see or measure them.

Astrophysicists Denigrate Outsiders - Then Quietly Adopt their New Ideas

There have been several instances in the past when the astronomical mainstream has long rejected an idea that is later accepted. There is usually no public disgrace for the in-group who were on the wrong side of the issue. When, after being viciously denigrated, the validity of a new idea becomes inescapably obvious, a few years go by, and then we quietly hear: "Well, Everyone has known for a Long Time that this (the new idea) was always true." An example of this is Hannes Alfvén's discovery of plasma waves. This relatively recently discovered property of plasmas is now being wrongly used by astrophysicists to explain away all sorts of (what is for them) enigmatic phenomena - such as the temperature inversion in the Sun's lower corona.

The Future

In a few years, perhaps we will hear: "Well, Everyone has known for a Long Time that quasars are



not extremely distant, and red shift is more a measure of the youth of an object than its recessional velocity and distance. No one said for sure there ever was a Big Bang. It was just another false theory. Everyone has known for a Long Time that electric currents flowing in plasmas produce many of the mysterious observed solar and cosmic phenomena." And we will not hear of machos, wimps, neutronium, dark energy, and broken magnetic field lines from any serious scientist ever again.

Time will tell.

Will the founders of the Electric / Plasma Universe Theory be acknowledged as having been the pathfinders they are?

Or will lesser men quietly adopt these ideas without giving credit to their originators and then claim them to be 'well known'?

This Web Site

The following pages discuss some of the people, observations, and ideas, that challenge the false assumptions that mainstream science refuses to re-examine. When you read them, remember that any single unanswered challenge of this sort is enough to bring down the pseudoscientific magic show that modern astronomy/cosmology has become - like a house of cards.

A Conceptual Model

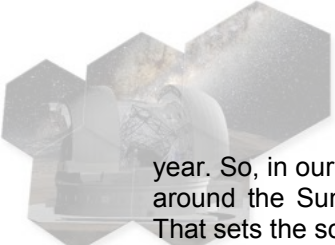
of Interstellar Space

Modern astronomers claim that the only forces capable of forming and driving the galaxies that make up the universe are gravitational and magnetic fields. In order to judge whether this or any alternative explanations are reasonable, we have to be able to visualize the relative sizes of stars and the distances between them.

In order to do this, we need a scale model that humans can relate to. It is very difficult, if not impossible, for us to relate conceptually to how far something is from us when we are told its distance is, say 14 light years. We know that is a long way - but HOW long?

Burnham's Model

In his "Celestial Handbook", Robert Burnham, Jr. presents a model that offers us a way to get an intuitive feel for some of these tremendous distances. The distance from the Sun to Earth is called an Astronomical Unit (AU); it is approximately 93 million miles. The model is based on the coincidental fact that the number of inches in a statute mile is approximately equal to the number of astronomical units in one light



year. So, in our model, we sketch the orbit of the Earth around the Sun as a circle, two inches in diameter. That sets the scale of the model. One light year is one mile in the model.

The Sun is approximately 880,000 miles in diameter. In the model that scales to $880,000 / 93,000,000 = 0.009$ inches; (Approximately $1/100$ of an inch in diameter). A very fine pencil point is needed to place it at the center of the (one inch radius) circle that represents the Earth's orbit.

In this model, Pluto is an invisibly small speck approximately three and a half feet from the Sun. All the other planets follow almost circular paths inside of this 3.5 foot orbit. If a person is quite tall, he or she may just be able to spread their hands far enough apart to encompass the orbit of this outer planet. That is the size of our model of our solar system. We can just about hold it in our extended arms.

The nearest star to us is over four light-years away.

In our model, a light year is scaled down to one mile. So the nearest star to us is four and a half MILES away in our model. So when we model our Sun and the nearest star to us, we have two specks of dust, each $1/100$ inch in diameter, four and a half miles apart from one another. And this is in a moderately densely packed arm of our galaxy!

To quote Burnham, "All the stars are, on the average, as far from each other as the nearest ones are from us. Imagine, then, several hundred billion stars scattered throughout space, each one another Sun, each one separated by a distance of several light

years (several miles in our model) from its nearest neighbor. ***Comprehend, if you can, the almost terrifying isolation of any one star in space*** because each star is the size of a speck of dust, about 1/100 inch in diameter - and is ***miles*** from its nearest neighbor.

When viewing a photographic image of a galaxy or globular star cluster, we must remember that the stars that make up those objects are not as close together as they appear. A bright star will "bloom" on a photographic plate or CCD chip. Remember the two specks of dust, miles apart.

Even ***in our model***, the collection of stars that makes up our Milky Way galaxy is about one hundred thousand miles in diameter. This is surrounded by many hundreds of thousand of miles of empty space, before we get to the next galaxy. And on a larger scale, we find that galaxies seem to be found in groups - galaxy clusters. On this gigantic scale even our model fails to give us an intuitive feeling for the vastness of those distances.

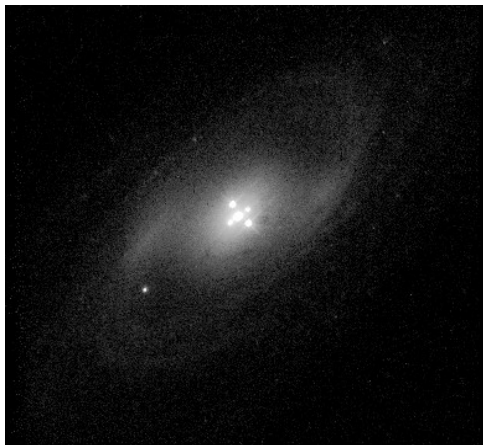
Because the stars are so small relative to their separation, they have only an extremely small gravitational pull on each other. However, it is now well known that the entire volume of our galaxy is permeated by plasma - huge diffuse clouds of ionized particles. These electrically charged particles are not relatively far from each other. And they respond to the extremely strong Maxwell / Lorentz electromagnetic forces (36 powers of 10 stronger than gravity). It is becoming clear that galaxies are not held together by gravity, but, rather, by dynamic electromagnetic forces.



Gravitational Lensing

As an application of the insight afforded by Burnham's model let us consider the oft proclaimed phenomenon known as gravitational lensing. If a far distant object lines up precisely with Earth and an intermediate object that has enough mass, Einstein's theory of relativity suggests that the light from the farther object will be bent - producing multiple images of that distant object when it is observed from Earth. Gravitational lensing is now a standard explanation used by mainstream astronomy to discredit any observations of quasar pairs situated very near their parent galaxies. We are told that any images of this sort are "mirages" due to gravitational lensing. Once this explanation is accepted by a gullible public, the way is cleared for its continued use, no matter how improbable its repeated occurrence is.

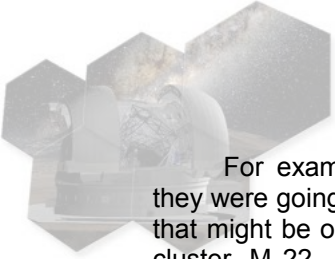
An image of the The "Einstein Cross" is shown below. NASA claims that the four small quasar objects flanking the central bright core of the galaxy represent only a single quasar located in the far distance directly behind the center of the galaxy - they tell us that we are not seeing four separate quasars - this is only a "mirage". The reason for their conclusion that the four small quasar images are in the deep background is that they have a vastly greater redshift value than does the central galaxy.



Spectral analysis of the region between the quasars indicates they are connected to the galaxy by streams of Hydrogen gas (plasma). ***This plasma has the same extremely high redshift value as do the quasars.*** So, what we actually have are four newly formed quasars symmetrically positioned around the active nucleus of a barred spiral galaxy. There is no mirage. No relativistic magic is needed to explain what we see happening in front of our eyes.

Most important is the fact that for a foreground galaxy to gravitationally 'lens' a background QSO, ***the mass of the galaxy would have to act as if it were concentrated at the galaxy's center.*** We know from the difficulties associated with galactic rotation profiles that ***this does not occur.***

But what is ignored by astrophysicists is the statistical improbability of this line-up happening in the first place, let alone over and over again.



For example, astronomers recently announced they were going to look for gravitational lensing effects that might be occurring in the closely packed globular cluster, M 22. For such a gravitational lensing effect to be visible on Earth, two stars in the cluster and the Earth must line up - all three objects - on the same precise straight line. Let us calculate the probability of that happening with any two stars in M 22.

M 22 contains on the order of 500,000 stars and is approximately 50 light-years in diameter. Therefore, stars in the center of M22 are separated by distances in the order of 0.5 light year. (1/2 mile in Burnham's model.) Assume that stars in the M 22 cluster are of the same general size as our Sun, a medium sized star, 880,000 miles in diameter (1/100 inch in the model). Put such a star at the center of one face of a cube that is 0.5 LY along each edge. Assume that Earth lies an infinite distance away on a line which is perpendicular to that face of the cube and which passes through the centered star.

First, ask the question, what is the probability, p , that another star lies directly on that line, at the center of the opposite face of the cube? Considering the average diameter of the typical star, there are approximately 10^{13} non-overlapping possible star positions on that opposite face. So the answer to our question is: "One out of 10^{13} ". $p = 10^{-13}$.

We have to remember that the center of the cluster is 50 LY (100 such cubes) deep. The probability that we will NOT get a match with a star in any of those deeper cubes is $(1-p)^{100}$. The first two terms of the expansion of this expression are $1 - 100p$. So, (as an approximation) the probability that

we WILL get a match is approximately the first probability multiplied by 100: $100p = 10^{-11}$.

But there are $100 \times 100 = 10^4$ other lines of cubes that make up the visible face of M 22. So, we must multiply by 10^4 . This yields an overall approximate probability of $10^{-11} \times 10^4 = 10^{-7}$ which is ***one in ten million***. This answer is, of course, an approximation. But it does reveal the futility of looking for gravitational lensing in M 22.

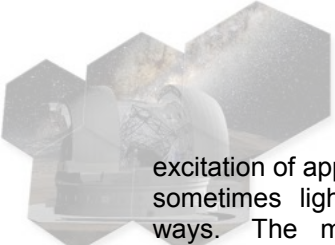
This means that if astronomers see anything 'mysterious' in M 22, they cannot, with any credibility, point to "gravitational lensing" as being the cause. And, if this is so in a dense cluster like M22, it is even less likely when discussing galaxies and supposedly far distant quasars - like the Einstein Cross.

Plasma

The Fundamental State of Matter

Definitions

When one or more of the outer (valence) electrons are stripped away from an atom we say the atom has become 'ionized'. It then exhibits a net positive electrical charge, and is called a 'positive ion'. On the other hand, if an extra electron is *added* onto a neutral atom, the combination then carries a net *negative* charge and is referred to as a 'negative ion'. The electrical forces between dissimilar ions are orders of magnitude stronger than any mechanical force such as that produced by gravity. An electrical plasma is a cloud of ions and electrons that, under the



excitation of applied electrical and magnetic fields, can sometimes light up and behave in some unusual ways. The most familiar examples of electrical plasmas are the neon sign, lightning, and the electric arc welding machine. The ionosphere of Earth is an example of a plasma that does not emit visible light. Plasma permeates the space that contains our solar system. The cloud of particles that constitutes the solar 'wind' is a plasma. Our entire Milky Way galaxy consists mainly of plasma. In fact 99% of the entire universe is plasma!

History

During the late 1800's in Norway, physicist Kristian Birkeland explained that the reason we could see the auroras was that they were plasmas. Birkeland also discovered the twisted corkscrew shaped paths taken by electric currents when they exist in plasmas. Sometimes those twisted shapes are visible and sometimes not - it depends on the strength of the current density being carried by the plasma. Today these streams of ions and electrons are called Birkeland Currents. The mysterious sprites, elves, and blue jets associated with electrical storms on Earth are examples of Birkeland currents in the plasma of our upper atmosphere.

In the early 20th century, Nobel laureat Irving Langmuir studied electric plasmas in his laboratory at General Electric; he further developed the body of knowledge Birkeland had initiated. In fact it was he who first used the name 'plasma' to describe the almost lifelike, self-organizing behavior of these ionized gas clouds in the presence of electrical

currents and magnetic fields.

Basic Properties

Modes of Operation

There are three distinctly different steady state modes in which a plasma can operate:

- **Dark Current Mode** - The strength of the electrical current (flow of charged particles) within the plasma is very low. The plasma does not glow. It is essentially invisible. We would not know a 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.

- **Normal Glow Mode** - The strength of the electrical current (flow of charged particles) is significant. The entire plasma glows. The brightness of the glow depends on the intensity of the current in the plasma. Examples: Any neon sign. Emission nebulae. The Sun's corona.

- **Arc Mode** - The strength of the electrical current in the plasma is very high. The plasma radiates brilliantly over a wide spectrum. Current tends to form twisting filaments. Examples of this mode of operation are: An electric arc welding machine. Lightning. The



Sun's photosphere.

In all three modes of operation, plasmas emit measurable electromagnetic radiation (radio frequency noise). At any given time, the current density (Amps per square meter) existing in the plasma, determines which particular mode a plasma is operating in. The atomic structure of the gas that became ionized to form the plasma in the first place also is a factor in this.

Double Layers

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 isolating wall is called a double layer (DL). When a plasma is studied in the lab, it is usually contained in a closed cylindrical glass tube. Electrodes are inserted into the ends of the tube - one electrode (called the anode) is maintained at a higher voltage than the electrode at the other end (the cathode). If such a voltage difference is applied, then ionization will be initiated and current will start to flow through the plasma. Positive ions (atoms with one or more electrons stripped off) will migrate away from the anode, and negative ions (atoms carrying one or more extra electrons) will move toward the anode. The mathematical **sum** of these two oppositely directed flows constitutes the total current in the plasma.

If the voltage difference from one electrode to the other becomes large enough, a DL will form in a narrow cross-section somewhere in the middle of the tube. Almost all the voltage drop that is applied across the electrodes will fall across this DL. The plasma on

one side of the DL (the side toward the anode) will have approximately the same voltage as the anode. The plasma on the cathode side of the DL will have essentially the same voltage as the cathode. The two halves of the plasma are then electrically isolated from one another by the DL. No electrostatic force is felt by particles on one side of the DL due to charges on the other side of the DL. The total electric current, however, is the same throughout the plasma (on both sides of the DL). Plasmas are excellent conductors and, therefore, there will not be a significant voltage drop across them while they are carrying current - thus the need for the presence of the DL that 'takes' most of any externally applied voltage. In other words, the DL is where the strongest electric fields in the plasma will be found.

If a foreign object is inserted into a plasma, a DL will form around it, shielding it from the main plasma. This effect makes it difficult to insert voltage sensing probes into a plasma in order to measure the electric potential at a specific location. This is a well known property of plasmas. Various methods have been developed in the laboratory to overcome it.

In space, it is impossible to send a spacecraft to measure the voltage of the solar plasma at some point. Voltage is a relative measure (like velocity, for example); it must be measured **with respect to** some datum. A spacecraft will start out having the same voltage as the surface of Earth. As it penetrates the plasmasphere and enters the solar plasma it will slowly accumulate charge and thus alter its voltage. The strength of an electric field, however, **can** be measured in space.



The Z-Pinch

Electric current, passing through a plasma, will take on the corkscrew (spiral) shape discovered by Birkeland. These Birkeland currents most often occur in pairs. There is a tendency for these pairs to compress between them any material (ionized or not) in the plasma. This is called the "z-pinch" effect. The ability of Birkeland currents to accrete and compress even *non*-ionized material is called "Marklund convection".

Hannes Alfvén and the 'Frozen-in Magnetic Fields'

For years it was assumed that plasmas were *perfect* conductors and, as such, a magnetic field in any plasma would have to be 'frozen' inside it.

The technical explanation is as follows: One of Maxwell's equations is that the curl of \mathbf{E} is equal to $-\mathbf{dB}/dt$. Consequently, if the electric field, \mathbf{E} , in a region is everywhere zero valued, then any magnetic field in that region must be time invariant (have a constant value). So if all plasmas are ideal conductors (and so cannot have electric fields - that is to say, voltage differences - inside them), then any magnetic fields inside a plasma must be frozen - i.e., cannot move or change in any way.

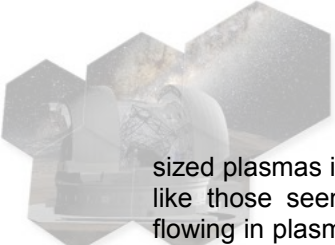
Now we know that there can be slight voltage differences between different points in plasmas. Plasma engineer [Hannes Alfvén](#) pointed out this fact in his acceptance speech while receiving the Nobel Prize for physics in 1970. The electrical conductivity

of any material, including plasma, is determined by two factors: the density of the population of available charge carriers (the ions) in the material, and the mobility of these carriers. In any plasma, the mobility of the ions is extremely high. Electrons and ions can move around very freely in space. But the concentration (number per unit volume) of ions available to carry charge may not be at all high if the plasma is a very low pressure (diffuse) one. So, although plasmas are excellent conductors, they are not perfect conductors. Weak electric fields can exist inside plasmas. Therefore, magnetic fields are *not* frozen inside them.

Currents in Cosmic Sized Plasmas

Because plasmas are good (but not perfect) conductors, they are equivalent to wires in their ability to carry electrical current. It is well known that if any conductor cuts through a magnetic field, a current will be caused to flow in that conductor. This is how electric generators and alternators work. Therefore, if there is any relative motion between a cosmic plasma, say in the arm of a galaxy, and a magnetic field in that same location, Birkeland currents will flow in the plasma. These currents will, in turn, produce their own magnetic fields.

Plasma phenomena are scalable. That is to say, their electrical and physical properties remain the same, independent of the size of the plasma. Of course dynamic phenomena take much less time to occur in a small laboratory plasma than they do in a plasma the size, say, of a galaxy. But the phenomena are identical in that they obey the same laws of physics. So we can make accurate models of cosmic



sized plasmas in the lab - and generate effects exactly like those seen in space. In fact, electric currents, flowing in plasmas, have been shown to produce most of the observed astronomical phenomena that are inexplicable if we assume that the only forces at work in the cosmos are magnetism and gravity.

Why Do Astrophysicists Ignore Electrical Phenomena?

When such a firm foundation has been laid for continued work in the electrical properties of the universe, why do "mainstream" astrophysicists continue to ignore this field of study and, instead, patch up their failing "gravity only" models with more and more arcane, invented theoretical fictions? Why do conventional astronomers and cosmologists systematically exclude electric fields and currents from not only their consideration, but from their *curricula*? Why do they intentionally ignore the fact that many here-to-fore "unexplained" phenomena are quite simply explained by recognizing the existence of electric fields and currents in solar and galactic plasma?

The answer is this:


Magnetism was known to exist in the middle ages. They knew, even back then, that a piece of iron could act on another - at a distance.

But, the early astronomers (like their modern brethren) were simply unaware of *electrical*

phenomena. Johannes Kepler (1571-1630) had already mathematically explained the shape of the orbits of the planets when Isaac Newton published his treatise on gravity in 1687. Once that occurred, nothing more was needed to explain and predict the planetary motions that could be observed in those days. Everything was solved.

This, of course, was all long before Benjamin Franklin (1706-1790) flew his kite in a thunder storm or James Clerk Maxwell (1831-1879) developed his equations relating magnetic and electric fields. But, electric fields were difficult to measure. And astronomers didn't know they needed to know about them. So, they never got included in the "accepted" model of how the solar system or the cosmos works.

That is why, to this day, most astrophysicists have never taken courses in electromagnetic field theory or experimental plasma discharges. They attempt to describe the actions of plasma by means of equations that are applicable only to fluids like water - and magnetic effects. This is what Alfvén called 'magneto-hydrodynamics'. They do not realize, as he did, that the prefix 'magneto' implies 'electro'. And that, in turn, explains why astrophysicists blithely talk about stellar winds, vortex trails, and bow shocks instead of electrical currents in plasmas, electrical fields, z-pinches, and double layers. It also explains why they make wrong claims about how magnetic fields must pile-up, merge, and recombine - they are simply uneducated in, and therefore understandably mystified by, this



now well known area of engineering science.

Recent Development!

The American Institute of Physics has just recently announced that they will now officially recognize the Plasma Universe as an official field of study in physics! Eighty years late! But better late than never.

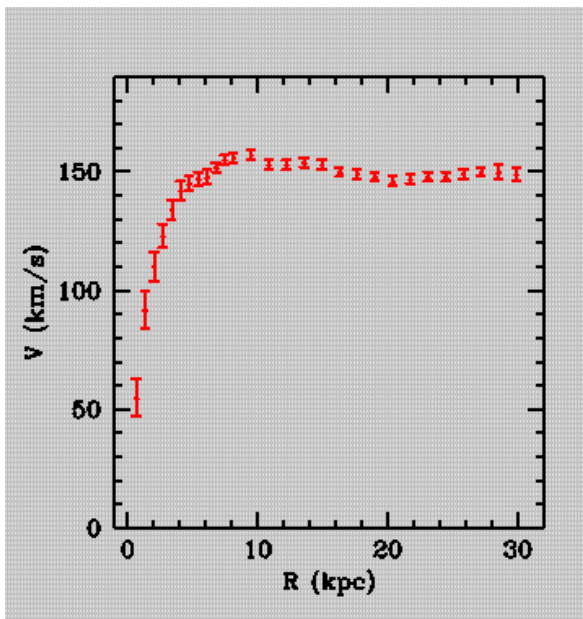
Dark Matter (Missing)

What Was Missing

Dutch astronomer Jan Oort first discovered the 'missing matter' problem in the 1930's. By observing the Doppler red-shift values of stars moving near the plane of our galaxy, Oort assumed he could calculate how fast the stars were moving. Since the galaxy was not flying apart, he reasoned that there must be enough matter inside the galaxy such that the central gravitational force was strong enough to keep the stars from escaping, much as the Sun's gravitational pull keeps a planet in its orbit. But when the calculation was made, it turned out that there was not enough mass in the galaxy. And the discrepancy was not

small; the galaxy had to be at least twice as massive as the sum of the mass of all its visible components combined. Where was all this missing matter?

