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# THE COSMIC-TRIPLE-JUMP OF THE PLASMA UNIVERSE

The framing of a triply-connected Plasma Cosmology as a higher hypothesis of three plasma physicists: Anthony Peratt, Hannes Alfven, and Kristian Birkeland.

By Pierre Beaudry, 6/13/2016

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## FOREWORD

Up until the 1950's, the universe was usually assumed to be composed of ordinary physical matter. During the 1960's plasma physicist, Hannes Alfven considered that since earlier atom-smashing experiments showed asymmetry in the production of particles and antiparticles, it were possible that the universe be composed of ambiplasma; that is, composed of matter and antimatter.

In this report, I will show how the three leading plasma physicists, Anthony Peratt, Hannes Alfven, and Kristian Birkeland have found good reasons to believe that the universe was also composed of matterofmind; that is to say, that the universe could only be understood fundamentally from the vantage point of a triply-connected scientific mind.

## INTRODUCTION

*“Always make sure that you rely on something that you didn't believe before.”*

Lyndon LaRouche, EIR, June 3, 2016

The means of guaranteeing the pace of developing creativity around the world is to innovate in conceptions about God, man, and nature that may have existed before, but which had been *rejected by public opinion*. This means that the discovery of a new conception does not come cheap. It requires the discovery of a new principle of higher hypothesis, above and beyond art and science. Such a discovery requires nothing less because the new principle has to be on creativity, and creativity is the only higher principle which can rearrange an array of already known principles into a higher integrated geometry.

Take the example of the higher hypothesis of plasma physicist, Hannes Alfvén who wrote in 1971: *“The study of astrophysics in modern times should essentially involve the application of laboratory results to cosmic problems, with help from theoretical physics. In the realm of plasma physics, there appears to be no reason why known basic laws, formulated in the laboratory, should not hold just as well as at the astrophysical and cosmological scale.”* (Hannes Alfvén, [Plasma Physics Applied to Cosmology](#), Physics Today, 1971.)

In other words, the creative mind is your laboratory, and it must always proceed from the top down; with a check and balance return which goes from the bottom up. This means that the creative mind must, first and foremost, get rid of deduction as a *modus operandi* and proceed from a cyclical method instead.

### 1. THE DIALOGUE BETWEEN XI JINPING AND LYNDON LAROUCHE

Once you have discovered that the practicality of deduction is the enemy of the creative process, you will have made the breakthrough, not before. But, you

won't know it until you have made the crucial jump; that is, until you have become *rejected by public opinion*. That's the test of fire.

This is what is currently happening to Chinese leader, Xi Jinping in the international western press, because he is proposing a new just world economic order. He is being everywhere rejected because what he is doing is going to work, but is unacceptable to the old geopolitical western view of the world. This is the reason why Obama, representing the obsolete British way of thinking, wants to go to war against China. In the *People's Daily* of May 5, 2016, Xi Jinping described his mission as follows:

“Bringing forth new ideas is a complex process of social engineering involving every section of the economy. To strengthen the development of creativity and innovation, you must insist on a holistic point of view, and seek to grasp the crucial elements, using the most important areas and key segments in order to create a breakthrough in the overall situation.” (Reported by William Jones, [An Exchange Between Xi Jinping and Lyndon LaRouche](#), EIR, June 3, 2016, p. 23.)

This is precisely the point that Lyndon LaRouche has been emphasizing about creativity. The process has to be “holistic” and the whole must be connected universally by its “crucial elements.” This seems to be so simple that no one pays any attention to it. As the ancient Confucian principle of the *Tao Te Ching* stated: *“Nothing under Heaven is more pliable than water but when it amasses, there is nothing that can withstand its force. That the soft overcomes the hard, and the yielding conquers the unyielding is a fact known to all men – yet utilized by none.”* It is important to note for our purpose, here, that *Tao Te Ching* is part of the ancient Confucian practice of *Tai Chi*, which is the corner stone of Confucian Cosmology.

However, as Lyn indicated, what is required in addition to this epistemological requirement is the idea of the “destiny of mankind.” And, that requires the necessity of *public-opinion-axiom-busting*. As Lyn put it:

“The essence of the thing, and everybody who has made this particular mistake, has always paid a big price for it, if they were even able to survive. Because the question of what human values are, lies not in popular ideas. Not at all! It lies in something which is the *un*-popular idea.

You know, when you say the parents are proud of their children, or things like that, this sort of thing, this may have an inkling of some useful function; but the *idea* of it as a policy for people is wrong. It does not work. And we have not really grappled with this thing; we didn't want to grapple with it. Most people did not want to grapple with it! The point is, the secret of the future generation lies in a layer of society which did not play a role in what we call education today, and behavior today. Because it is the mind of the individual human, not as an educated individual as such, but it has to be the education within the person which enables that person to see beyond popular opinion. What does that mean? You say, well, look at the Twentieth Century, and most people don't realize how they were taken in, by the Twentieth Century: Why? Because the great geniuses were never heard, or almost never heard. Because the genius is one who is not developed to follow a certain pattern; the genius is someone who stands outside all notions of popular opinion, like Einstein.

“Einstein is a prototype of what the future mankind, as an individual, represents. Other people don't. The objective is not to try to produce new children, made in the image of their parents. That is not the image, that is not the truth! That's the ugly truth, which is not the truth.

“The point is, that Einstein one century after his death, has been noted for creativity. How did this work? How could Einstein, having no period of life from the time of his own actual death, how did he suddenly become a source of true creativity of a new generation? How! By being like Einstein; they do not base themselves on practicality. They base themselves on being *free* of the achievements of their families. If you want to succeed, *don't adopt your parents' habits*. And the future of mankind lies precisely in that policy. Because people collect ideas, trades, impulses, habits, all these kinds

of things. And they all say “Ahh! I want to imitate this guy. I want to imitate this guy! I want to imitate this guy. I don't want to imitate this guy, I want to imitate somebody else.” And that is how mankind degenerates, by trying to find a practical model, to recommend to all people in the organization, whatever the organization is, and that is how the 20th century was created, by the evil Bertrand Russell

“The future of mankind lies with the person, whom the popular opinion *rejects*. And the reason for his success is he's right. And that's the model of man that we have to develop. This is the new model of man, who has, with some copies from the past as models, the ability to reject popular opinion. And reject it by throwing it in the garbage pail. And then, throwing the garbage pail away, itself.” (William Jones, [\*An Exchange Between Xi Jinping and Lyndon LaRouche\*](#), EIR, June 3, 2016, p. 24.)



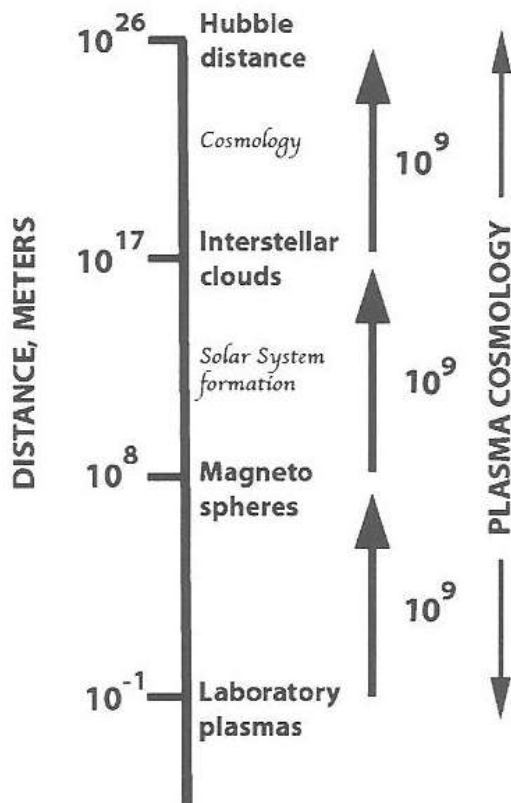
**Figure 1** Chinese President Xi Jinping and wife Ping Liyuan are greeted by Indian Prime Minister Narendra Modi. Photo: Reuters

In other words, as Lyn concluded: “*Always make sure that you rely on something that you didn't believe before.*” This is the dominant feature of what has to be rediscovered in the original nineteenth century domain of plasma physics.