In addition, in the 1960's the radial profile of the tangential velocity of stars in their orbits around the galactic center as a function of their distance from that center was measured. It was found that typically, once we get away from the galactic center ***all the stars travel with the same velocity*** independent of their distance out from the galactic center. (See the figure below.) Usually, as is the case with our solar system, the farther out an object is, the slower it travels in its orbit.



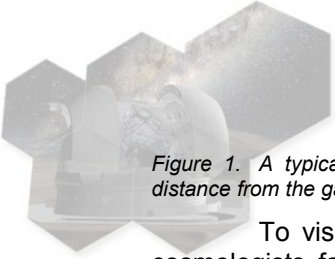


Figure 1. A typical star's tangential velocity as a function of its distance from the galactic center.

To visualize the seriousness of the problem cosmologists face, we need to consider just a bit of Newtonian dynamics:

- To change a body's velocity vector - either in direction or magnitude or both, a force must be applied to the mass of the body. The resulting acceleration is equal to the ratio of the applied force divided by the mass of the object; i.e., $\mathbf{f} = m \mathbf{a}$, where \mathbf{f} is the force applied to the body, m is the mass of the body, and \mathbf{a} is the resulting acceleration (change in velocity). Both \mathbf{f} and \mathbf{a} are vectors; the change in direction of the velocity will be in the direction of the applied force.
- When an Olympic athlete, starting to do the hammer throw, swings the hammer around himself in a circle, the force he feels stretching his arms (the force he is applying to the hammer) is the 'centripetal force'. That force is equal to the product of the hammer's mass, m_1 , times the centripetal acceleration (which in this case is the acceleration that continually changes only the **direction**, not the magnitude, of the velocity vector of the hammer - inward - so as to keep it in a circular orbit around the athlete). This acceleration is equal to the square of the hammer's tangential velocity, v , divided by the radius of the circle. So, the inward force the athlete needs to exert to keep the hammer in its circular path is: $f = m_1 v^2/r$

R.

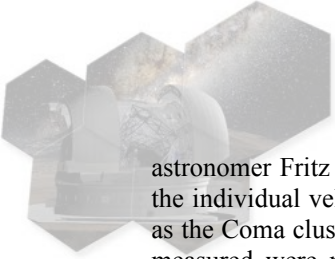
- Newton's law of gravitational force says that the force between two masses is equal to G (the gravitational 'constant') times the product of the two masses divided by the square of the distance between them. $f = G(m_1 \times m_2)/R^2$.

Consider the case of a star on the outskirts of a galaxy. Its radius from the galactic center is R . Its mass is m_1 , and m_2 is the total mass of everything else (all the other stars and matter) inside a circle whose radius is R , the distance of the star from the galaxy's center. Newtonian dynamics assumes all that combined mass, m_2 , acts as if it were located at a single point at the galaxy's center. For the star to remain in a fixed orbit, the necessary inward (centripetal) force, $m_1 V^2/R$, must be exactly equal to the available (gravitational) force, $G(m_1 \times m_2)/R^2$. Setting these two expressions equal to each other results in the expression:

$$m_2 = (V^2) R / G$$

This says that for the tangential velocity, V , to remain constant as R increases - as it does in figure 1 (as we look at stars farther and farther out from the galaxy's center) the included mass, m_2 , must increase proportionally to that radius, R . But we realize that, if we move far out from the center, to the last few stars in any galaxy, included mass will not increase proportionally to the radius. So there seems to be no way the velocity can remain the same for the outermost stars as for the inner stars. Therefore, astrophysicists have concluded that, either some mass is 'missing' in the outer regions of galaxies, or the outer stars rotating around galaxy cores do not obey Newton's law of gravity.

There were problems, too, at a larger scale. In 1933



astronomer Fritz Zwicky announced that when he measured the individual velocities of a large group of galaxies known as the Coma cluster, he found that all of the galaxies that he measured were moving so rapidly relative to one another that the cluster should have come apart long ago. The visible mass of the galaxies making up the cluster was far too little to produce enough gravitational force to hold the cluster together. So not only was our own galaxy lacking mass, but so was the whole Coma cluster of galaxies.

MACHOs, WIMPs & MOND

At first, cosmologists decided to leave Newton's laws inviolate and to postulate the existence of some invisible dark entities to make up the missing mass. Apparently it never occurred to anyone to go back and examine the basic assumption that **only gravity** was at work in these cases. It was easier to patch up the theory with invisible entities. (Remember the invisible gnomes in my garden?) To quote Astronomy magazine (Aug. 2001 p 26):

"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)....."

1. Cold dark matter - supposedly in dead stars,

planets, brown dwarfs ("failed stars") etc.


2. Hot dark matter - postulated to be fast moving particles floating throughout the universe, neutrinos, tachions etc.

"And all the while 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."

Of course, the second possibility mentioned above (that the outer stars rotating around galaxy cores do not obey Newton's Law of Gravity) was thought to be impossible. But the first alternative - the fanciful notion that 99% of the matter in the universe was invisible - began to be worrisome too. It was stated that WIMPs and MACHOs were in the category of particle known as "Fabricated Ad hoc Inventions Repeatedly Invoked in Efforts to Defend Untenable Scientific Theories" (FAIRIE DUST). Even such an august authority as Princeton University cosmologist Jim Peebles has been quoted as saying,

"It's an embarrassment that the dominant forms of matter in the universe are hypothetical..."

So the second alternative, radical as it is, was chosen by some astrophysicists and called "MOdify Newton's Dynamics" (MOND) This paradigm shaking proposal to alter Newton's Law of Gravity - because it does not seem to give correct answers in the low density regions of galaxies - was first put forward in 1983 by astrophysicist Mordehai Milgrom at the



Weizman Institute of Science in Israel. It has recently been given more publicity by University of Maryland astronomer Stacy McGaugh. Milgrom, himself, has recently ("Does Dark Matter Really Exist?", *Scientific American*, Aug. 2002, p. 42-52) said, "Although people are right to be skeptical about MOND, until definitive evidence arrives for dark matter **or for one of its alternatives**, we should keep our minds open." One wonders what **alternatives** was he referring to?

Some other astrophysicists have grasped at the announcement that neutrinos, that permeate the cosmos, have mass. This, they say, must be the previously "missing matter". But the "missing mass" is not missing homogeneously throughout the universe - just in specific places (like the outer reaches of galaxies). The neutrinos are homogeneously distributed. So this last ditch explanation fails as well.

The dilemma presented by the fact that Newton's Law of Gravity does not give the correct (observed) results in most cases involving galaxy rotation can only be resolved by realizing that Newton's Law of Gravity is simply not applicable in these situations. Galaxies are not held together by gravity. They are formed, driven, and stabilized by dynamic electromagnetic effects.

The Real Explanation:

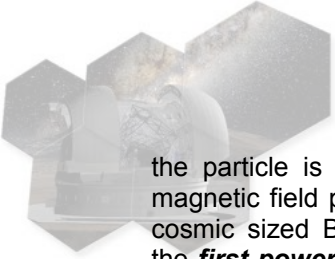
Dynamic Electromagnetic Forces in Cosmic Plasmas

Ninety nine percent of the universe is made up of tenuous clouds of ions and electrons called electric plasma. Plasmas respond to the electrical physical laws codified by James Clerk Maxwell and Oliver Heaviside in the late 1800's. An additional single law due to Hendrick Lorentz explains the mysterious stellar velocities described above.

$$\frac{d}{dt}(m\mathbf{v}) = q(\mathbf{E} + \mathbf{v} \times \mathbf{B})$$

Simply stated, this law says that a moving charged particle's momentum (direction) can be changed by application of either an electric field, \mathbf{E} , or a magnetic field, \mathbf{B} , or both. Consider the mass and charge of a proton for example. The electrostatic force between two protons is 36 orders of magnitude greater than the gravitational force (given by Newton's equation). It's not that Newton's Law is wrong. It is just that in deep space it is totally overpowered by the Maxwell-Lorentz forces of electromagnetic dynamics.

Notice, in the equation in the previous paragraph, that the change in a charged particle's momentum (left hand side of the equation) is directly proportional to the strength of the magnetic field, \mathbf{B} ,



the particle is moving through. The strength of the magnetic field produced by an electric current (e.g., a cosmic sized Birkeland current) falls off inversely as the **first power** of the distance from the current. Both electrostatic and gravitational forces fall off inversely as the **square** of the distance. This inherent difference in the spatial distribution of electromagnetic forces as compared to gravitational forces may indeed be the root cause of the inexplicable velocity profiles exhibited by galaxies.

Electrical engineer Dr. Anthony L. Peratt, using Maxwell's and Lorentz's equations, has shown that charged particles, such as those that form the intergalactic plasma, will evolve into very familiar galactic shapes under the influence of electrodynamic forces. The results of these simulations fit perfectly with the observed values of the velocity contours in galaxies. No missing matter is needed - and Newton can rest easy in his grave. The electromagnetic force is many orders of magnitude stronger than the force due to gravity and it distributes itself more widely throughout space. But present day astronomy refuses to recognize the existence of any cosmic force other than gravity. That error is the cause of their mystification.

An allegory:

A farmer and his young daughter are driving along a dusty road. They are almost home when the car breaks down. The farmer walks to the barn and gets his horse, Dobbin. He harnesses Dobbin to the front bumper of the car and begins to drag it along the road toward home. The young daughter takes a piece of string and attaches it to the bumper and says, "I'll help drag the car, Daddy." Anyone who cannot see horses will think the daughter must possess "missing muscle".

Or, as in Moti Milgrom's MOND proposal, they might suggest that Newton's Laws of motion needed

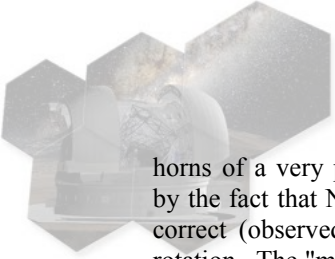
"modification" in this case.

In 1986, Nobel laureate Hannes Alfvén postulated both an electrical galactic model and an electric solar model. Recently physicist Wal Thornhill has pointed out that Alfvén's circuits are really scaled up versions of the familiar homopolar motor that serves as the watt-hour meter on each of our homes. The simple application of the Lorentz force equation ("crossing" the direction, \mathbf{v} , of the current into the direction, \mathbf{B} , of the magnetic field) yields a rotational force. Not only does this effect explain the mysterious tangential velocities of the outer stars in galaxies, but also (in scaled down version) the observed fact that our Sun rotates faster at its equator than at higher (solar) latitudes.

Up to now astronomers and cosmologists have not given serious consideration to any sort of electrical explanation for any of the above observations. This is puzzling because all these electrical principles have now been known for decades. They have long been applied in the solution of problems in plasma laboratories here on Earth and have been used successfully in the invention of many practical devices - such as industrial electrical arc machining, particle accelerators, etc. The correct, simple, solution to the "mysteries" of galaxy rotation lies in Plasma Electro-Dynamics - not in the invention of imaginary, fanciful entities such as WIMPs and MACHOs or in the trashing of a perfectly valid law of physics as is proposed in MOND.

Conclusion

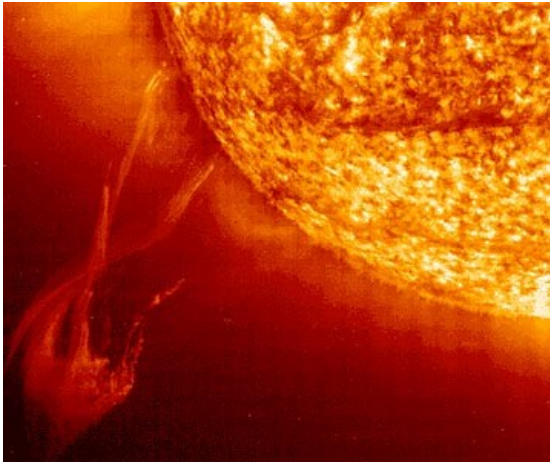
Present day astronomy/cosmology seems to be on the

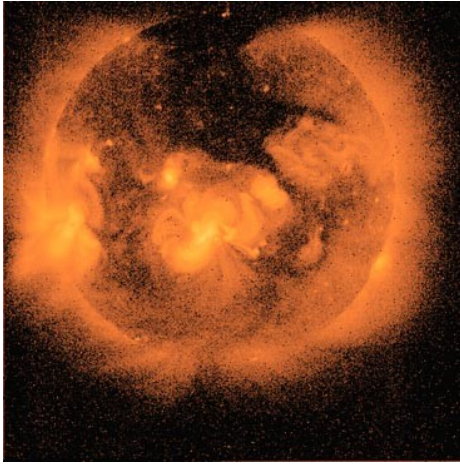


horns of a very painful dilemma. This dilemma is caused by the fact that Newton's Law of Gravity does not give the correct (observed) results in most cases involving galaxy rotation. The "missing matter" proposal attempts to balance the equation by increasing one of the variables (one of the mass terms). The second proposal (MOND) is to change Newton's equation itself. (If you are losing the game, change the rules.)

But, the ultimate resolution of the dilemma lies in realizing that Newton's Law of Gravity is simply not applicable in these situations. Maxwell's equations are! Why do astrophysicists grope wildly for solutions in every possible direction except the right one?

THE SUN





(Top) A solar flare showing the twisting motion characteristic of a Birkeland current.

(Bottom) An X-ray image of the sun showing the active lower corona.

The Electric Sun Hypothesis

The Basics

In this day and age there is no longer any doubt that electrical effects in plasmas play an important role in the phenomena we observe on the Sun. The major properties of the



"Electric Sun (ES) model" are as follows:

- Most of the space within our galaxy is occupied by plasma (rarefied ionized gas) containing electrons (negative charges) and ionized atoms (positive charges). Every charged particle in the plasma has an electric potential energy (voltage) just as every pebble on a mountain has a mechanical potential energy with respect to sea level. The Sun is surrounded by a plasma cell that stretches far out - many times the radius of Pluto. These are facts not hypotheses.

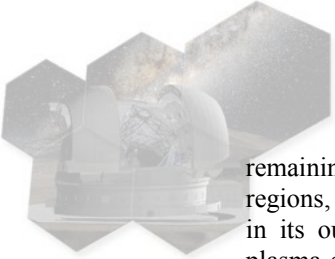
- The Sun is at a more positive electrical potential (voltage) than is the space plasma surrounding it - probably in the order of 10 billion volts.

- Positive ions leave the Sun and electrons enter the Sun. Both of these flows **add** to form a net positive current leaving the Sun. This constitutes a plasma discharge analogous in every way (except size) to those that have been observed in electrical plasma laboratories for decades. Because of the Sun's positive charge (voltage), it acts as the anode in a plasma discharge. As such, it exhibits many of the phenomena observed in earthbound plasma experiments, such as **anode tufting**. The granules observed on the surface of the photosphere are anode tufts (plasma in the arc mode).

- The Sun may be powered, not from within itself, but from outside, by the electric (Birkeland) currents that flow in our arm of our galaxy as they do in all galaxies. This possibility that the Sun may be externally powered by its galactic environment is the most speculative idea in the ES hypothesis and is always attacked by critics while they ignore all the other explanatory properties of the ES model. In the Plasma Universe model, these cosmic sized, low-density currents create the galaxies and the stars within those galaxies by the electromagnetic z-pinch effect. It is only a small extrapolation to ask whether these currents remain to power those stars. Galactic currents are of low current **density**, but, because the sizes of the stars are large, the total current (Amperage) is high. The Sun's radiated power at any instant is due to the energy imparted by that amperage. As the Sun moves around the galactic center it may come into regions of higher or lower current density and so its output may vary both periodically and randomly.

The Corona

The Sun's corona is visible only during solar eclipses (or via sophisticated instruments developed for that specific purpose). It is a vast luminous plasma glow that changes shape with time - always



remaining fairly smooth and distributed in its inner regions, and showing filamentary spikes and points in its outer fringes. It is a "normal glow" mode plasma discharge. If the Sun were not electrical in nature this corona would not exist. If the Sun is simply a (non-electrical) nuclear furnace, the corona has no business being there at all. So one of the most basic questions that *ought* to arise in any discussion of the Sun is: ***Why does our Sun have a corona? Why is it there?*** It serves no purpose in a fusion-only model nor can such models explain its existence.

The Solar Wind

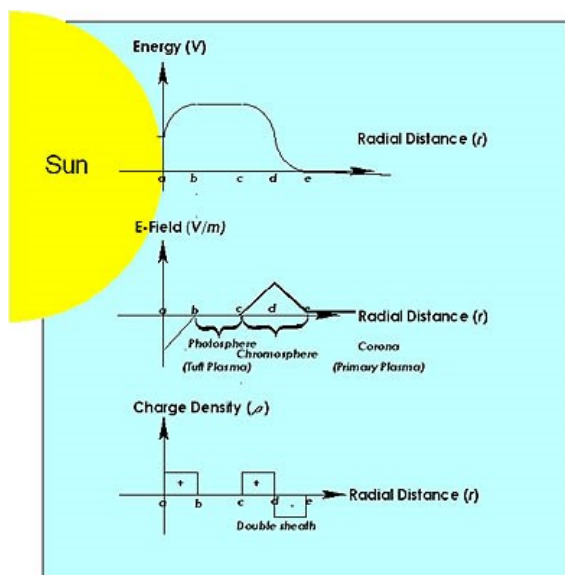
Positive ions stream outward from the Sun's surface and accelerate away, through the corona, for as far as we have been able to measure. It is thought that these particles eventually make up a portion of the cosmic ray flux that permeates the cosmos. The 'wind' varies with time and has even been observed to stop completely for a period of a day or two. What causes this fluctuation? The ES model proposes a simple explanation and suggests a mechanism that creates fluctuations in this flow. The standard model provides no such explanation or mechanism.

Electrical Properties of the Photosphere and Chromosphere

The essence of the Electric Sun hypothesis is an analysis of the electrical properties of its photosphere and the chromosphere and the

resulting effects on the charged particles that move across them. A radial cross-section taken through a photospheric 'granule' is shown in the three plots shown, below. The horizontal axis of each of the three plots is distance, measured radially outward, starting at a point near the bottom of the photosphere (the true surface of the Sun - which we can only observe in the umbra of sunspots). Almost every observed property of the Sun can be explained through reference to these three plots; for this reason, much of the discussion that follows makes reference to them.

The first plot shows the energy per unit (positive) charge of an ion as a function of its radial distance out from the solar surface. The units of Energy per Unit Charge are Volts, **V**. The second plot, the **E**-field, shows the outward radial force (toward the right) experienced by such a positive ion. The third plot shows the locations of the charge densities that will produce the first two plots. The chromosphere is the location of a plasma double layer (DL) of electrical charge. Recall that one of the properties of electric plasma is its excellent (although not perfect) conductivity. Such an excellent conductor will support only a weak electric field. Notice in the second plot that the almost ideal plasmas of the photosphere (region b to c) and the corona (from point e outward) are regions of almost zero electric field strength



Energy, Electric field strength, and Charge density as a function of radial distance from the Sun's surface.


All three of these plots are related mathematically. By the laws of electrophysics: $\mathbf{E} = -dV/dr$, and Charge density = $d\mathbf{E}/dr$. In words: The value of the \mathbf{E} -field, at every point r , is the (negative of) the slope of the energy plot at that point. (The reason for the negative sign in the first equation is that the force on a positively charged particle is *down* the potential hill, not up.) The value of the charge density at each point, r , is the slope of the \mathbf{E} -field plot at that point. The two layers of opposite charge density necessary to produce

the compound shaped energy curve between points c and e used to be called a 'double sheath'. Modern nomenclature calls it a 'double layer' (DL). It is a well known phenomenon in plasma discharges. Because of the DL positioned between points c and e, a +ion to the right of point e sees no electrostatic force from +ions to the left of point c. The 'primary plasma' of the corona and the 'secondary plasma' of the photosphere are separated by the DL - a well known, and often observed property of plasmas.

The energy plot shown above is valid for **positively charged** particles. Because a positive **E**-field represents an outward radial force (toward the right) per unit charge on any such particle, the region wherein the **E**-field is negative (a to b) constitutes an inward force. This region of the lower photosphere is, thus, an energy barrier that positive ions must surmount in order to escape the body of the Sun. Any +ions attempting to escape outward from within the Sun must have enough energy to get over this energy barrier. So the presence of the single positive charge layer at the bottom of the tuft plasma serves as a constraint on unlimited escape of +ions from the surface of the Sun.

Tuft Shrinkage and Movement

In order to visualize the effect this energy diagram has on **electrons** (negative charges) **coming in** toward the Sun from cosmic space



(from the right), we can turn the energy plot upside down. Doing this enables us to visualize the 'trap' that these photospheric tufts are for incoming electrons. As the trap fills, the energy gap between b and c decreases in height, and so the tuft weakens, shrinks, and eventually disappears. This is the cause of the observed shrinkage and disappearance of photospheric granules.

Temperature Minimum

Charged particles do not experience external electrostatic forces when they are in the range b to c - within the photosphere. Only random thermal movement occurs due to diffusion. (Temperature is simply the measurement of the violence of such random movement.) This is where the 6,000 K temperature is measured. Positive ions have their maximum electrical potential energy when they are in this photospheric plasma. But their mechanical kinetic energy is relatively low. At a point just to the left of point c, any random movement toward the right (radially outward) that carries a + ion even slightly to the right of point c will result in it being swept away, down the energy hill, toward the right. Such movement of charged particles due to an **E**-field is called a 'drift current'. This drift current of accelerating positive ions is a constituent of the solar 'wind' (which is a serious misnomer). As positive ions begin to accelerate down the potential energy drop from point c through e, they convert the high (electrical) potential energy they had in the photosphere into kinetic energy - they gain

extremely high outward radial velocity and lose side-to-side random motion. Thus, they become 'dethermalized'. In this region, in the upper photosphere and lower chromosphere, the movement of these ions becomes extremely organized (parallel).

The Transition Zone

When these rapidly moving + ions pass point e (leave the chromosphere) they move beyond the radially directed **E**-field force that has been accelerating them. Because of their high kinetic energy (velocity), any collisions they have at this point (with other ions or with neutral atoms) are violent and create high amplitude random motions, thereby re-thermalizing the plasma to a much greater degree than it was in the photospheric tufts (in the range b to c). This is what is responsible for the high temperature we observe in the lower corona. Ions just to the right of point e are reported to be at temperatures of 1 to 2 million K. Nothing else but exactly this kind of mechanism could be expected from the electric sun (anode tuft - double layer) model. The re-thermalization takes place in a region analogous to the turbulent 'white water' boiling at the bottom of a smooth laminar water slide. In the fusion model no such (water slide) phenomenon exists - and so neither does a simple explanation of the temperature discontinuity.



Acceleration of the Solar 'Wind'

The energy plot (to the right of point e) actually trails off, with slightly negative slope, toward the negative voltage of deep space (our arm of the Milky Way galaxy). A relatively low density plasma can support a weak **E**-field. Consistent with this, a low amplitude (positive) **E**-field extends indefinitely to the right from point e. This is the effect of the Sun being at a higher voltage level than is distant space beyond the heliopause. The outward force on positive ions due to this **E**-field causes the observed **acceleration** of +ions in the solar wind.

Cosmic Rays

The particles in our solar wind eventually join with the spent solar winds of all the other stars in our galaxy to make up the total cosmic ray flux in our arm of our galaxy.

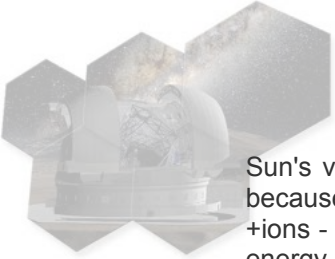
Juergens points out that the Sun is a rather mediocre star as far as radiating energy goes. If it is electrically powered, perhaps its mediocrity is attributable to a relatively unimpressive driving potential. This would mean that hotter, more luminous stars should have driving potentials greater than that of the Sun and should consequently expel cosmic rays of greater energies than solar cosmic rays. A star with a driving potential of 20 billion volts would expel protons energetic enough to reach the Sun's surface, arriving with **10 billion electron volts of energy to spare**. Such cosmic ions, when they collide with

Earth's upper atmosphere release the muon neutrinos that have been much in the news recently.

Hannes Alfvén in his book, *The New Astronomy*, Chapter 2, Section III, pp 74-79, said about cosmic rays: "How these particles are driven to their fantastic energies, sometimes as high as a million billion electron volts, is one of the prime puzzles of astronomy. No known (or even unknown) nuclear reaction could account for the firing of particles with such energies; even the complete annihilation of a proton would not yield more than a billion electron volts."

Fluctuations in the Solar "Wind"

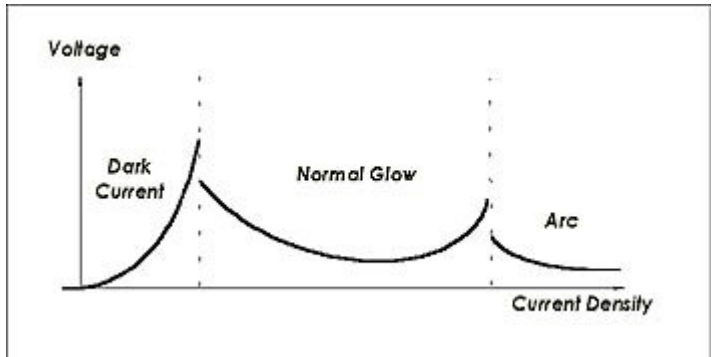
It is interesting to note in passing that the three plots presented above are identically the plots of energy, **E**-field, and charge distribution found in a pnp transistor. Of course in that solid-state device there are different processes going on at different energy levels (valence band and conduction band) within a solid crystal. In the solar plasma there are no fixed atomic centers and so there is only one energy band. In a transistor, the amplitude of the collector current (analogous to the drift of +ions in the solar wind toward the right) is easily controlled by raising and lowering the difference between the base and emitter voltages. Is the same mechanism (a voltage fluctuation between the anode-Sun and its photosphere) at work in the Sun? e.g., If the



Sun's voltage were to decrease slightly - say, because of an excessive flow of outgoing +ions - the voltage rise from point a to b in the energy diagram would increase in height and so reduce the solar wind (both the inward electron flow and the outward +ion flow) in a negative feedback effect. In May of 1999 the solar wind completely stopped for about two days. There are also periodic variations in the solar wind. The transistor-like mechanism described above is certainly capable of causing these phenomena. The fusion model is at a complete loss to explain them. Transistor 'cutoff' is a process that is used in all digital circuits.


Characteristic Modes of a Plasma

In the page on Electric Plasma the three characteristic static modes in which a plasma can operate are discussed. Here is a more detailed description. The volt-ampere characteristic of a typical plasma discharge has the general shape shown below.



The volt-ampere plot of a plasma discharge.

This plot is easily measured for a laboratory plasma contained in a column - a cylindrical glass tube with the anode at one end and the cathode at the other. These two terminals are connected into an electrical circuit whereby the current through the tube can be controlled. In such an experiment, the plasma has a constant cross-sectional area from one end of the tube to the other. The vertical axis of the volt-ampere plot is the voltage rise from the cathode up to the anode (across the entire plasma) as a function of the current passing through the plasma. The horizontal axis shows the Current Density. Current density is the measurement of how many Amps per square meter are flowing through a cross-section of the tube. In a cylindrical tube the cross-section is the same size at all points along the tube and so, the current density at every cross-section is just proportional to the total current passing through the plasma.



When we consider the Sun, however, a spherical geometry exists - with the sun at the center. The cross-section becomes an imaginary sphere. Assume a constant total electron drift moving from all directions toward the Sun and a constant total radial flow of +ions outward. Imagine a spherical surface of large radius through which this total current passes. As we approach the Sun from deep space, this spherical surface has an ever decreasing area. Therefore, for a fixed total current, the current **density** (A/m^2) increases as we move inward toward the Sun.

- In deep space the current density there is extremely low even though the total current may be huge; we are in the **dark current** region; there are no glowing gases, nothing to tell us we are in a plasma discharge - except possibly some radio frequency emissions.


- As we get closer to the Sun, the spherical boundary has a smaller surface area; the current *density* increases; we enter the **normal glow** region; this is what we call the Sun's "corona". The intensity of the radiated light is much like a neon sign.

- As we approach still closer to the Sun, the spherical boundary gets to be only slightly larger than the Sun itself; the current density becomes extremely large; we enter the **arc region** of the discharge. This is the anode tuft. This is the photosphere.

The intensity of the radiated light is much like an arc welding machine or continuous lightning. A high intensity ultraviolet light is emitted.

Some early plasma researchers and most modern astronomers believe that the only "true" plasma is one that is perfectly conductive (and so will "freeze" magnetic fields into itself). The volt-ampere plot shown above indicates that this does not happen. Every point on the plot (except the origin) has a non-zero voltage coordinate. The static resistivity of a plasma operating at any point on the above volt-ampere plot is proportional to the slope of a straight line drawn from the origin to the point. This means that, at every possible mode in which a plasma can operate, it has a non-zero static resistivity; it takes a non-zero **E**-field to produce the current density. Obviously the static resistivity of a plasma in the high end of the dark mode can be quite large. (The arc region and the left half of the glow region exhibit negative *dynamic* resistance - and the **E**-field can be quite small - but that is not what is in question.) No real plasma can "freeze-in" a magnetic field. The highest conductivity plasmas are those in the arc mode. But, even in that mode, it takes a finite, non-zero valued electric field to produce a current density. No plasma is an "ideal conductor".

Fusion in the Double Layer



The z-pinch effect of high intensity, parallel current filaments in an arc plasma is very strong. Whatever nuclear fusion is taking place on the Sun is occurring here in the double layer (DL) at the top of the photosphere (not deep within the core). The result of this fusion process are the "metals" that give rise to absorption lines in the Sun's spectrum. Traces of sixty eight of the ninety two natural elements are found in the Sun's atmosphere. Most of the radio frequency noise emitted by the Sun emanates from this region. Radio noise is a well known property of DLs. The electrical power available to be delivered to the plasma at any point is the product of the **E**-field (Volts per meter) times current density (Amps per square meter). This multiplication operation yields Watts per cubic meter. The current density is relatively constant over the height of the photospheric / chromospheric layers. However, the **E**-field is by far the strongest at the center of the DL. Nuclear fusion takes a great deal of power - and that power is available in the DL.

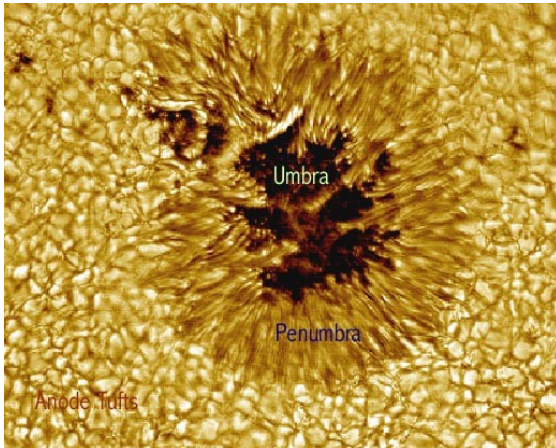
It is also observed that the neutrino flux from the Sun varies inversely with sunspot number. This is expected in the ES hypothesis because the source of those neutrinos is z-pinch produced fusion which is occurring in the double layer - and sunspots are locations where there is no DL in which this process can occur.

Sunspots and Coronal Holes

In a plasma, both the dimensions and the voltages of the anode tufts depend on the current density at that location (near the anode). The tufts appear and/or disappear, as needed, to maintain a certain required relationship between +ion and electron numbers in the total current. This property of anode tuft plasmas was discovered, quantified, and reported by Irving Langmuir over fifty years ago.

In the Electric Sun model, as with any plasma discharge, tufting disappears wherever the flux of incoming electrons impinging onto a given area of the Sun's surface is not sufficiently strong to require the shielding produced by the plasma double layer. At any such location, the anode tufting collapses and we can see down to the actual anode surface of the Sun. Since there is no arc discharge occurring in these

locations, they appear darker than the surrounding area and are termed "sunspots". Of course, if a tremendous amount of energy were being produced in the Sun's interior, the spot should be **brighter and hotter** than the surrounding photosphere. The fact that sunspots are dark and cool strongly supports the contention that very little, if anything, is going on in the Sun's interior. The center of the spot is called its umbra.



A sunspot showing the umbra, penumbra, and surrounding anode tufts (DLs).

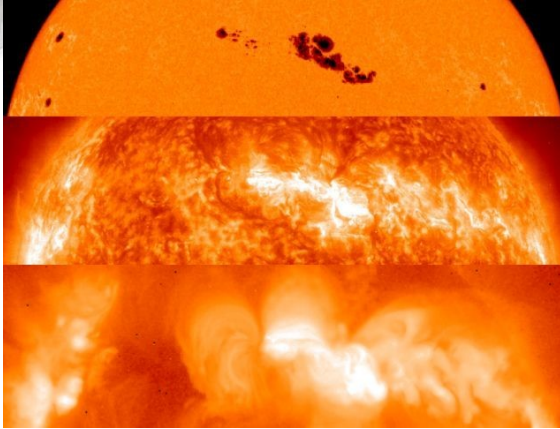
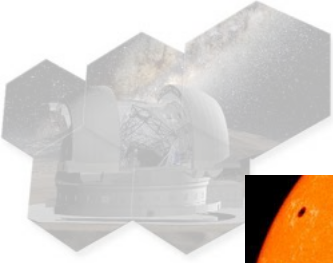
Because there is no anode tufting where a spot is located, the voltage rise (region a to b in the energy plot above), which normally limits the local flow of positive ions leaving the anode surface, does not exist there. In sunspots, then, a large number of ions will flood outward

toward the lower corona. Such a flow constitutes a large electrical current - and, as such, will produce a strong localized magnetic field near the sunspot.

The Sun's corona is difficult to see except in solar eclipses and in X ray images. This is because the corona is a "normal glow" discharge compared to the tufts which are in "arc mode". In some X ray images of the Sun (such as the one shown in the first figure at the very top of this page) we can see "coronal holes" - large dark regions in the brighter image of the solar corona. The bright regions in X-ray images of the corona indicate hotter, more energetic areas; these are mainly above the sunspot regions.

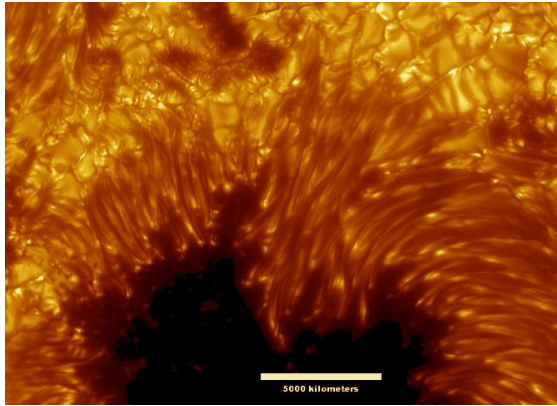
In the three images of a sunspot group, shown below:

- The top one is the photosphere - taken in visible light - where, in the umbrae, we can see down to the dark (cool) surface of the Sun. Ions are pouring upward out of the Sun at these locations.
- The middle image is taken in ultraviolet light and shows the chromosphere / transition region.
- The lower panel is an X-ray image showing the violent activity in the lower corona. This activity is due to the flood of accelerating positive ions escaping the Sun and colliding with atoms higher in the atmosphere (lower corona).

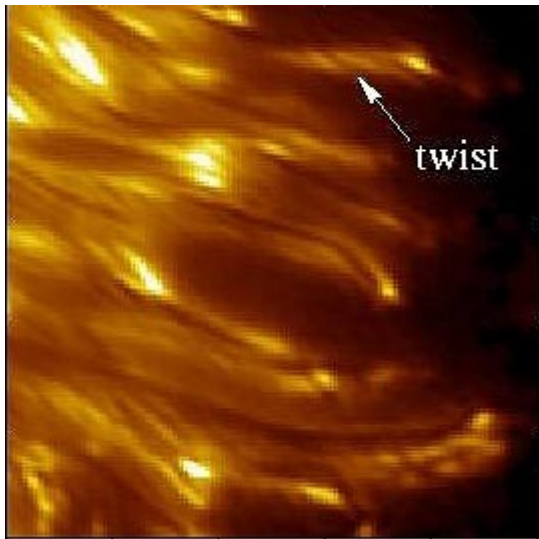


The effects of +ions flowing out of a sunspot.

Strong electric currents also flow in and above the Sun's surface at the edge of sunspot umbrae due to the voltage difference between nearby anode tufts and the central umbrae of the spots (where there are no tufts). This region is called a sunspot's penumbra. These currents of course produce magnetic fields. Since, in plasmas, twisting electrical (Birkeland) currents follow the direction of magnetic fields, the glowing plasma in these regions often shows the complicated shapes of these spot related looping magnetic fields. Remember. Birkeland currents TWIST !



(c)

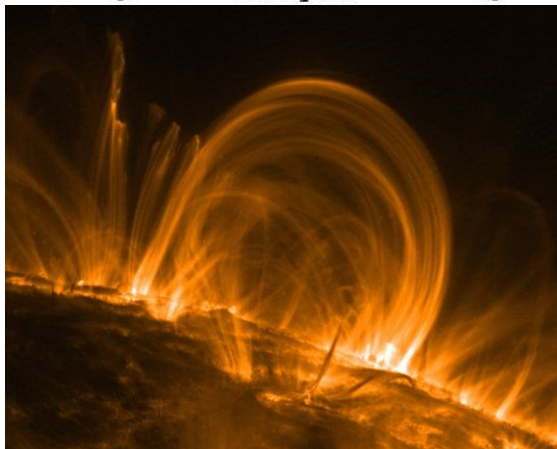
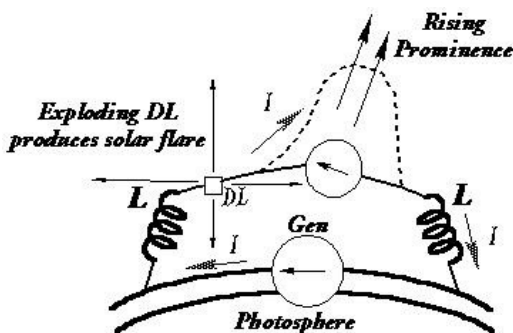


(Top) The Penumbra - Birkeland currents following the voltage drop from the photosphere down to the umbra.
(Bottom) The twisting Birkeland currents evident in a detailed image of the penumbral streamers.

Prominences, Flares, and CME's


All of the above discussion applies to the **steady-state** (or almost steady-state) operation of the Electric Sun. But there are several **dynamic** phenomena such as flares, prominences, and coronal mass ejections (CME's) that we observe. How are they produced? Nobel laureate Hannes Alfvén, although not aware of the Juergens Electric Sun model, advanced his own theory (3) of how prominences and solar flares are formed electrically. It is completely consistent with the Juergens model. It too is electrical. Any electric current, i , creates a magnetic field (the stronger the current - the stronger the magnetic field, and the more energy it contains). Curved magnetic fields cannot exist without either electrical currents or time varying electric fields. Energy, W_m , stored in any magnetic field, is given by the expression $W_m = 1/2 L i^2$. If the current, i , is interrupted, the field collapses and its energy must be delivered somewhere. The magnetic field of the Sun sometimes, and in some places on its surface, forms an "omega" shaped loop. This loop extends out through the double sheath layer (DL) of the chromosphere. One of the primary properties of Birkeland currents is that they generally follow magnetic field lines. A strong looping current will produce a secondary toroidal magnetic field that will surround and try to expand the loop. If the current following the loop becomes too strong, the DL will be destroyed¹. This interrupts the

current (like opening a switch in an inductive circuit) and the energy stored in the primary magnetic field is explosively released into space.



(Top)Hannes Alfvén's Solar Prominence Circuit
(Bottom)TRACE Image of Plasma Loops

It should be well understood (certainly by anyone who has had a basic physics course) that the magnetic field "lines"² that are drawn



to describe a magnetic field, have no beginning nor end. They are closed paths. In fact one of Maxwell's famous equations is: " $\text{div } \mathbf{B} = 0$ ". Which says precisely that (in the language of vector differential calculus). So when magnetic fields collapse due to the interruption of the currents that produce them, they do **not** "break" or "merge" and "recombine" as some uninformed astronomers have claimed (e.g., see the quote regarding the mainstream concerns above - in 4. Acceleration of the Solar "Wind" Ions). The field simply collapses (very quickly!). On the Sun this collapse releases a tremendous amount of energy, and matter is thrown out away from the surface - as with any explosively rapid reaction. This release is consistent with and predicted by the Electric Sun model as described above. Some astronomers have proposed that heat is routinely transported out to the lower corona by magnetic fields and released there by "reconnection of magnetic field lines, whereby oppositely directed lines cancel each other out, converting magnetic energy into heat. The process requires that the field lines be able to diffuse through the plasma." This idea is inventive but, unfortunately, has no scientific basis whatever.


Note that although astronomers ought to be aware that **magnetic fields require electrical currents or time varying E-fields** to produce them, currents and **E-fields** are never mentioned in standard models. Possibly because they do not seem to be included in astrophysics curricula.

1. Double layers can be destroyed by at least two different mechanisms: a) Zener Breakdown - The electric field gradient becomes strong enough to rip all charges away from an area, thus breaking the discharge path; b) Avalanche Breakdown - A literal avalanche occurs wherein all charges are swept away and no conducting charges are left - thus the conducting path is opened.

2. A magnetic field is a continuum. It is not a set of discrete 'lines'. Lines are drawn in the classroom to describe the magnetic field (its direction and magnitude). But the lines themselves do not actually exist. They are simply a pedagogical device. Proposing that these lines break, merge, and/or recombine is an error (violation of Maxwell's equations) compounded on another error (the lines do not really exist in the first place). Magnetic field lines are analogous to lines of latitude and longitude. They are not discrete entities with nothing in between them - you can draw as many of them as close together as you'd like. And they most certainly do not break, merge, or reconnect any more than lines of latitude do. Oppositely directed magnetic intensity **H-fields** simply cancel each other - no energy is stored or released in that event.

Conclusion

This has been the briefest of introductions to Juergens' Electric Sun model - the realization that our Sun functions electrically - that it is a



huge electrically charged, relatively quiescent, sphere of ionized gas that supports an electric plasma arc discharge on its surface and is powered by subtle currents that move throughout the now well known tenuous plasma that fills our galaxy. A more detailed description of the ES hypothesis as well as the deficiencies of the standard solar fusion model are presented in *The Electric Sky*.

Today's orthodox thermonuclear models fail to explain many observed solar phenomena. The Electric Sun model is inherently predictive of all these observed phenomena. It is relatively simple. It is self consistent. And it does not require the existence of mysterious entities such as the unseen solar 'dynamo' genie that lurks somewhere beneath the surface of the fusion model. The Electric Sun model does not violate Maxwell's equations as the fusion model does.

Ralph Juergens had the genius to develop the Electric Sun model back in the 1970's. His hypothesis has so far passed the harsh tests of observed reality. His seminal work may eventually get the recognition it deserves. Or, of course, others may try to claim it, or parts of it, and hope the world forgets who came up with these ideas first.

There is now enough inescapable evidence that a majority of the phenomena we observe on the Sun are fundamentally electrical in nature. Ralph Juergens was the person with the vision to see it.



Ralph Juergens in 1949.



Sudbury Neutrino Observatory Report

an Analysis

Missing Neutrinos

A thermonuclear reaction of the type assumed to be powering the Sun must emit a flood of electron-neutrinos. Nowhere near the requisite number of these neutrinos have been found after thirty years of searching for them. A series of grandly expensive experiments have failed to find the necessary neutrino flux.

Some solar neutrinos have indeed been observed - but **only one-third the number required** if the fusion reaction really is the main source of the Sun's energy production. These negative results from the neutrino experiments have resulted not in any re-examination of solar models. Rather, an intense theoretical effort to discover new properties that solar neutrinos 'must have' has occurred. As a result of this effort, it was announced (June 2001) by the Sudbury Neutrino Observatory (SNO) in Canada that neutrinos have mass and can change 'flavor'. This supposedly accounts for why they have not been fully observed previously. However, several important questions

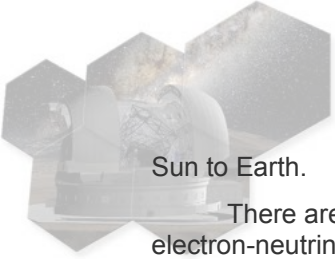
remain to be answered about the methodology that was used by the SNO researchers in arriving at their conclusions. Of course, whether neutrinos actually do change type or not has no bearing whatever on the validity of the Electric Sun model. The neutrino problem is a hurdle only for the standard fusion model. In the Electric Sun model there is no energy produced in the core - ***radiant energy is released at the surface by electric arc discharge.*** So, there is no 'missing neutrino' problem for the electric Sun model. The electron-neutrinos that are observed are probably produced by fusion taking place at the solar surface that produces heavy elements (other than hydrogen and helium).

For decades the measured deficiency of electron-neutrinos has been a continuing embarrassment for those who want to believe that the accepted H-He fusion model of how the Sun produces its energy is correct. Because this failure to observe the predicted neutrino flux clearly constitutes falsification of this fusion model, there has been a great effort to explain away the observed deficit.

The Official Announcement

In June 2001, the Sudbury Neutrino Observatory (SNO) in Ontario, Canada made an announcement that was joyfully hailed by proponents of the accepted mainstream fusion model. The complete official announcement can be viewed [here](#) .

As a result of their interpretation of the data obtained from their experiment, SNO researchers claim that the deficit does not lie with the fusion model, but is due to the fact that neutrinos change from one flavor to another on their way from the center of the



Sun to Earth.

There are thought to be three flavors of neutrino: electron-neutrinos, muon-neutrinos, and tau-neutrinos. Some of these flavors were not measurable by the previous experiments that were looking for them. SNO researchers claim, on the basis of their experiment, that the measurable neutrinos turn into previously non-measurable ones enroute from the Sun's core. That 'oscillation', they say, explains the previously measured shortage.

Press Releases

Press releases were filled with pronouncements of confidence that the standard fusion reaction is indeed alive and well at the core of the Sun. There was, however, more rejoicing than factual information in most of these releases.

Some examples:

1. "Physicists have wrestled with the 'solar neutrino problem' since the early 1970s, when experiments detected a shortfall of the particles coming from the sun. The neutrino shortage meant either that theories describing the nuclear furnace at the sun's core were wrong, or that something was happening to the particles on their way to Earth. Monday's announcement demonstrates with 99 percent confidence that it is the latter."
- AP article appearing on line in The Nando Times of June 19, entitled "Physicists: Neutrinos have some mass," by Matt Crenson.

QUESTION: What was the basis for the "99%

confidence" figure? Was that a mathematically derived number based on a statistical analysis - or was it just pulled out of the blue – an example of unprofessional, non-scientific, hubris?

2. "The SNO detector has the capability to determine whether solar neutrinos are changing their type en-route to Earth, thus providing answers to questions about neutrino properties and solar energy generation."
-
http://www.sno.phy.queensu.ca/sno/first_results/

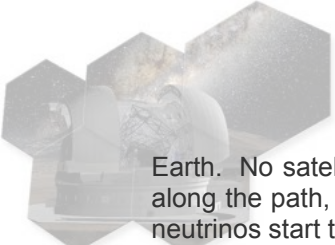
QUESTION: How can the SNO team claim the ability to determine whether something happens to neutrinos enroute from the Sun to Earth without making measurements at the Sun (at the start of the journey) or somewhere along the route? Or by making assumptions about how they started out? More on this question below.

3."SNO appears to be measuring a rate expected for all types of neutrinos combined but a decided deficit for the electron neutrino."
<http://antwpr.gsfc.nasa.gov/apod/ap010710.html>

COMMENT: This appears to be in complete contradiction with the official announcement that states that the results of the only SNO experiment that can measure all three flavors of neutrino will not be announced until a later time.

Analysis of the Official Announcement

The SNO observations were only made here on



Earth. No satellite observations were made anywhere along the path, certainly not at its beginning where the neutrinos start their journey (inside the Sun).

QUESTION: Consider a freight train that goes from New York to Chicago. We live in Chicago and are only able to observe the train as it arrives in Chicago. It arrives with 4 freight cars, 2 tank cars, and 1 flat car. How is it possible, no matter how sophisticated our method of observation, for us to make any conclusions about whether freight cars, tank cars, or flat cars have been added to or subtracted from the train at, say, Cleveland? Moreover, how is it possible to say that freight cars have mysteriously turned into tank cars or flat cars along the route somewhere? (And do it with “99% confidence”?)

The answer must be that they are assuming they know the value of the neutrino flux leaving the Sun. If so, this is an exercise in circular reasoning. If they know what the solar neutrino flux leaving the Sun is, there is no need for the experiment. The experiment adds nothing in the way of verification of the assumption. It certainly does not explain the low value of neutrino flux observed here on Earth, it only confirms it.

The logic used in drawing conclusions seems to be faulty in other ways as well.

A sentence from the conclusion of the report

In the conclusion of the Sudbury report it states: "Comparison of the (neutrino) flux deduced from the ES reaction assuming no neutrino oscillations, to that

measured by the CC reaction can provide clear evidence of flavor transformation without reference to solar model flux calculations. If neutrinos from the Sun change into other active flavors, then CC flux < ES flux."

A logical analysis of the last above sentence:

Let:

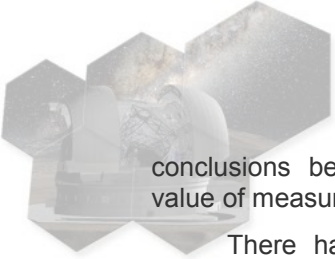
(a) = Neutrinos from the Sun change into other active flavors.

(b) = Electron-neutrino flux measurement is less than the measurement that includes electron-neutrinos and some of the other two types as well.

The sentence says: IF (a) is true, THEN (b) is true. No one can disagree with that.

But they are implying: IF (b) is true, THEN (a) is true. (If the measurement of the flux of electron-type neutrinos is less than the more inclusive measurement that includes some of the other types, then neutrinos from the Sun change flavor on their way to Earth.)

That is a logical non-sequitor. If the Sun is emitting all three types of neutrinos, $e+u+t$, then any Earthbound experiment that measures only e will always have a lower output than one that measures (for example) $e + 0.1u + 0.3t$. Moreover, the report states that the CC measured value (e type only) is "significantly smaller than the measurements by [S. Fukuda in an earlier experiment]". So the electron neutrino flux just measured by SNO is ***even lower than previously reported levels***. And it is possible that muon-neutrinos oscillate into electron-neutrinos. And that presents a further complication to the SNO



conclusions because of the already extremely low value of measured electron-neutrino flux.

There have been other neutrino experiments that have resulted in unclear answers about whether neutrinos 'oscillate' into different types. The final report of the Liquid Scintillator Neutrino Detector (LSND) experiment in 2001 said their results strengthened previously published, but controversial LSND results that provided evidence of neutrino oscillation and mass. The LSND data, collected from 1993 to 1998, *suggested* that muon anti-neutrinos oscillate into electron anti-neutrinos. However the MiniBooNE project results of 2007 reported *no* mu-neutrino to electron-neutrino oscillations of the sort that would explain the LSND result. MiniBooNE was designed specifically to look for this, and has successfully ruled it out at 98% confidence level. So it is now exceedingly doubtful that the long sought excuse for the solar neutrino flux deficit has been found.

A measurement that can and should be made but was not

It is regrettable that the SNO results do not address several other pertinent questions relative to the solar neutrino flux. For example, why does the total flux seem to be a function of the sunspot cycle? Physicist Wal Thornhill points this out in detail in his analysis of the neutrino problem at his Holoscience web site.

Thornhill points out that the Electric Sun model predicts that fluctuations in the neutrino flux will be correlated with the level of electrical input to the Sun – that is, with such measurable phenomena as sunspot numbers and solar wind activity. This correlation has

already been observed qualitatively. The standard solar model cannot explain it. Neutrinos carry no electrical charge; therefore, the usual 'hidden strange magnetic fields lurking beneath the Sun's surface' cannot be invoked to explain away a correlation between neutrino flux and sunspot number if, indeed, that correlation is real. Any quantitative determination of a relationship between neutrino flux and sunspot number and/or solar wind intensity would absolutely falsify the fusion model once and for all. And it would be further validation of the Electric Sun model. But it was not undertaken.

Summary

The high decibel level of rejoicing contained in the SNO pronouncements is unprofessional. It is a clue that should not be ignored. It stands in curious contrast to the existence of errors in fundamental logic contained in the report. The prime requirement in research is scientific objectivity. And (given the paucity of actual data that was collected) there is substantial reason to question to what extent a degree of wishful thinking went into the announced conclusions of this report.

There simply is no way that a measurement taken at only one end of a transmission channel can reveal changes that have occurred farther up the channel. The only way such conclusions can be made is when observations have been made at more than one place along the path! Further measurements (MiniBooNE 2007) have found no evidence to support the SNO 2001 announcement.

Clearly, although the fusion model is beloved by its advocates, an objective analysis of the Sudbury and

MiniBooNE experiments reveal that the missing neutrino problem still remains very far from being solved. And unless it is, the fusion model stands completely falsified.

Electric Cosmology

Stellar Evolution

Introduction

If the Sun is essentially an electrical phenomenon, as seems to be the case, and it is also a fairly typical star, then all stars should exhibit properties that are consistent with the Electric Sun (ES) model. Do they? Let us extrapolate the ES model and compare it to what we have observed about stars.

In 1911 Ejnar Hertzsprung constructed a plot of the absolute brightness vs. spectral class (temperature) of the stars whose distances we could then accurately measure by the parallax method. In 1913 Henry Norris Russell independently repeated this exercise. This plot is therefore named the Hertzsprung-Russell (HR) diagram, and is one of the first topics presented in introductory astronomy courses. It is clear that the HR diagram is a plot of actual observations – not something deduced from theory. So, any viable model of the workings of a star must be consistent with it. Is the Electric Sun (ES) model of how a star is powered consistent with the HR diagram? If it is not, then this would disprove the ES hypothesis.

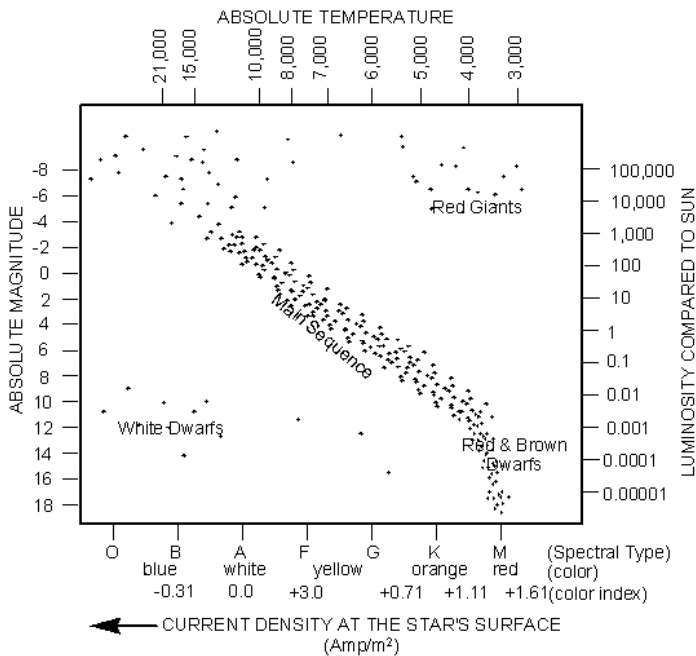


The Hertzsprung-Russell Diagram

In the HR diagram, as it is usually presented, the vertical axis is labeled with two scales: Absolute Magnitude (linear scale from about 18th magnitude at the bottom running up to perhaps -8 or so at the top), and Luminosity x Sun (log scale with 0.00001 at the bottom running up to 100,000 at the top). The horizontal axis also is labeled with several scales: Spectral Class - left to right: O and B [blue], A [white], F [yellow], G [yellow-orange], K [orange], M [red]).

Another horizontal axis scale - Absolute Temperature, also runs from left to right (from around 20,000 K down to 3000 K) corresponding to the (decreasing!) black-body temperature of those spectral classes. [As an engineer, I object to plotting increasing temperature from right to left! But such is the convention of astronomers. We will live with it.] A single given star defines a single point on this plot. A web search for the topic "Hertzsprung-Russell Diagram" will yield many different renderings of the HR plot.

Our Sun, being a fairly typical star, falls almost at the center of the diagram (at Luminosity = 1 and Absolute magnitude. = 5, Spectral Class G, and (photospheric) Temp. = 6,000K). The points on the plot seem to group nicely, generally forming a long, slightly diffuse line, that snakes from the upper left down toward the lower right. The line falls very steeply at the lower right end. There are two other less populated clouds of points: one group at the upper right and another one strung out across the bottom of the plot from a concentration in the lower left of the diagram.



Add A New Horizontal Axis Scale

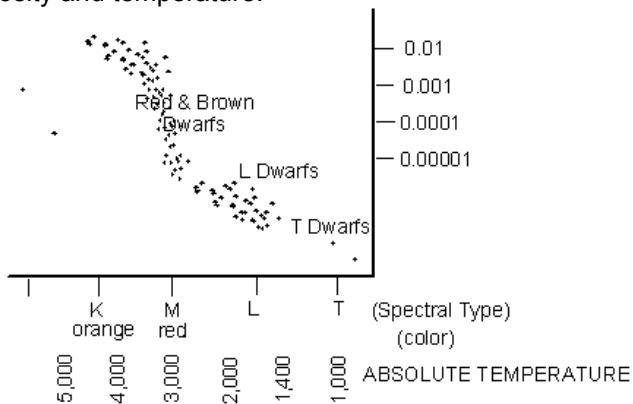
In the ES model the important variable is: current density (Amps/sq m) at the star's photospheric surface. If a star's current density increases, the arc discharges on its surface (photospheric granules) get hotter, change color (away from red, toward blue-white), and get brighter. The absolute luminosity of a star, therefore, depends on two main variables: current density at its effective surface, and its size (the star's diameter).

Therefore, let us add a new scale to the horizontal axis of the HR diagram: 'Current Density at the Surface of

each Star'. Consider moving from the lower right of the HR diagram toward the left. In so doing we are moving in the direction of **increasing current density** at the star's surface.

Red and Brown Dwarfs

The first region on the lower right of the diagram is where the current density has such a low value that double layers (DLs) (photospheric granules) are not needed by the plasma surrounding the (anode) star. This is the region of the brown and red "dwarfs" and giant gas planets. Recent discoveries of extremely cool L - Type and T - Type dwarfs has required the original diagram to be extended to the lower right (See below). These 'stars' have extremely low absolute luminosity and temperature.



Notice that the surface temperature of the T - Type dwarfs is in the range of 1000 K or less! For comparison purposes recall that some points on the surface of Venus are in the range of 900 K. T - Type spectra have features due mostly to Methane - they

resemble Jupiter's spectrum. The plasma that constitutes a star of this type is in its 'normal glow' range - or perhaps, even the 'dark current' range. If all stars are indeed powered by a nuclear fusion reaction as is claimed, with the T dwarfs we must be in the 'cold fusion' range! Indeed, for fusion reactions to occur, standard theory requires that the temperature in a star's core must reach at least three million K. And because, in the accepted model, core temperature rises with gravitational pressure, the star must have a minimum mass of about 75 times the mass of the planet Jupiter, or about 7 percent of the mass of our sun. Many of the dwarfs do not meet these requirements. One mainstream astrophysicist, realizing this, has said that these dwarfs must be powered by 'gravitational collapse'.

The orbiting X-ray telescope, Chandra, recently discovered an X-ray flare being emitted by a brown dwarf (spectral class M9). This poses an additional problem for the advocates of the stellar fusion model. A star this cool should not be capable of X-ray flare production.

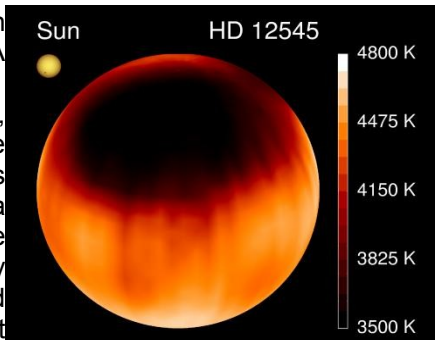
However, in the ES model, there are no minimum temperature or mass requirements because the star is inherently electrical to start with. In the ES model (if a brown/red dwarf is operating near the upper boundary of the dark current mode), a slight increase in the level of total current impinging on that star will move it into the normal glow mode. This transition will be accompanied by a rapid change in the voltage rise across the plasma of the star's atmosphere. Maxwell's equations tell us that such a change in voltage can produce a strong dynamic E-field and a strong dynamic magnetic field. If they are strong enough, dynamic EM fields can produce X-rays. Another similar phenomenon can occur if a star makes the

transition from normal glow to arc mode.

As we progress leftward in the HR diagram, at first the plotted points move steeply upward; we enter the spectral M range where some arc tufting becomes necessary to sustain the star's electrical discharge.

As current density increases, tufts (plasma in the arc discharge mode) cover more and more of the surface of each star, and its luminosity increases sharply – plasma arcs are extremely bright compared to plasma in its normal glow mode. You can look directly at neon signs but not at electric arc welders. This accounts for the steepness of the HR curve in the M region – a slight increase in current density produces a large increase in luminosity. As we move upward and toward the left in the diagram, stars have more and more complete coats of photospheric arcs (tufting).

A case in point – NASA recently discovered a star, half of whose surface was "covered by a sunspot". A more informative way to say this would have been that "Half of this star's



surface is covered by photospheric arcing." The present controversy about what the difference is between a giant gas planet and a brown dwarf is baseless. They are members of a continuum – it is simply a matter of what the level of current density is at their surfaces. NASA's discovery supplies the missing link between the giant gas planets and the fully tufted

stars. In fact, the term "proto-star" may be more descriptive than "giant gas planet".

Main Sequence Stars

Continuing toward the left, beyond the "knee of the curve", all these stars (K through B) are completely covered with tufts (have complete photospheres), their luminosity no longer grows as rapidly as before. But, the farther to the left we go (the higher the current density), the brighter the tufts become, and so the stars' luminosities do continue to increase. The situation is analogous to turning up the current in an electric arc welding machine. The increased brightness of the arcs accounts for the upward slope of the line toward the left. Mathematically we have the situation where the variable plotted on the horizontal axis (current density) is also one of the factors in the quantity plotted on the vertical axis (luminosity). The more significant this relationship is, the more closely the plot will approach a 45 degree straight line.

[Reminder: Our progression from right toward the left is not a description of one star evolving in time - we are just moving across the diagram from one static point (star) to another.]

That the stars do not all fall precisely on a line, but have some dispersion above and below the line, is due to their variation in size. The relatively straight portion of the HR diagram is called the 'main sequence'. This nomenclature gives a false impression, that stars move around 'sequentially' in the HR plot. The HR diagram is a static scatter plot, not a sequence.



White and Blue Stars

When we get to the upper left end of the main sequence, what kind of stars are these? This is the region of O type, blue-white, high temperature (35,000+ K) stars. As we approach the far upper-left of the HR diagram (region of highest current density), the stars are under extreme electrical stress - too many Amps per sq. meter. Their absolute luminosities approach 100,000 times the Sun's. Even farther out to the upper left is the region of Wolf-Rayet stars. Extreme electrical stress can lead to a such a star's splitting into parts, perhaps explosively. Such explosions are called *novae*. The splitting process is called *fissioning*. A characteristic of Wolf-Rayet stars is that they are losing mass rapidly.

Fissioning

Wal Thornhill once said:

"..... internal electrostatic forces prevent stars from collapsing gravitationally and occasionally cause them to "give birth" by electrical fissioning to form companion stars and gas giant planets. Sudden brightening, or a nova outburst marks such an event. That elucidates why stars commonly have partners and why most of the giant planets so far detected closely orbit their parent star."

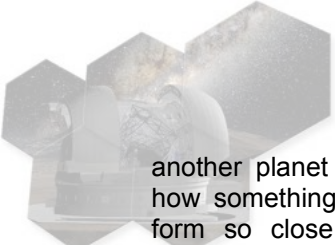
If a sphere of fixed volume splits into two smaller (equal sized) spheres, the total surface area of the newly formed pair will be about 26% larger than the area of the original sphere. (If the split results in two unequally sized spheres, the

increase in total area will be something less than 26%.) So, to reduce the current density it is experiencing, an electrically stressed, blue-white star may explosively fission into two or more stars. This provides an increase in total surface area and so results in a reduced level of current density on the (new) stars' surfaces. Each of two new (equal sized) stars will experience only 80% of the previous current density level and so both will jump to new locations farther to the lower-right in the HR diagram.

A possible example of two equal sized offspring may be the binary pair called Y Cygni. This is a pair of giant O or B type stars that orbit each other in a period of 2.99 days. Each star is some 5 million miles in diameter and 5000 times as luminous as our Sun - absolute magnitudes about -4.5. They are some 12 million miles apart (less than 2.5 times their diameters!). Their masses are 17.3 and 17.1 times the mass of our Sun.

If the members of the resulting binary pair turn out to be unequal in size, the larger one will probably have the larger current density - but still lower than the original value. (This assumes that the total charge and total driving current to the original star distributes itself onto the new stars proportionally to their masses.) In this case, the smaller member of the pair might have such a low value of current density as to drop it, abruptly, to "brown dwarf" or even "giant planet" status. That may be how giant gas planets get born (and are in close proximity to their parents).

There was an interesting statement made in this regard in the Jan. 1, 2001 issue of **Science Now** magazine (p.4). "Astronomers are scratching their heads over a strange new planetary system. A team discovered a huge gas ball -- apparently a failed star called a brown dwarf -- circling a star that holds



another planet in its sway. But no one understands how something so massive as a brown dwarf could form so close to a normal star with a planetary companion." This was in an article called "An awkward trio disturbs astronomers" by G. Schilling.

The final distribution of mass and current density is sensitive to the mechanics of the splitting process. Such a process can only be violent - possibly resulting in a **nova** eruption. Some mass may be lost to the **plasma** cloud that later can appear as a planetary nebula or **nova-remnant** that surrounds the **binary pair**. If the charge on the original star was highly concentrated on or near its surface, and the fissioning process is similar to the peeling off of a onion's skin, then most of that original charge (and current) may end up on the offspring star that is constituted only of the skin of the original star. In this way the smaller, rather than the larger of the two members of the resulting binary pair, can be the hotter one. In any event, both stars will **move to different positions in the HR diagram** from where their parent was located.

Stellar Evolution

Mainstream astronomy attempts to describe how stars 'age' (run out of nuclear fuel) and slowly migrate, taking hundreds of thousands of years to do so, tracing paths from one location on the HR diagram to another (the star going from one spectral class to another). The paths that stars 'must take' are, of course, completely predicated on the assumption that stars are fueled by the various stages of nuclear fusion of the lightest elements.

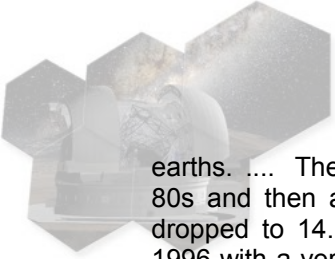
The ES model does not make that assumption. Humans have not been around long enough to actually observe any stars making the predicted slow migrations from one place on the HR diagram to another. So, at present, slow "stellar evolution" is another one of those complicated theoretical constructs that live brightly in the minds of astrophysicists without any observational evidence of their actual existence.

Examples That Falsify (Disprove) The Accepted Stellar Evolution Process

FG Sagittae

The star FG Sagittae breaks all the rules of accepted stellar evolution. FG Sagittae has changed from blue to yellow since 1955! It, quite recently, has taken a deep dive in luminosity. FG Sagittae, is the central star of the planetary nebula (nova remnant?) He 1-5. It is a unique object in the sense that for this star we have direct evidence of stellar evolution but ***in a time scale comparable with the human lifetime.*** [CCD Astronomy, Summer 1996, p.40.]

"Around 1900 FG Sge was an inconspicuous hot star ($T = 50,000$ K) of magnitude 13. During the next 60 years it cooled to about 8000 K and ***brightened*** in the visual region to magnitude 9, as its radiation shifted from the far-UV to the visual region. Around 1970 a whole new bunch of spectral lines appeared due to elements such as Sr, Y, Zr, Ba and rare



earths. The star cooled further in the 1970s and 80s and then all of a sudden in 1992 its magnitude dropped to 14. Further drops occurred from 1992 to 1996 with a very deep minimum near magnitude 16 in June of 1996." [Italics added]

So, after abruptly **brightening by four magnitudes**, it has **dropped seven magnitudes**. From the end of the last century FG Sagittae has moved across the HR diagram changing from a normal hot giant to a "late spectral type" (cool) star with marked changes in its surface chemical composition. Its present surface temperature is in the range of 4000K. This is not the kind of slow stellar 'evolution' mainstream astrophysicists preach.

And FG Sagittae is a *binary pair!*

The official wording was, "In 1995 FG Sge changed in brightness in a quite sporadic manner from V~10.5 to ~13.0 according to the data by Hungarian Astronomical Association-Variable Star Section. During the spectral observations on 9/10 and 10/11 August, FG Sge was very faint (HAA-VSS data: V~12.5-13.0, according to Variable Stars Observers' League of Japan: ~13.3) and therefore erroneously **the visual companion 8**" apart from FG Sge was actually observed. This is probably the first high resolution spectrum of the companion ever obtained. The spectrum turned out to correspond to a quite normal giant with the spectral type around K0."

Is FG Sagittae an example of the binary fissioning (caused by electrical stress) that was described above? It seems to have all the basic characteristics: **nova-like brightening** followed by loss of luminosity and loss of temperature - **moving to a different spectral type** with

marked changes in its surface chemical composition, discovery of a *binary* companion, and the entire systems lies within a nebulous *nova remnant*.

Two More Examples That Falsify the Accepted Stellar Evolution Process

Virginia Trimble, professor of physics at the University of California, Irvine, and visiting professor of astronomy at the University of Maryland, has said recently:

"We don't often see stars change their spectral types in a human lifetime. Thus, FG Sagittae, which brightened, cooled from about BO to K, and added lines of carbon, barium, and other elements to its spectrum in the century after 1890 was long seemingly unique. The standard interpretation has been that it experienced its very last flash of helium shell burning (the products are carbon and oxygen) and was about to become an R Coronea Borealis variable. These are carbon-rich stars that fade suddenly and unpredictably (which FG Sge started doing a couple of years ago) and that have hydrogen-depleted atmospheres (which FG Sge has just developed). In addition, the "galloping giant" is no longer alone. Examination of old images and spectrograms reveal that *V 605 Aquilae*, studied by Knut Lundmark in the 1920's was a similar sort of beast, though it is now very faint And the latest recruit is *V 4334 Sagittarii*, better known as Sakurai's object, for its 1994 discoverer. It, too, changed both spectral type and surface composition very rapidly, and is now hydrogen-poor and carbon-rich, and well on its way to becoming the century's third new R CrB star."



And Yet A Fourth Example - V838 Monocerotis

On October 2, 2002, NASA's Astronomy Picture of the Day (APOD) announced what is to them another "**mystery star**".

[Click here for the official announcement.](#)

The official "explanation" reads, in part:

"V838 Mon was discovered to be in outburst in January of this year. Initially thought to be a familiar type of classical nova, astronomers quickly realized that instead, V838 Mon may be a totally new addition to the astronomical zoo. Observations indicate that the erupting star ***transformed itself over a period of months from a small under-luminous star a little hotter than the Sun, to a highly-luminous, cool supergiant star undergoing rapid and complex brightness changes.*** The transformation ***defies the conventional understanding*** of stellar life cycles. A most notable feature of V838 Mon is the "expanding" nebula which now appears to surround it." [Ital and emphasis added.]

So now there are at least four prime examples of stars that do not evolve according to the accepted thermonuclear model of how stars are powered. These are stars that ***falsify*** the conventional understanding of stellar life cycles. All of them act in a manner predicted by the Electric Star hypothesis.

In the Electric Star version of "stellar evolution" things can happen quickly. If the fusion model were correct, it would take hundreds of thousands of years for a star to change from one place in the HR diagram

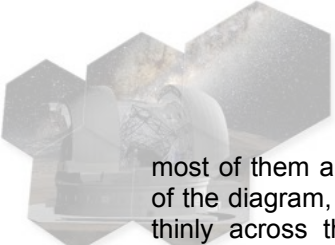
to another. It would not be observed within a "human lifetime". It didn't take FG Sagittae hundreds of thousands of years to "run down." The star V838 Monocerotis has moved half way across the Hertzsprung-Russell diagram in a few months. Migrating across the HR diagram can happen very rapidly - and apparently does! How many such counter-examples does it take for astrophysicists to realize their stellar fusion theory has been falsified?

Red Giants

The diffuse group in the upper right hand corner of the HR diagram are stars which are cool (have low values of current density powering them) but are luminous and so are thought to be very large. They are highly luminous **only** because of their apparent size. And that size may well be due to having a huge corona rather than an inherently large diameter. At any rate, these are the 'red giants'. They are not necessarily any older than any other star. Notice that some are relatively quite cool - in the range of 1000 K. How do stars at this low a temperature maintain an internal fusion reaction? The simple answer is: They cannot! And they do not! And beneath an extended diffuse corona, they may be quite small stars.

White Dwarfs

Similarly, the group in the lower left hand corner have very low absolute luminosity but are extremely hot. The ES model simply explains them as being very small stars that are experiencing very high current densities. These are the "white dwarfs." Although



most of them are concentrated in the lower-left corner of the diagram, the white dwarf group actually extends thinly across the bottom of the diagram. Thus the name white dwarf is a kind of misnomer. The shape of this thin grouping begins to drop off steeply at its (cooler) right end much as the main sequence does.

A professional astronomer has been quoted as saying:

"The observed white dwarfs are basically cooling embers. The nuclear fire of the stars burned out billions of years ago. The light emitted comes from the heat remaining from the earlier nuclear burning. By measuring the spectrum of the light, the brightness in various colors, the temperatures of the stars were determined. The two coolest of the white dwarfs studied, PSR J0034-0534 and PSR J1713+0747, are 3400 degrees Kelvin (5600 F), making them the coolest known white dwarfs. For comparison, the surface of the sun measures 5800 degrees Kelvin and the coolest previously known white dwarfs are 4000 degrees Kelvin."

But then, why are these relatively cool stars called "white"? One presumes it is only because they seem to be members of the grouping in the HR diagram that was originally given that name.

Spectral Lines in Various Types of Stars

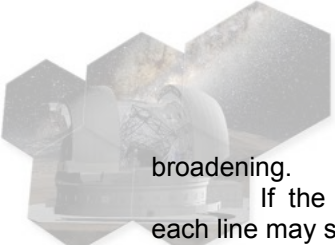
In a paper entitled "Stellar Spectra" (Aeon, Vol. V, No. 5, Jan. 2000, p. 37.) the late Earl R. Milton, Professor of Physics, University of Lethbridge reported on research he had performed on spectral line broadening in 1971 while at the Dominion Astrophysical Observatory in Vancouver, British

Columbia. This work provides strong evidence in support of the Electric Sun model.

If a relatively cool gas comes between a wide-band light source and an observer, absorption lines will appear in the light's spectrum. These lines arise because of the absorption of (light) energy by the atoms of the gas. Electrons in those atoms jump from lower to higher discrete quantum energy states - they get the energy to make that jump from the light (having exactly the frequency that corresponds to that energy gap) that is passing through the gas. Each element in the gas produces its own signature pattern of lines. By recognizing the line patterns, we can identify the gas that is causing those lines. This method is used to discern what elements and molecules are present in the upper atmospheres of stars.

If, on the other hand, a sufficiently strong electric current is passed through a gas, the gas itself will emit a light spectrum in which only a few discrete colors (frequencies) appear. These are called emission lines. They are located precisely at those wavelengths (frequencies) at which that same gas produces absorption lines as described in the previous paragraph.

The spectra of most stars are heavily dominated by absorption lines. Spectra from the cooler stars (such as types G and K) are dominated by molecular bands arising from oxides (like ZrO and TiO) and from compounds of carbon like CH, CN, CO, and C₂. Stars like the Sun (type G) show "metal" absorption lines. Astronomers call any element heavier than Helium a "metal". In fact the Sun shows the presence of 68 of the known elements. The spectra of hot O and B type stars show few lines, and what lines they do have appear quite blurred or "broadened". There are a few possible causes of this



broadening.

If the absorbing gas is in a magnetic field, each line may split, symmetrically, into multiple, closely spaced lines. This is called the Zeeman effect - named for its discoverer, Pieter Zeeman (1865-1943).

If the gas is in an electric E-field, then lines split unsymmetrically - this is called the Stark effect named for Johannes Stark (1874-1957). These secondary lines are very closely spaced in frequency (wavelength) and so the effect is sometimes called line-broadening or blurring. A most important property is that the degree of Stark (electric field) broadening depends on the atomic mass of the affected gas. The lines of heavy elements are only slightly broadened whereas those of lighter atoms and ions are quite smeared out. This effect is not noted in Zeeman (magnetic field) broadening.

As we progress from right to left up the “main sequence” in the Hertzsprung-Russell diagram – from the less electrically stressed stars toward those experiencing higher current input, we see an increasing broadening of spectral lines. In fact at the upper left end (O-type stars) there is so much blurring that we can distinguish very little structure in the line spectra. Is this caused by the increasing strengths of the E-fields in the stars' DLs as electrical stress increases? And, is increased E-field strength the *only* possible explanation for this line broadening? Milton states that two pieces of evidence strongly suggest that the answer is yes.

In highly stressed B-type stars:

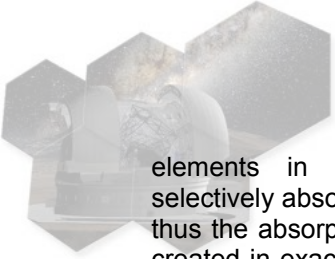
1. A line at 4471.6 Angstroms is accompanied by a 'forbidden' partner at 4469.9 Angstroms. **It is well known that this latter line only occurs when an electric field is present.**
2. There is an extreme difference between the

degree of broadening of the lines from hydrogen and helium (light elements) and those arising from sodium and ionized calcium (heavier elements). **This effect is only noted in Stark effect broadening.**

The usual mainstream explanation of line broadening is that the star must be rotating rapidly – light from the limb going away from us is red shifted, and light from the limb coming at us is blue shifted – the total effect being to smear out the line widths. BUT, if that were the true explanation, the lines from hydrogen should be no more smeared out than those from calcium. Both of these observations (1 and 2 above) strongly suggest that it is the presence of a strong electric field that is selectively broadening the spectral lines in B-type stars.

There is no simple explanation of these spectral effects via the (non-electrical) thermonuclear core model. So, let us consider to what degree this phenomenon – the existence of spectral absorption lines and their selective broadening – is consistent with the Electric Sun model.

In the Electric Sun model it is clear that the photosphere is the site of a strong plasma arc discharge. This produces the Sun's continuous visible light spectrum. Immediately above this in the Sun's atmosphere there is the Double Layer (DL) in which an intense, outwardly directed electric field resides. It is within this strong E-field that many heavy elements are created by z-pinch fusion. Recall that the strong E-field dethermalizes the ions in that region and thus it is the (relatively) coolest layer of the Sun's atmosphere. Light that originates in the photosphere passes through the relatively cool, newly formed heavier



elements in the DL. These heavier elements selectively absorb energy from the light's spectrum and thus the absorption lines are created. In fact they are created in exactly the place where the Sun's E-field is strongest. Thus we have the ideal situation for selective broadening of those lines due to the Stark effect.

In those instances wherein we see emission lines in a star's spectrum we may speculate that, just as in the laboratory, the easiest way to generate them is by passing a strong electric current through a tenuous gas cloud. For example, type W (Wolf-Rayet) stars are under such intense electrical input that they are hotter even than type O stars. They are located to the left of the top of the Hertzsprung-Russell diagram. They typically show strong emission lines in their spectra. Since these stars experience stronger electrical currents than any other type star, there is ample probability that any tenuous coronal gases will be excited by such currents to produce emission lines.

At the other end of the HR diagram, type M (relatively cool) stars also sometimes exhibit spectral emission lines. Can we explain this via the Electric Sun model as well? Consider the star Betelgeuse – a type M red 'giant'. The average density of Betelgeuse is less than one ten thousandth of the density of the air we breathe. A star of such tenuous nature has often been called a 'red hot vacuum'. The outer surface of this tenuous sphere (the radius of which is larger than the orbit of Jupiter from the Sun) has been found to have three bright areas of photospheric tufting above which we would expect to find DLs wherein z-pinch fusion may occur. It is from this source that the absorption lines in the M-type spectra come. But, in addition, Betelgeuse is surrounded by a coronal plasma that extends out several hundred radii from the

surface of the star. This corona is even less dense than the star itself. Thus we have a gigantic gas cloud through which (according to the Electric Star model) electric current is passing – an ideal situation for the production of spectral emission lines.

So, once again, in the case of stellar emission and absorption lines and their selective broadening, we observe a stellar phenomenon that is more consistent with the Electric Sun model than it is with the “fusion core” model (in which, of course, no mention is made of electric fields).

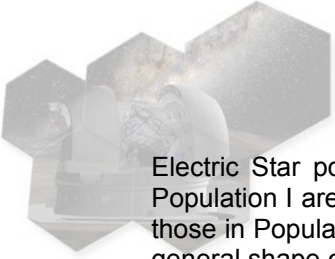
Population I and II Stars

There are many ways to categorize stars. While observing the Andromeda Galaxy, M 31, astronomer Walter Baade discovered that he could distinguish between two general types of stars in that object. He called them Population I and Population II.

Population I stars are located in the arms of the galaxy. They are generally like our Sun; they are bright; are often blue giants, and are typically members of the “main sequence” of the HR diagram; there is usually lots of nebulosity, dust, and gas in their vicinity. Mainstream astronomers call them “young” stars.

Population II stars are not found in the arms, but rather, in the nucleus of the galaxy and in globular clusters that are situated around its periphery. These are less luminous, cooler, with fewer heavy elements; many are red and yellow giants; there is almost no dust and gas in their vicinity. Mainstream astronomers call these stars “old”.

So we see that there is very roughly a lower-left half (Population I), upper-right half (Population II) partitioning of the HR diagram. Therefore, from the



Electric Star point of view, we note that the stars in Population I are more heavily electrically stressed than those in Population II. In the next page we discuss the general shape of galaxies and then will be able to point out that the usual physical locations of these two star types in a typical galaxy are vastly different in electrical activity. The arms (where Population I type stars are usually located) are the focus of strong Birkeland current densities.

Blue Stragglers

Up until recently no (Population I) O or B type stars were observed in globular clusters. It was thought that all stars in any given globular cluster were of a similar age (old - Population II). Therefore, it came as a big shock when it was discovered that there were some blue "stragglers" (stars that hadn't "aged properly") in certain clusters. It was said, in awe, that these stars were "rejuvenated stars that glow with the blue light of young stars"! "Stellar evolution" doesn't seem to be working too well in these cases.

Another example of "stellar evolution" that is difficult to explain via the H-He fusion reaction is that in recent years, the centers of elliptical galaxies (the other typical location of Population II stars) have been found to emit unexpectedly high amounts of blue and ultraviolet light. Elliptical galaxies (and the stars in them) are thought to be quite old. How, then, can there be so many "young" blue stars in them? One mainstream answer is that some dying old stars suddenly decide to burn the Helium they had been previously producing – or we hear (as always) the mantra that perhaps there were "collisions between stars".

Stellar densities in galactic nuclei are typically 50 - 60 stars per cubic light year. Each star occupies,

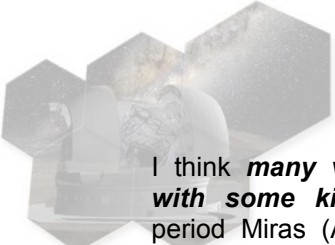
say, $1/60$ cubic LY. The cube root of $1/60$ is approximately 0.25 - so, each star is $1/4$ light year from its neighbor. (Remember Burnham's model: Two specks of dust $1/100$ inch in diameter separated by a distance of $1/4$ MILE.) What is the probability of their colliding?

From the ES point of view, any star can move quickly across the HR diagram if its electrical environment changes. Anyone who has seen the aurora's plasma curtains moving and folding in the polar sky realizes that Birkeland current filaments are not fixed, static, things. They move around. If the galactic Birkeland currents move around, it is likely they will move relative to some stars - either increasing or decreasing the current densities these stars experience. A blue star is just one that is experiencing the full brunt of a strong Birkeland current. "Blue stragglers" aren't stragglers at all. They are just blue.

Variable Stars

When I was researching topics for this article, Wal Thornhill said to me,

"Have a look at variable stars, particularly bursters, where I think you will find the brightness curve is like that of lightning with a sudden rise time and exponential decay. Some stars are regular and others irregular. The irregular ones seem to average the power over the bursts. When they are more frequent, the energy is less per burst. If there is a long latency, the next burst is more powerful. It's the kind of thing you would expect from an electrical circuit when the trigger level is variable and the power input constant.



I think ***many variable stars are actually binaries with some kind of electrical interaction.*** Long period Miras (A type of variable star) may actually have an object orbiting within the shell of a red giant (as I have proposed for the proto-Saturnian system)"

Following Wal's suggestion, I looked at the recent Hubble image of Mira itself, the flagship star of that class of variable stars. Mira's image reveals a huge plasma emission on one side of the star. The official explanation includes the words, "Mira A is a red giant star undergoing dramatic pulsations, causing it to become more than 100 times brighter over the course of a year. Mira can extend to over 700 times the size of our Sun, and is only 400 light-years away. The photograph taken by the Hubble Space Telescope shows the true face of Mira. But what are we seeing? The unusual extended feature off the lower left of the star remains somewhat mysterious. Possible explanations include gravitational perturbation and/or heating from Mira's ***white dwarf star companion.***" [Italics added.]

Mira has a white dwarf companion, just as Wal suggested was likely. So, a much better possible explanation of its pulsating output is that an electrical discharge is taking place between Mira and its companion, much like a relaxation oscillator. It's not really "mysterious" at all.

There are many examples of unequally sized, closely spaced, binary pairs that are variable and emit frequent nova-like explosions. The list includes:

- SS Cygni - A yellow dwarf and a hot blue-white dwarf. Orbital period 6.5 hours! Separation distance 100,000 miles or less. Burnham asks, "Is SS Cygni dying out

after having been [a full scale nova] in the past?"

- U Geminorum - A B-type blue dwarf and a G-type dwarf. Orbital period 4.5 hours! Separation distance a few hundred thousand miles. In this case Burnham states, "Spectroscopic studies reveal the existence of a "rotating ring of gas" (plasma) around the blue star, and it appears that the explosive increase of light is due not only to the brightening of the star, but to a large increase of radiation from the cloud."

- Z Andromedae and R Aquarii - Both of these consist of a hot blue dwarf mated to a red giant.

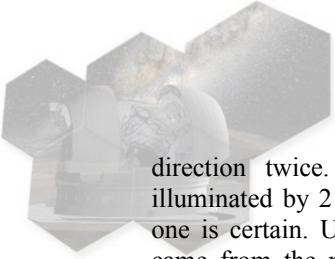
- T Coronae and RS Ophiuchi - Both have recurrent nova-like eruptions and are close binary systems.

Gamma Ray Bursters

If you check the web page http://www.science.nasa.gov/newhome/headlines/ast13oct98_1.htm

you will see the following description of what constitutes a "gamma ray burster".

"October 13, 1998: Cosmic gamma-ray bursts have been called the *greatest mystery of modern astronomy*. They are powerful blasts of gamma- and X-radiation that come from all parts of the sky, but never from the same



direction twice. Space satellites indicate that Earth is illuminated by 2 to 3 bursts every day. What are they? No one is certain. Until recently we didn't even know if they came from the neighborhood of our own solar system or perhaps from as far away as the edge of the universe. The first vital clues began to emerge in 1997 when astronomers detected an optical counterpart to a gamma-ray burst. In February 1997 the BeppoSAX X-ray astronomy satellite pinpointed the position of a burst in Orion to within a few arcminutes. That allowed astronomers to photograph the burst, and what they saw surprised them. They detected a *rapidly fading star*, probably the aftermath of a *gigantic explosion, next to a faint amorphous blob* believed to be a very distant galaxy." [Italics added.]

Doesn't this sound like fissioning again? An **explosion**, followed by a **rapidly fading star**, accompanied by some sort of **companion!** Might it be that the reason they "never [come] from the same direction twice" is that the creation of the binary pair has relieved the electrical stress (at least for a long enough time that we humans haven't yet seen a recurrence)? The February 2001 issue of *Sky & Telescope* magazine contains these words,

"Does every gamma-ray burst begin with the supernova explosion of a massive star? New observations from NASA's Chandra X-ray Observatory and the Italian-Dutch BeppoSAX satellite suggest this is so. Some astronomers think it's still too early to draw firm conclusions, though they hail the new observations as revolutionary. In any case, a link between gamma-ray bursts and supernovae seems to be convincingly confirmed."

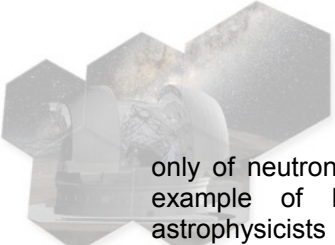
Pulsars

Although pulsars do not occupy a specific place in the HR diagram, it is worth noting that they, too,

have characteristics that are most comfortably explained via the ES model. Pulsars are stars that have extremely short periods of variability in their production of EM radiation (both light and radio frequency emissions) . When they were first discovered it was thought that they rotated rapidly - like lighthouses. But when the observed rate of "rotation" got up to about once per second for certain pulsars, despite their having masses exceeding that of the sun, this official explanation became untenable. Instead, the concept of the **"neutron star"** was invented. It was proposed that only such a dense material could make up a star that could stand those rotation speeds.

But, one of the basic rules of nuclear chemistry is the 'zone of stability'. This is the observation that if we add neutrons to the nucleus of any atom, we need to add an almost proportional number of protons (and their accompanying electrons) to maintain a stable nucleus. In fact, it seems that when we consider all the natural elements (and the heavy man made elements as well), there is a requirement that in order to hold a group of neutrons together in a nucleus, a certain number of proton-electron pairs are required. The stable nuclei of the lighter elements contain approximately equal numbers of neutrons and protons, a neutron/proton ratio of 1. The heavier nuclei contain a few more neutrons than protons, but the limit seems to be 1.5 neutrons per proton. Nuclei that differ significantly from this ratio SPONTANEOUSLY UNDERGO RADIOACTIVE TRANSFORMATIONS that tend to bring their compositions into or closer to this ratio.

Flying in the face of this observed fact, mainstream astrophysicists continue to postulate the existence of stars made up of solid material consisting



only of neutrons, "neutronium". This is yet one more example of Fairie Dust entities fantasized by astrophysicists to explain otherwise inexplicable observations. The 'neutron star' is simply yet another fantasy conjured up, this time, in order to avoid confronting the idea that pulsar discharges are electrical phenomena. A nucleus or charge free atom made up of only neutrons has never been synthesized in any laboratory nor can it ever be. In fact, a web search on the word 'neutronium' will produce only references to a computer game – not to any real, scientific discussion or description. Lone neutrons decay into proton - electron pairs in less than 14 minutes; atomlike collections of two or more neutrons will fly apart almost instantaneously.

Perhaps some astronomers have begun to realize neutronium is embarrassingly impossible. In any event, a less easily falsifiable entity has now been proposed. Wal Thornhill has written about this latest mainstream explanation of pulsar emissions:

"The discovery now of an x-ray pulsar SAX J1808.4-3658 (J1808 for short), located in the constellation of Sagittarius, that flashes every 2.5 thousandths of a second (that is 24,000 RPM!) goes way beyond the red-line even for a neutron star. So another ad hoc requirement is added to the already long list - this pulsar must be composed of something even more dense than packed neutrons - **strange matter!** ...When not associated with protons in a nucleus, neutrons decay into protons and electrons in a few minutes. Atomic nuclei with too many neutrons are unstable. If it were possible to form a neutron star, why should it be stable?"

"Strange matter"! Yet another *ad hoc* fictional invention! They have been getting away with this kind of nonsense for decades. How ludicrous does it have to get before some responsible astronomer cries out

that this Emperor Has No Clothes On?

Some pulsars oscillate with periods in the millisecond range. Their radio pulse characteristics are: the 'duty cycle' is typically 5% (i.e., the pulsar flashes like a strobe light - the duration of each output pulse is much shorter than the length of time between pulses); some individual pulses are quite variable in intensity; the polarization of the pulse implies the origin has a strong magnetic field; magnetic fields require electrical currents. These characteristics are consistent with an **electrical arc (lightning) interaction between two closely spaced binary stars**. Relaxation oscillators with characteristics like this have been known and used by electrical engineers for many years. Therefore, I was pleased when I saw the following announcement:

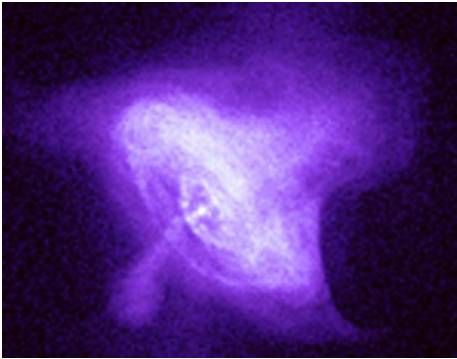
Hubble Space Telescope Observations Reveal Coolest and Oldest White Dwarf Stars in the Galaxy: "Using the Hubble Space Telescope, astronomers at the Naval Research Laboratory (NRL) have detected five optical ***companion stars*** orbiting ***millisecond pulsars***. Only two other such systems are known. Three of the companions are among the coolest and oldest white dwarf stars known." [Italics added]

It is becoming obvious that pulsars are electrical discharges between members of binary pairs.

The Crab Pulsar

The "Crab Nebula" (M1) is a cloud of gas (plasma) that is the remnant of a ***nova*** explosion seen by Chinese astronomers. Lying at the center of the nebula is a ***pulsar***- a star called CM Tauri. The frequency of repetition of the pulsar's output is 30 pulses per second. The length of each flash, however, is approximately 1/1000 sec., one millisecond! The

obvious question to ask next is: Is this star a binary pair? No companion is visible from even the largest earthbound telescopes. But, the Hubble orbiting telescope has recently found **a companion**, "a small knot of bright emission located only 1500 AU (1500 times the distance from the Earth to the Sun) from the pulsar. This knot has gone undetected up until now because even at the best ground-based resolution it is lost in the glare of the adjacent pulsar. The knot and the pulsar line up with the direction of a jet of X-ray emission. A second discovery is that in the direction opposite the knot, the Crab pulsar is capped by a ring-like 'halo' of emission tipped at about 20 degrees to our line of sight. In this geometry the polar jet flows right through the center of the halo."



M1 - The Crab Nebula

The shape of this pulsar centered object is exactly that of an electrical homopolar motor - generator.

Supernova Remnant G11.2-0.3

On August 6, 2000, and October 15, 2000, the orbiting X-ray telescope Chandra discovered a pulsar at the geometric center of the supernova remnant known as G11.2-0.3. This observation provides strong evidence that the pulsar was formed in the supernova of 386 AD, which was also witnessed by Chinese astronomers. The official description of the image included the words:

"The Chandra observations of G11.2-0.3 have also, for the first time, revealed the *bizarre* appearance of the pulsar *wind nebula* at the center of the supernova remnant. Its rough cigar-like shape is in contrast to the graceful arcs observed around the Crab and Vela pulsars. However, together with those pulsars, G11.2-0.3 demonstrates that such complicated structures are ubiquitous around young pulsars."

Upon examination, the image of the central star reveals that it is at the center of a 'cigar shaped' *plasma discharge*, not a 'bizarre wind nebula' (whatever that is). Although no binary companion has (yet) been found, the presence of the observed plasma discharge makes one suspect it is only a matter of time.

Each new discovery of a *binary pair* of stars, one of which is either a *variable star or pulsar*, at the center of a *nova* remnant, is one more piece of evidence that Juergens' electric star model and Thornhill's theory of the fissioning of those electric stars are both valid.



Electric Star Evolution

In the Electric Star hypothesis, there is no reason to attribute youth to one spectral type over another. We conclude that a star's location on the HR diagram only depends on its size and the electric current density it is presently experiencing. If, for whatever reason, the strength of that current density should change, then the star will change its position on the HR diagram - perhaps, like FG Sagittae, abruptly. Otherwise, no movement from one place to another on that plot is to be expected. And its age remains indeterminate regardless of its mass or spectral type. This is disquieting in the sense that we are now confronted by the knowledge that our own Sun's future is not as certain as is predicted by mainstream astronomy. We cannot know whether the Birkeland current presently powering our Sun will increase or decrease, nor how long it will be before it does so.

Summary

A fresh look at the Hertzsprung-Russell diagram, unencumbered by the assumption that all stars must be internally powered by the thermonuclear fusion reaction, reveals an elegant correspondence between this plot and the Electric Star model proposed by Ralph Juergens and extended by Earl Milton. In fact the correspondence is better than it is with the standard thermonuclear model. The details in the shape of the HR diagram are exactly what the tufted electric star model predicts they should be. The observed actions of nova-like variable stars, pulsars, the anomalies in the line spectra of B-type stars, and the high frequency of occurrence of binary pairs of stars are all in concordance with Thornhill's Electrical Universe theory, his stellar fissioning concept, and the Electric Star model as

well. Completely mysterious and unexplained from the thermonuclear model point of view is the 'impossible' evolutionary behavior of FG Sagittae and V838 Monocerotis. Yet these phenomena are perfectly understandable using the ES model. We eagerly await NASA's next 'mysterious discovery' to further strengthen the case for the Electric Star hypothesis.

Galaxies

The usual definition of what a galaxy is: 'An island universe', or 'A vast collection of stars' is not wrong, but it is misleading. Because of the vast distances that separate stars even in the most densely packed regions of most galaxies, a better definition is: 'A vast formation of plasma clouds that contain electrical currents and occasional, widely distributed tiny lumped points of matter called nebulae, stars and planets.'

The shape that characterizes most galaxies was first described by Hannes Alfvén in 1981.

TRANSACTIONS ON PLASMA SCIENCE, VOL. PS-9, NO. 5, DECEMBER 1979

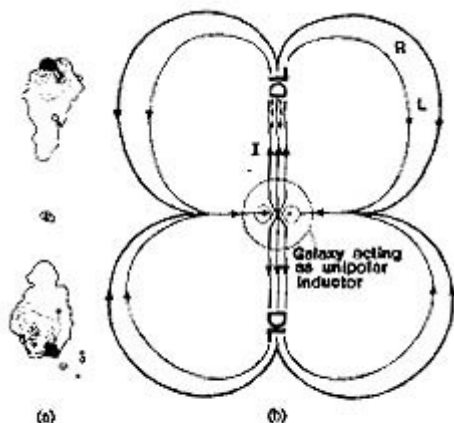
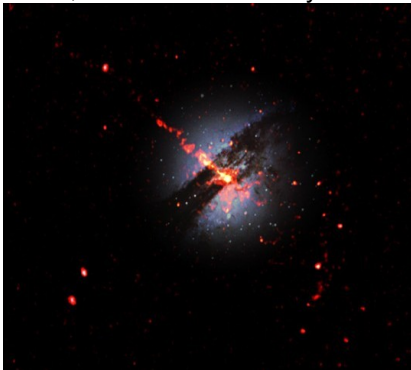


Fig. 10. Galactic circuit. (a) Observed radio emission of Cygnus A (by Hargrave and Ryle [38]). (b) The heliospheric circuit is scaled up by a factor 10^9 , and the sun replaced by a galaxy located almost exactly between the radio sources (cf. [5, sec. III.4.4]). The radio emission is attributed to synchrotron emission by electrons accelerated in the double layers.

The shape he proposed is shown here. This diagram is a vertical cross section of a three

dimensional figure. The horizontal line at the center of the diagram is actually a circular disk lying in the horizontal plane. It is this disk, when viewed not from the edge as it is here, but more face on, that is the familiar spiral shape picture of a galaxy that we are used to seeing. The parallel vertical lines coming out from the center of the galaxy (along its axis of rotation) represent a strong electrical current in a plasma that sometimes is visible as a "jet".

The two pairs of letters - DL - in the sketch are Double Layers within the jet plasma. Recall that DLs contain strong **E**-fields and are the source of radio frequency emissions. The two amorphous shapes at the left of the diagram show the resulting typical "double radio source" that is observed in many galaxies. These are due to the presence of DLs. In some galaxies the jet plasma is in the dark current mode; in others it is clearly visible.



This is Centaurus A. The jet is clearly visible in this image. Halton Arp's contention that quasars are emitted from the centers of Seyfert galaxies along their 'secondary axes' (axes of rotation) is supported by these pictures. Recall that DLs are also the locations of strong electromagnetic z-pinches which can compress dispersed material into denser objects.

The general shape of a rotating disk carrying electrical currents in the shape shown by Alfvén

defines what is called the homopolar motor - generator. Note that the horizontal disk (the arms of the galaxy) is where the current, I , is least spread out - the current density is greatest. This is where Population I stars are usually found.



In many galaxies the jet structure cannot be seen in visible light. So until the development of infrared and x-ray orbiting satellite telescopes, most of these features remained undiscovered. There are now many images of galaxies that show the Alfvén structure. The image at the right was taken by the Subaru orbiting IR telescope of galaxy M 82.

Even our neighboring Andromeda galaxy, M 31, shows the disk like structure of the homopolar motor-generator morphology. Below on the right is a normal, visible light photograph of M 31. Below on the left is an image of that same object obtained by the Infrared Space Observatory (ISO) operated by ESA.





But Alfven also proposed that individual stars themselves had similar morphologies. He proposed an almost identical diagram for the operation of a typical star. Once again the plasmas involved may or may not all be in one of the visible modes of operation. So not all images of stars show this structure - but many do. Alfven's heliospheric circuit is shown here. Because our Sun is a typical star, this diagram would apply equally well to it.

This proposal remained in the realm of conjecture until the spring of the year 2001 when the spacecraft Ulysses discovered long plasma 'tubes' emanating from the bottom pole of our Sun. These tubes are long enough to extend out farther than the distance of the orbit of Mars from the Sun. There are also many images available now of individual 'jetted stars'. Of course, Alfven believed all stars were jetted - but some less visibly than others. Below are a pair of images of stars that show the plasma jets and characteristic disk shape clearly.

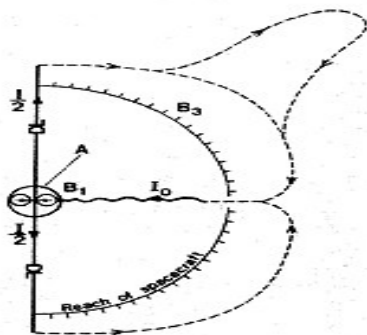
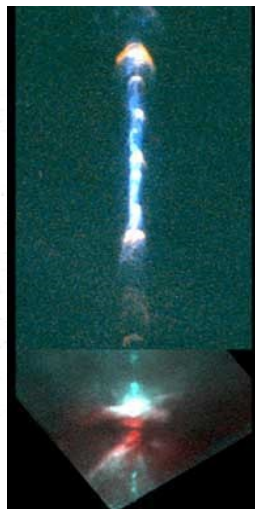
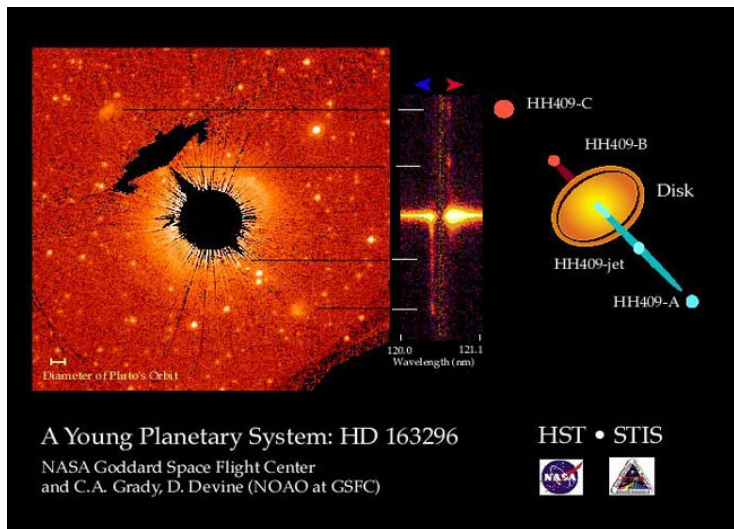


Fig. 9. Heliospheric circuit. The sun acts as a unipolar inductor (A) producing a current that goes outward along both the axes and inward in the equatorial plane and along the magnetic field lines B_1 . The current must close at large distance (B_2), either as a homogeneous current layer, or, more likely, as a pinched current. Analogous to the auroral circuit, there may be double layers which should be located symmetrically at the sun's axes. Such double layers have not yet been discovered.

R. Heliospheric Current

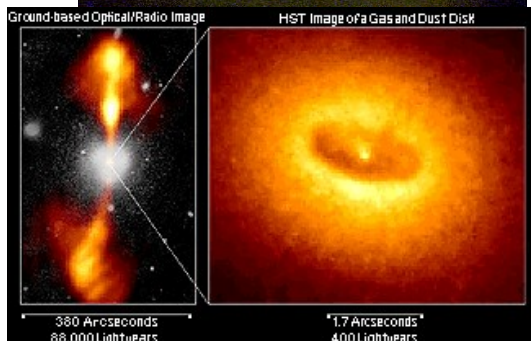
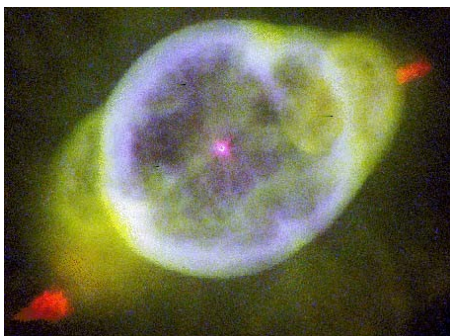


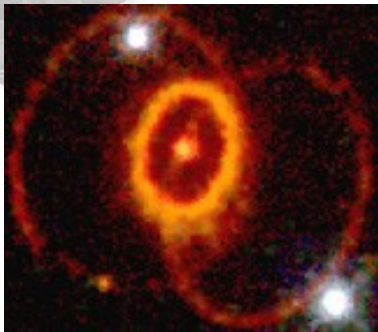
Notice in the right hand image (Goddard Space Flight Center) that the 'planets' (Herbig-Haro objects) are formed in a collinear array along the jet axis of the parent star. These clumpings are probably formed by DLs at those locations. In the center image (above) the tell-tale twisting shape of a large Birkeland current containing DLs is clearly visible. Dr. Anthony Peratt points out that the number of objects typically formed



by the z-pinch effect is usually around nine.

Whether we choose to call it the homopolar motor - generator, the jetted disk, or the Alfvén circuit, this shape is being seen with increasing frequency as more accurate and broader bandwidth instruments are developed. (Notice, for example, the shape of the "Crab pulsar" shown on the Main page of this site.) All the images shown below are of stars. All exhibit the homopolar disk shape.



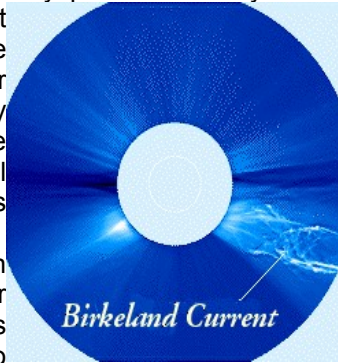


The Solar System

The Solar Plasma

The space surrounding the Sun, its corona and beyond, is a plasma. Indeed, much of all space is occupied by plasma - mostly in the dark current mode.


The planets and their moons each carry an electric charge as they travel through this plasma. The plasma sea in which the solar system floats extends out to



what is called the heliopause - where there is probably a double layer that separates our Sun's plasma from the lower voltage plasma that fills our arm of the Milky Way galaxy. In solar flares and coronal mass ejections (CME's), charged particles are thrown outward from the Sun. These flows constitute electrical currents. And what form do (Birkeland) currents take in plasmas? - They twist!

Planetary Magnetotails

Each planet has a 'plasma sheath' - a well



known electrical phenomenon - the size and shape of which is determined by the difference between the electrical potential (voltage) of the planet and that of the nearby solar plasma. The shape of this plasma sheath is usually a tear-drop or wind-sock shape, the pointed end facing away from the sun. The boundary of this sheath is a double layer that separates the planet's surrounding plasma from the solar plasma.

Interactions of Magnetotails

The plasma sheath of Venus is extremely long, almost touching the Earth when the two planets are at their closest approach. Jupiter's plasma sheath has the same relationship with Saturn. Recently NASA astronomers have discovered what they call 'stringy things' in the long plasma tail of Venus. Such twisted (stringy) filaments are exactly the paths Birkeland currents take in plasmas. Apparently Venus is discharging an electrical current. The plasma tails of all the planets today are in the dark current mode of operation. But were they always thus? The ancients reported that Venus once was seen to have a fiery tail and 'twisted hair'. Could it have been that her plasma tail was then in the normal glow or even the arc mode of operation?

Consider for a moment what the shape of Venus' plasma tail would look like if it were visible. The diameter of the plasma sheath around Venus is, at most, possibly two or three

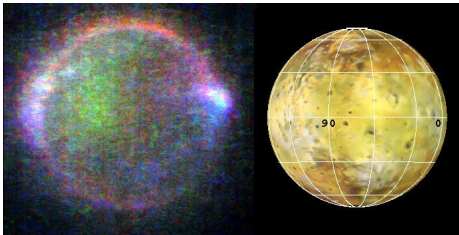
times the planet's diameter - say about 20,000 miles. But the distance from Venus to Earth during their closest approaches is in the order of 26 million miles. So the Venusian tail is approximately a thousand times as long as it is broad at its thickest point. That is a very long, thin, twisting snakelike shape. If, at some time in the past, this plasma tail were in the normal glow mode, it would have been visible from Earth! How would the ancients have described it?

Intersecting Plasma Sheaths

When a planet is surrounded by a double layer sheath, it is protected from direct electrical interaction with any outside body. Two electrically charged planets, each surrounded by such a plasma sheath cannot see each other electrostatically. However, if a body having a different electrical charge, penetrates the double layer, moving into the plasmasphere surrounding a planet, electrical interactions (current discharges) can and will occur. Thus, if any other body such as a large meteor (or asteroid, comet, etc.) should come close enough to Earth to penetrate our plasma sheath, violent electric discharges would occur between the two bodies. It would, of course, be unfortunate to be standing at the point of origin of such a discharge. But the discharge itself might destroy the intruder and thus protect the Earth from an otherwise disastrous collision.

Physicist Wal Thornhill states that Io, the

innermost of the four large moons of Jupiter, is presently experiencing electric discharges from Jupiter and is being electrically machined as a result. He points out that Io is a living laboratory of electric plasma discharges sitting right in front of us, if we are only willing to see it for what it is. NASA released the photo of Io shown below. Io is pretty much aglow. Note the heaviest glows on Io are on the sides directly toward and directly away from Jupiter. The famous 'volcanos' on Io cannot be true volcanos because they have moved around a distance of many miles since their discovery. Also the material ejected from the site of these phenomena is not disbursed over a circular **area** as volcanic ejecta would be. It all lands in a **thin ring** - just as the output of a plasma gun does. These are clearly electric discharges, not volcanos.



Original Caption Released with Image:

This eerie view of Jupiter's moon Io in eclipse (left) was acquired by NASA's Galileo spacecraft while the moon was in Jupiter's shadow. Gases above the satellite's surface produced a ghostly glow that could be seen at visible wavelengths (red, green, and violet). The vivid colors, caused by collisions between Io's atmospheric gases and energetic charged

particles trapped in Jupiter's magnetic field, had not previously been observed. The green and red emissions are probably produced by mechanisms similar to those in Earth's polar regions that produce the aurora, or northern and southern lights. Bright blue glows mark the sites of dense plumes of volcanic vapor, and may be places where Io is electrically connected to Jupiter.

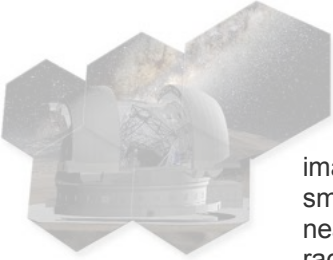
The viewing geometry is shown in the image on the right. North is to the top of the picture, and Jupiter is towards the right. The resolution is 13.5 kilometers (8 miles) per picture element. The images were taken on May 31, 1998 at a range of 1.3 million kilometers (800,000 miles) by Galileo's onboard solid state imaging camera system during the spacecraft's 15th orbit of Jupiter.

JPL manages the Galileo mission for NASA's Office of Space Science, Washington, DC. This image and other images and data received from Galileo are posted on the World Wide Web on the Galileo mission home page at <http://www.jpl.nasa.gov/galileo>. Background information and educational context for the images can be found at <http://www.jpl.nasa.gov/galileo/sepo>.

(Underlining added for emphasis.)

NASA recently directed the Galileo space probe to pass very close to one of the "volcanos" (electric arc discharges) on Io - with the following result (**New Scientist** October 30, 1999):

"On October 10 Galileo passed within 611 kilometers of Io, using its solid state

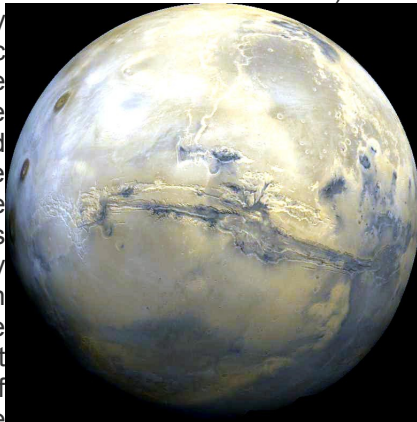


imager to reveal features as small as 9 meters across near the volcano Pillan. But radiation took its toll, zapping a critical bit in Galileo's computer memory and blurring many images."

Flying a computer through a high intensity electric field is much more likely to "zap" its electronics than simply passing it no nearer than 380 miles distant from some smoke and molten rock.

Planetary Scars

Thornhill and other like minded investigators also believe that the monstrous scar across the face of Mars (the canyon called Valles Marineris) was produced by electric arc machining. The rocks and rubble that are found strewn everywhere across the landscape of Mars are most probably the detritus from this huge excavation. Just look at the size of that scar! The Grand Canyon of Arizona would be lost in one small section of it.

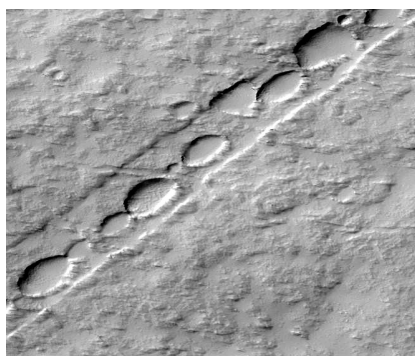
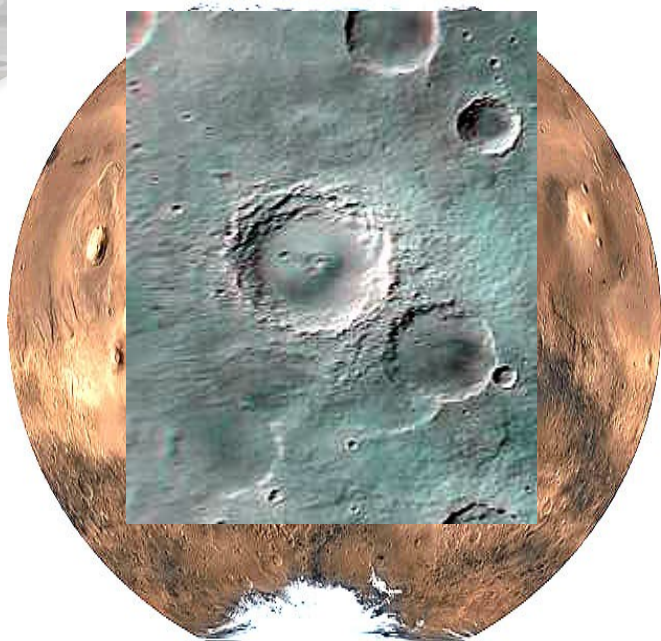


There are many visible examples of electrical scarring on Mars. Electrical scars have characteristics that enable us to distinguish between them and water erosion and/or impact cratering. Venus also exhibits evidence of having been electrically machined.

Presently a debate is occurring among some geologists as to exactly what process formed the Grand Canyon of Arizona. There is no evidence of where the soil that was removed **went!** There is no river delta. It has all disappeared. And the Colorado River would have had to flow uphill in order to create the Canyon. Also, no evidence of the "meteor" that formed Arizona's "Meteor Crater" has ever been found. Were both these scars also formed by electric arc machining? It is highly likely. For a detailed description of the problems associated with the accepted explanation of how the Grand Canyon was formed [see Wal Thornhill's page.](#)

Mars

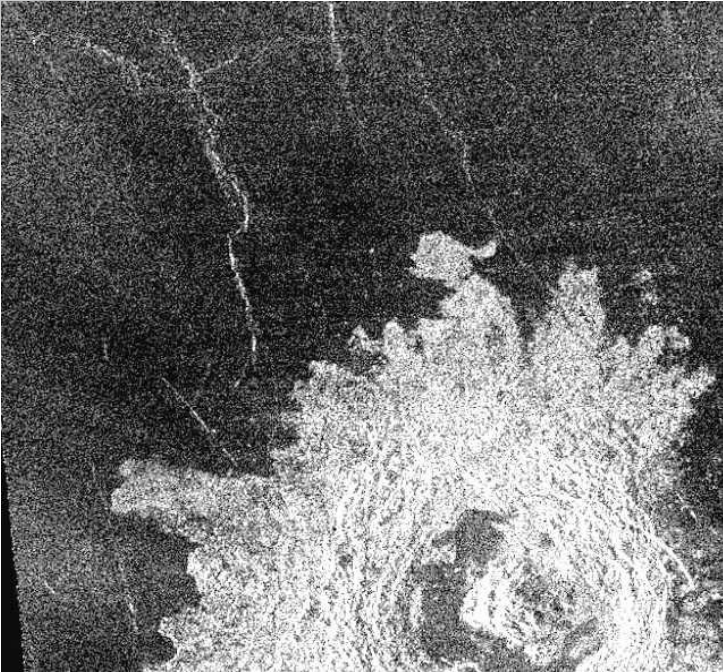
A full disk image of Mars is on the right. Notice that the southern hemisphere is covered with craters. The northern hemisphere is, for the most part, smooth and has many fewer craters. Below is an image of Martian "Sinuous rilles". They are made up of chains of craterlets. This too is characteristic of electric arc machining (certainly not water flow). Notice the faint horizontal rilles crossing the large one. The horizontal rilles obviously were made later than the large rille. Notice too that the horizontal rille goes up hill and down hill, cutting right across the earlier structure.



Terraced crater walls and small secondary craters sitting on the edge of larger craters are characteristic of electric arc machining. Also notice the flat floors and almost perfect circularity of the craters. If the twisting arc that creates an electrically formed crater stops on the rim and does not extinguish, it will form a secondary crater. This effect is clearly demonstrated in a laboratory experiment shown on physicist Wal Thornhill's CD "The ElectricUniverse."

Venus

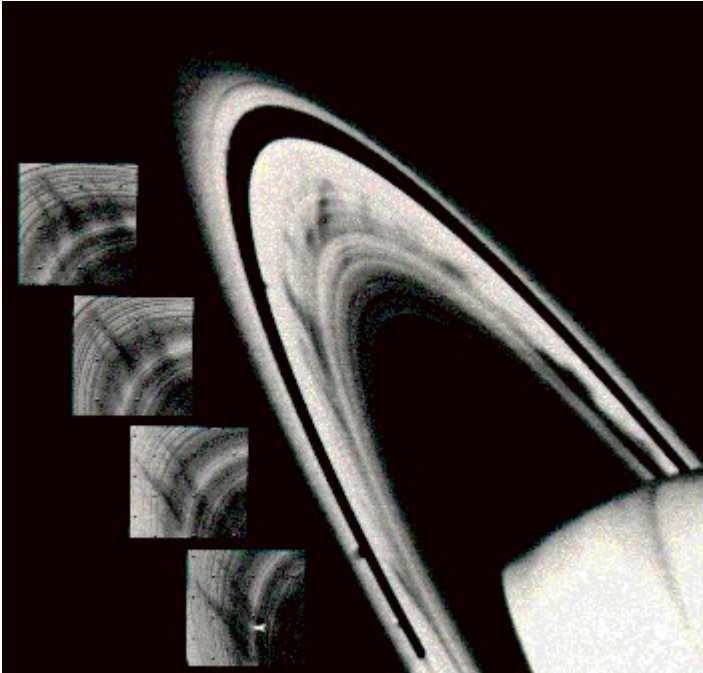
On the right is a closeup of the upper left region of Venus' crater Buck. It is a classic example of when the arc is extinguished before it can make a complete circular rotation. The fact that the sinuous rilles are made up of strings of small craters is obvious in this image. There are two straight rills to the left of the crater (as well as the curving ones leading down into it from the top of the photo). Sinuous rilles are one of the typical characteristics of electric arc machining. The standard mainstream explanation for these horseshoe



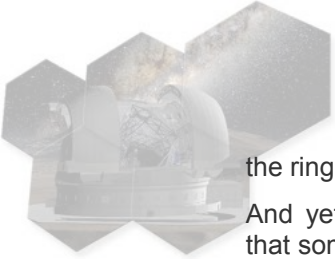
shaped craters is that one side of the crater wall has collapsed. What do you think?

If all the "impact" craters on Mars, Venus, and our Moon were really formed by impacts, then probability would dictate that most (or at least a significant fraction) of them should be elliptical. Meteors very rarely come straight down. On the other hand, electric fields always impinge on conducting spheres at right angles to their surfaces (i.e., vertically) and that is why all these so-called circular "impact" craters are round. They were not made by impacts. They were caused by electric anode scarring.

Saturn's Rings



An interesting phenomenon (called "mysterious" by those in the mainstream) is the fact that the planet Saturn has radial "spokes" in its ring system. The radial nature of these almost screams ELECTRIC FIELD at us! But one of the official explanations is that "they are thought to be microscopic grains that have become charged and are **levitating** away from



the ring plane." *Levitating??*

And yet another property of Saturn's rings is that some of them are braided! They twist! The following is a quote from **Science**, Vol. 210, 5 Dec 1980, p. 1108: "There was the F ring, revealed in Voyager's narrow-angle camera to be **kinked** and triply stranded - and, perhaps, in defiance of all commonsense celestial mechanics, **braided.**" (Emphasis added.)

Are the "braids" in Saturn's F ring due to just the kind of twisting currents that Birkeland observed?

Redshift

What is redshift?

If the lines in the spectrum of the light from a star or galaxy appear at a lower frequency (shifted toward the red) than where they are observed in the spectrum of the Sun, we say this object exhibits 'positive redshift'. The accepted explanation for this effect is that the object must be moving away from us. This interpretation is drawn by analogy with the downward shift in the pitch of a train whistle as it passes through a railroad crossing and then speeds away from us. The question is: Is recessional velocity the **only** thing that can produce a redshift, as modern astrophysicists presume? It has become clear that the answer to that question is an emphatic **NO!**

If the wavelength of an absorption line in an object's observed spectrum appears at a wavelength that is, say, 1.56 times its 'normal wavelength' (the wavelength at which it is observed in a laboratory experiment here on Earth), then we say this object has a positive redshift of $z = 0.56$. The 'z value' is simply the observed fractional increase in the wavelength of the spectral lines. The simple interpretation of this is to say that this object must therefore be receding from us at 56% of the speed of light or $0.56 \times 300,000$ km/sec. Mainstream astrophysicists believe that recessional velocity, $v = cz$. This object, therefore, must be very far away from Earth.

But a high redshift value does not necessarily mean the object is far away. There is another, more important cause of high redshift values.

Halton Arp



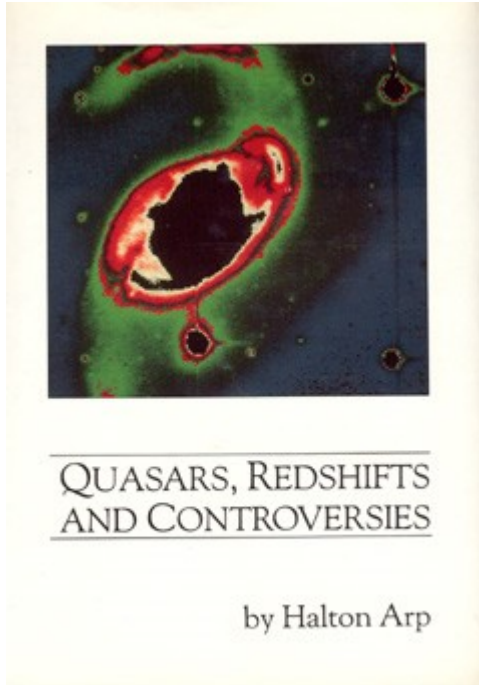
Halton C. Arp is a professional astronomer who, earlier in his career, was Edwin Hubble's assistant. He has earned the Helen B. Warner prize, the Newcomb Cleveland award and the Alexander von Humboldt Senior Scientist Award. For years he worked at the Mt. Palomar and Mt.

Wilson observatories. While there, he developed his well known catalog of "Peculiar Galaxies" that are misshapen or irregular in appearance.

Arp discovered, by taking photographs through the big telescopes, that many pairs of quasars (quasi-stellar objects) which have extremely high redshift z values (and are therefore thought to be receding from us very rapidly - and thus must be located at a great distance from us) are **physically associated with galaxies that have low redshift and are known to be relatively close by.** Arp has photographs of many pairs of high redshift quasars that are symmetrically located on either side of what he suggests are their parent, low redshift galaxies. These pairings occur much more often than the probabilities of random placement would allow. Mainstream astrophysicists try to explain away Arp's observations of connected galaxies and quasars as being "illusions" or "coincidences of apparent location". But, the large number of physically associated quasars and low red

shift galaxies that he has photographed and cataloged defies that evasion. It simply happens too often

Because of Arp's photos, the assumption that high red shift objects have to be very far away - on which the "Big Bang" theory and all of "accepted cosmology" is based - is proven to be wrong! The Big Bang theory is therefore falsified.



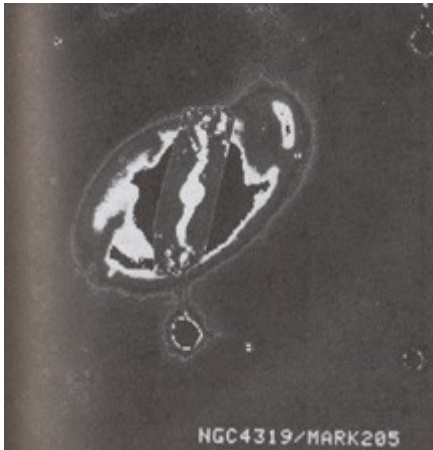
NGC 4319 and Markarian 205

A prime example of Arp's challenge is the connected pair of objects NGC 4319 and Markarian 205.

Dr. Arp has shown in his book "Quasars, Redshifts and Controversies" that there is a physical

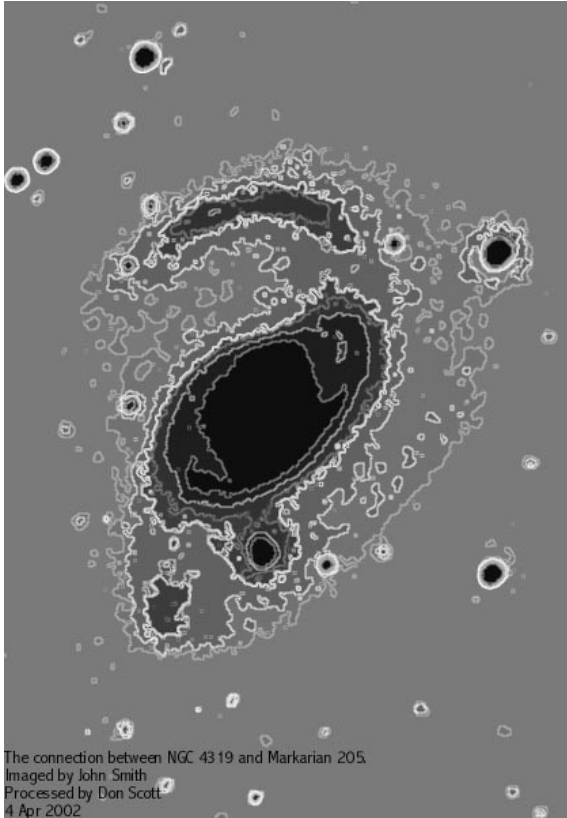
connection between the barred spiral galaxy NGC 4319 and the quasar like object Markarian 205. This connection is between two objects that have vastly different redshift values. Mainstream astronomers deny

the existence of this physical link. They claim these two objects are not close together - they are 'coincidentally aligned'.



On April 4, 2002 amateur astronomer John Smith of Oro Valley, AZ obtained an image of the two objects. The author of these pages then quantized that image to show isophote contours (of equal brightness). This result is shown below. The isophotes in the central section of 4319 suggest that the galaxy is indeed a barred spiral. Also the main arms seem to be coming off at their roots. Both of these observations were first noted by Arp and stated as such in his book. Notice that **only** Mark 205's isophotes are stretched back toward NGC 4319. None

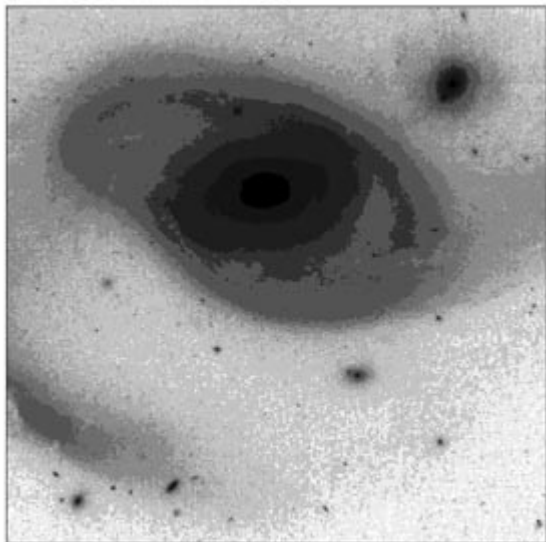
of the other objects in close proximity to 4319 are



distorted in this manner.

Then on October 7, 2002 the Astronomy Picture of the Day issued a Hubble Space Telescope image of these same objects. The orientation is different. After processing this HST image in the same way as the above amateur image, the following were obtained:

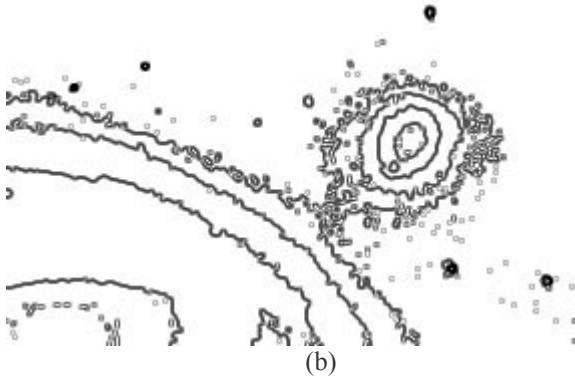
NGC 4319 and Markarian 205



Hubble
Heritage

NASA and The Hubble Heritage Team (STScI/AURA) • Hubble Space Telescope/WFPC2 • STScI-PR002-23

(a)

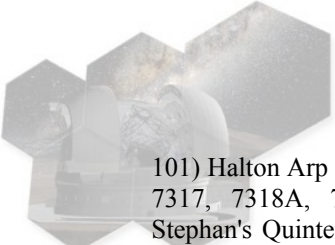


Notice, in the magnified isophote view, (b), that there is a distortion of the shape of the Mark 205 inner isophotes back toward NGC 4319. There are also a series of secondary masses within Mark 205 on a line connecting 4319 and the center of Mark 205. But NASA scientists 'cannot see any connection between these two objects.'

The official explanation of the NASA image states, "Appearances can be deceiving. In this NASA Hubble Space Telescope image, an odd celestial duo, the spiral galaxy NGC 4319 [center] and a quasar called Markarian 205 [upper right], appear to be neighbors. In reality, the two objects don't even live in the same city. They are separated by time and space. NGC 4319 is 80 million light-years from Earth. Markarian 205 (Mrk 205) is more than 14 times farther away, residing 1 billion light-years from Earth. The apparent close alignment of Mrk 205 and NGC 4319 is simply a matter of chance." Professional astronomers seem to be so enamored of their 'redshift equals distance' theory that it damages their eyesight.

Stephan's Quintet

In "Quasars, Redshifts, and Controversies" (p. 96-



101) Halton Arp discusses the five interacting galaxies NGC 7317, 7318A, 7318B, 7319, and 7320 that constitute Stephan's Quintet. The last one, NGC 7320, has a redshift value of 800 km/sec. The other four have redshifts of either 5700 km/sec or 6700 km/sec. Mainstream astronomers therefore claim those last four are about eight times farther away from us than NGC 7320. Therefore, they say, there cannot be any interaction between 7320 and the others.

Arp states "The deepest 200 inch (Mt. Palomar) plates that I have been able to obtain clearly show a 'tail' coming out of the southeast end of NGC 7320." He points out, "A tail like this from NGC 7320... must be an interaction tail - which could arise only from physical interaction with the adjacent high-redshift members of the Quintet."

He then states that at least one amateur has been able to see the tail but, "it is amazing that so many professionals have difficulty seeing it." NASA routinely crops their images of Stephan's Quintet to exclude the area where this tail would be seen.

However, my good friend, amateur astronomer John Smith acquired a full image of the Quintet.

The large, dark galaxy on the left is the low redshift NGC 7320. Then going counter-clockwise we have 7317, 7318A, 7318B, and 7319. At the top of the image is the small galaxy NGC 7320C. After some digital image processing (which only increased contrast), the result shown below was obtained.

It is apparent that a 'tail' does indeed extend out from NGC 7320 toward the left. In fact it appears to curve around and connect to the small galaxy NGC 7320C. The redshift of this small companion galaxy is $z = 0.02$ which is about 10 times that of NGC 7320.

So, once again we have evidence of a physical connection between two objects that have vastly different

redshift values.

Inherent Redshift

Arp believes that the observed redshift value of any object is made up of two components: the inherent component and the velocity component. The velocity component is the only one recognized by mainstream astronomers. The inherent redshift is a property of the matter in the object. It apparently changes over time in discrete steps. He suggests that quasars are typically emitted from their parent galaxies with inherent redshift values of up to $z = 2$. They continue to move away, with stepwise decreasing inherent redshift. Often, when the inherent redshift value gets down to around $z = 0.3$, the quasar starts to look like a small galaxy or BL Lac object and begins to fall back, with still decreasing redshift values, toward its parent. He has photos and diagrams of many such family groupings. Any additional redshift (over and above its inherent value) is indeed indicative of the object's velocity. But the inherent part is an indication of the object's youth and usually makes up the larger fraction of a quasar's total redshift.

In addition, these **inherent redshift z values of quasars seem to be quantized!** Unusually tight groupings of those calculated values occur centered around values of

$z = 0.061, 0.3, 0.6, 0.96, 1.41, 1.96, \text{etc...}$ such that $(1+z_2) = 1.23(1+z_1)$. [For example, $1.23(1+0.3) = 1.60$].

The very ***existence of this quantization*** alone, is sufficient proof of the failure of the idea that redshift is only an indicator of recessional speed (and therefore distance). This quantization means (under the redshift equals distance interpretation) that quasars all must lie in a series of concentric shells ***with Earth at the***



center of the entire arrangement. Copernicus found out a long time ago that Earth isn't at the center of anything!

Recently mainstream astronomers have joyfully announced that they can find no quantization effects in the observed redshift values of quasars. Of course not! The raw measured total redshift values of the universal set of all known quasars are not quantized. It is the **inherent redshift z values that are!**

Instead of nominating him for a prize (and simultaneously reexamining their assumption that "redshift equals distance"), Arp was (and continues to be) systematically denied publication of his results and refused telescope time. One would at least expect the "powers that be" to immediately turn the Chandra X-ray orbiting telescope, the Hubble space telescope, and all the big land based telescopes toward Arp's exciting discoveries in order to either confirm or disprove them once and for all. Instead, these objects have been completely excluded from examination. Official photographs are routinely cropped to exclude them. Those familiar with the Galileo story will remember the priests who refused to look through his telescope.

Evidence Says Arp is Right - A Quasar In Front of a Nearby Galaxy

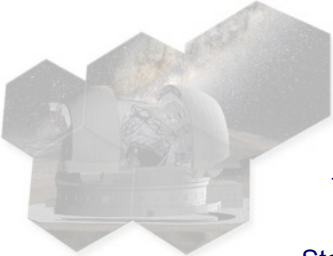
The final irrefutable falsification of the "Redshift equals distance" assumption is the following image of galaxy NGC 7319 (Redshift = 0.0225). The small object indicated by the arrow is a quasar (Redshift $z = 2.11$) This observation of a quasar **between** the galaxy and Earth is impossible if the quasar is over ninety times farther away than the galaxy.

In fact, a higher magnification image of the quasar (below) shows a "jet" of matter extending out from the center of NGC 7319 toward the quasar.

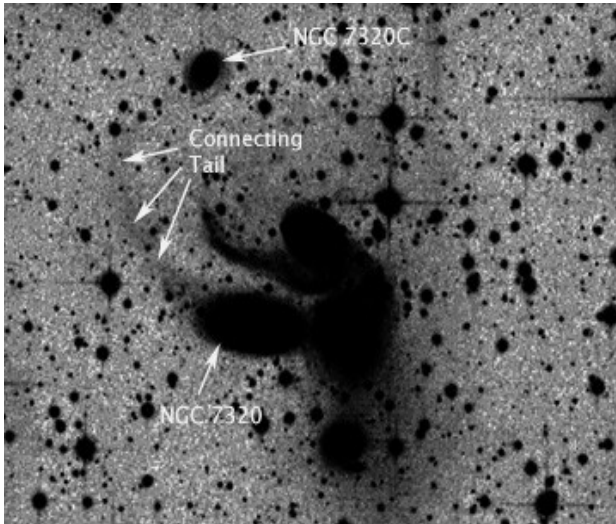
So, Arp is correct in his contention that redshift is caused mainly by an object's being young, and only secondarily because of its velocity. Therefore, quasars are not the brightest, most distant and rapidly moving things in the observed universe - but they are among the youngest.

The Big Bang Theory is false - not because I or others claim it to be false - but because it has been scientifically falsified.

Halton C. Arp is now at the Max Planck Institute in Germany. Occasionally he returns to the United States to give lectures and visit family.




[More about Halton Arp's work](#)
[Arp's Peculiar Galaxies](#)
[Exploding the Big Bang](#)
[Statistics Used as a Weapon](#)



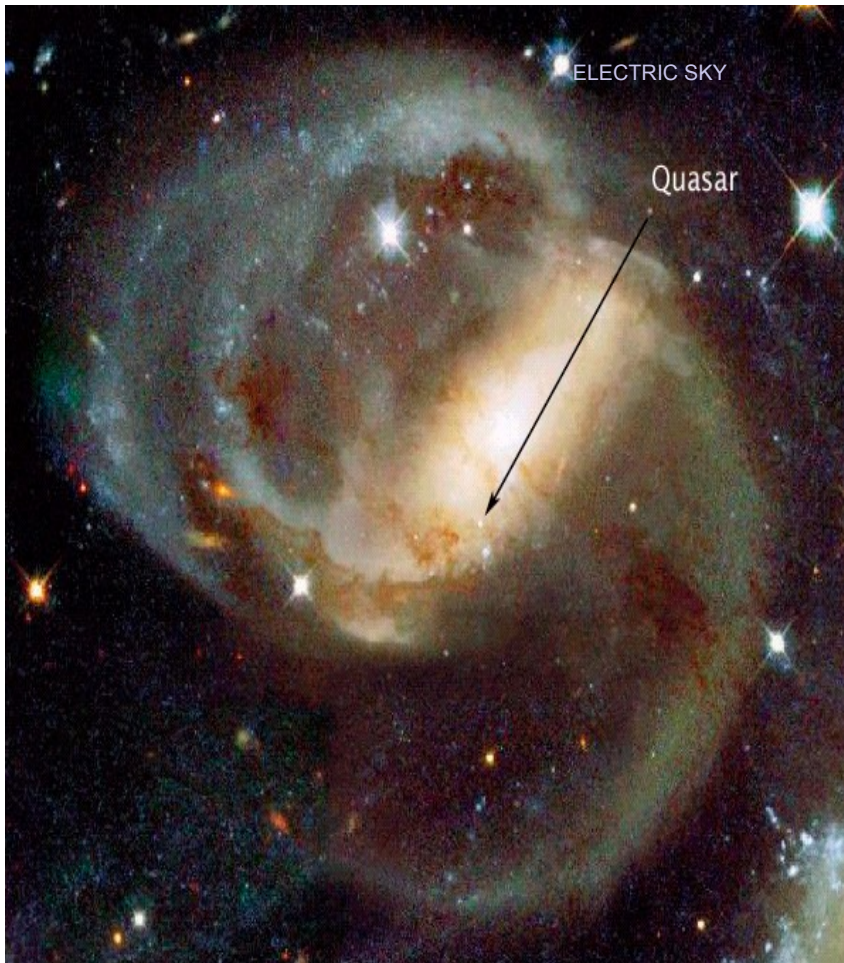
Summary

A complete summary of all the aspects of the Electric Cosmos is too extensive to fit into a single web page. In fact, this entire web site, with all its pages, is only a cursory introduction to the vast implications of these ideas. Therefore, this summary page can only list a few (not all) of the points that should be remembered by anyone who is trying to learn about the modern view of the Universe that is emerging. It is my hope that if you have read through these webpages, you may be interested in seeing a more complete

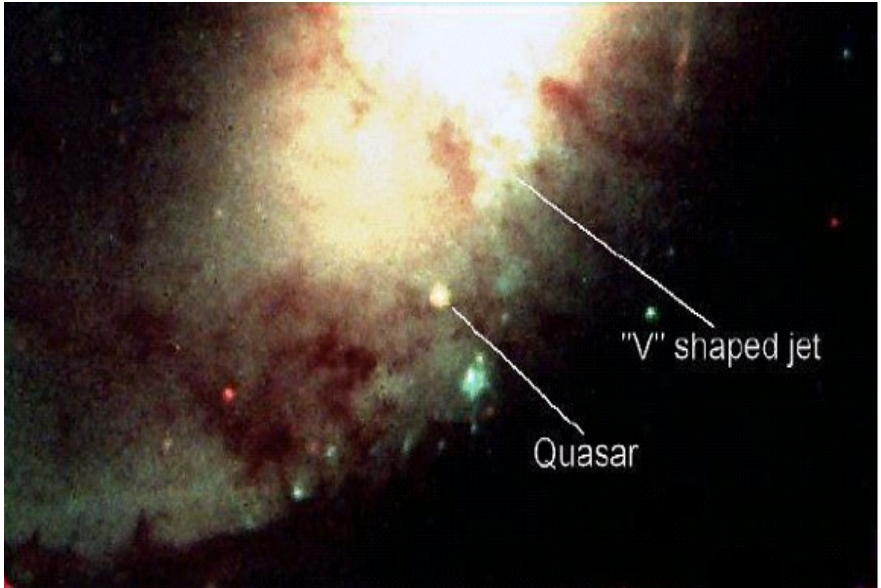


description of these and other properties of the [Electric Sky](#) provided in my book by that name available through Mikamar Publishing and at Amazon.com.

1. The entire cosmos is permeated with plasma. In some regions (within a galaxy, within a solar system) the plasma is denser than it is in others. In some cases the plasma is visible, in some, not. But everywhere our spacecraft have gone - they have found it.
2. The electrical properties of plasma vastly outweigh its mechanical (gravitational) properties.
3. There is nothing mysterious about magnetic fields. They do not "get tangled up", "break", "merge", or "reconnect". They require moving charges (electric currents) in order to exist.
4. The relative distances between even the most densely packed stars are vast in comparison to those stars' diameters.
5. The homopolar motor - generator shape seems to be ubiquitous. Stars, pulsars, and galaxies are organized in this morphology.
6. The z-pinch effect that occurs in Birkeland currents (electrical currents that flow through plasmas) is responsible for the accretion of stars, planets, and galaxies.
7. It is quite possible that the solar system started out as a collinear array of "Herbig - Haro" type objects formed by a z-pinch.



8. The presumption that, if an object exhibits redshift, it must be far away - is false.
9. The Big Bang Theory is false. It has been defended in a most unscientific way.
10. There is a lot more electrical activity out there in the cosmos than astrophysicists seem to want to admit.



11. Astrophysicists and cosmologists need to take some courses in electrodynamic field theory and experimental plasma physics.
12. Astrophysicists need to stop acting in a "knee-jerk" confrontational way to any new ideas, especially those involving electricity. True professionals do not engage in *ad hominum* attacks.
13. Astrophysicists should stop dreaming up impossible imaginary entities such as black holes, neutron stars, strange matter, WIMPs, MACHOs, and MOND, when a perfectly real and well understood body of knowledge stands ready to explain all the things that "mystify" them so. For anyone

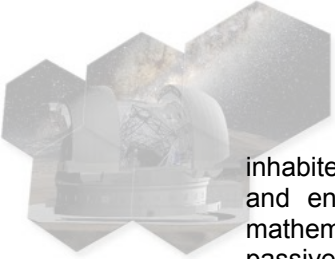
who is interested in learning more about these ideas, some important web pages to take a look at are shown on the Links page that follows this one.

Some Last Thoughts I have been asked several times recently why I think it is so important that the Electric/Plasma Universe Theory gains general acceptance. What difference can it possibly make to the future of humanity? How will knowing how the cosmos operates benefit mankind? Who cares? Of what possible practical use is this information anyway? Why get so excited about it? How will it help us in the future?

A blunt short answer would have been: "Posing that question is equivalent to asking, Why study astronomy in the first place?" It would have to have been asked by someone who can look at the night sky and not wonder about that marvelous sight.

So, let me answer it this way instead:

One of the attributes that separates the human from the animals is our yearning to know about our world and our sky - to wonder about the cosmos and have a desire to find out how it works and what is up there. Another attribute is that we do not like to be told things that are untrue and have these ideas forced on us by people who claim to have superior knowledge and intellect. We have been told that we average humans are not capable of really understanding the cosmos - that it is



inhabited by mysterious and invisible forces and entities that only impenetrably abstract mathematics can explain. We are told to just passively accept whatever the 'experts' tell us. We have become so intimidated by how complicated modern science has become that we throw up our hands and say, "You're the experts - we'll believe what ever you tell us." And they say, "That's good, because our continued funding depends on your feeling that way." What will the reaction of the taxpaying public be if and when they realize the full extent to which they are being bilked by the scientific power-structure?

Educated lay-people have abdicated their responsibility to think proactively and ask the questions that will keep science honest. It seems we would rather just lie back and believe whatever we read in "Discover" magazine. If 'they' tell us black-holes and dark matter exist - so be it. The public has become enthralled by the magic show that astronomy, particle physics, and some other sciences have become. Why does every TV 'science' program have background music that is more appropriate for a sci-fi horror movie? And a narrator's voice that sounds like God? The public apparently enjoys the magic, mystery-tour aura of most of present day science 'shows'. The ship of science, captained by astronomy and astrophysics, is not just steering a wobbling course - it is miles off track and it is intentionally laying down a smoke screen - implying that modern science has to be counter-intuitive and mysterious. The astronomical world badly needs a reality

check. The challenges embodied in these pages constitute just that.

The present day peer review system determines which proposed research projects get funded and which do not. It also determines what results get published and which do not. At first it seems very sensible that any scientific field should be able to keep 'quacks and crack pots' from being funded and published. However, when any given area becomes controlled by 'experts' who have accepted a deductively arrived at theory, they tend to see any alternative data or proposed hypotheses as 'crack pot'. When those who steer the ship of science refuse to allow alternative hypotheses from ***even being discussed or investigated, let alone published***, it is little wonder we are wildly off course. The general public thinks of science as always looking for new ideas. The sad truth is: it does not, certainly not in astronomy / cosmology. What it **does** do is constantly seek funding from friendly peer reviewers.

When we think about the travesty the Roman Catholic Church perpetrated against Galileo (waiting until late in the 20th century to admit it) we feel superior. **WE** modern folk would never ignore and suppress a scientist in that way! No? Then how about astronomer Halton Arp who was denied access to Mt. Palomar and refused publication of his work because the present day high priests of the Big Bang Power Structure found the publication of his photographs embarrassingly contradictory to their well-funded dogma? Would it not be educational to realize that we have just



screwed up again - big time!

If the Electric Star hypothesis is even partially correct, there is no guarantee that the Sun will continue to shine for millions of years as we have been assured by the experts. What anxieties will this realization engender in a scientifically semi-literate public? But, it may be reassuring for them to know that Earth has much less to fear from a near collision with an asteroid or comet than they now think. Why have **billions** of tax payer dollars been used to support "accepted" solar fusion models and the Big Bang but **none** invested in any alternative ideas, however worthwhile they may be?

The fundamental challenges that are described in these pages contain the most potentially explosive ideas ever to have been issued in science. They constitute a cosmic reality check for the entire intellectual community. There is almost no field of academic endeavor that will not be affected in some way (or even overturned) by these ideas. Areas of science that refuse to honestly address these questions will become irrelevant.

Will it take another several hundred years (as it took Galileo) to gain official recognition of the validity of these challenges from those who presently occupy Fortress Science? Will it ever happen? I don't know. But does it have practical importance? You bet your pocketbook it does. The eventual outcome depends on the public's attitude - do you want the expensive magic show to continue - or do you want honest answers from science?