For that purpose, we shall investigate briefly the following three plasma physicists: Anthony Peratt, Hannes Alfven, and Kristian Birkeland.

## 2. ANTHONY PERATT'S GALACTIC CHANGE BY TIME REVERSAL.

As I am reading Anthony Peratt's *Physics of the Plasma Universe*, Springer, Second Edition, 2015, I am completely perplexed at discovering the congruence that Alfven and he had made between the universal plasma domain and the "Cosmic-Triple-Jump" of 27 orders of magnitude required for scaling the universe as a whole. That beautifully well-ordered concept of triply-connected Plasma Cosmology is entirely congruent with the point I recently made with Nicholas of Cusa's illustration of the Holy Trinity as a process of change in his [DE CONIECTURIS](#). See my April 2016 report: [A TRIPLY-CONNECTED HIGHER HYPOTHESIS](#). The scaling of the universe as a whole is triply-connected.



**Figure 2** "Cosmic triple jump in the plasma universe. From laboratory to cosmological distances, experiments, simulations, and observations suggest the plasma state and its evolution follows the same laws of physics everywhere." (Anthony Peratt, *Physics of the Plasma Universe*, p. 362)

What Peratt wrote makes total sense in terms of the proportionality of the cosmological scale and the laboratory scale, in spite of axiomatic differences within the range of those magnitudes. That is a real puzzle and, what needs to be figured out is why this is so, and what significance these orders of magnitudes, originally chosen by

Alfven, have for epistemology. Peratt wrote:

“From the latter half of the nineteenth century through the twentieth century, research on the plasma state of matter led to a number of discoveries revealing a close tie of the physics of plasmas at the smallest known scale, e. g., the flow of charged particles in crystal lattices, to microampere particle beams, to intense particle beams, to the currents associated with planetary and solar plasmas, to the interstellar medium, to galaxies, and intergalactic plasmas (Alfven 1971).

“Alfven made note that the plasma, or the original state of matter, scaled. It was found experimentally and verified numerically, that the dimensionless parameters were valid regardless of whether the plasma was measured in microns or gigapersecs.

“From this, Alfven hypothesized a *Cosmic-Triple-Jump* for the state of plasma, scaled according to size but equally valid in other dimensionless parameters. In size, he chose  $10^9$ , such that starting with the smallest dimension, laboratory plasma, he could scale in three  $10^9$ m (giga)-steps to the Hubble distance (Alfven 1975, 1983, 1986; Gurnett and Bhattacharjee 2005, 2009; Kukushkin and Rantsev-Kartinov 1999; Suplee 2009).” (Anthony Peratt, [\*Physics of the Plasma Universe\*](#), Springer, Second Edition, 2015, p. 361)

What Peratt is showing, here, is not merely the ordering of 27 orders of magnitude and their numbers, but more importantly, the *magnitude of the proportionality between the human mind and the universe*. This is what galactical epistemology is all about. The issue is not mathematical, because mathemagicians are like fools, they never change. The issue is: how does the human mind relate to the universe as a whole?

For a visual effect of this range, see how Charles and Ray Eames have illustrated the magnitude of the powers of 10 as a linear projection. (See [Powers of Ten™ \(1977\) - YouTube](#).) Although the Youtube video of the Eames team is a micro-macro linear continuum, the zoom cosmic projection into the large and its

inverse quantum voyage back into the small is harmonically ordered by non-linear axiomatic changes that cannot be illustrated in such a format. Therefore, it is the job of this author and of this report to performatively demonstrate the significance of that epistemological ordering process.

The point is not to be mesmerized by the magnitude of numbers and the distance of the scale. That's just an effect of perception. What is important in this process is not the perception that the universe as a whole might be so big that it can be considered the size of an atom that could be part of something even bigger. The



point is not a magnitude in size, but a magnitude in the mental scope of axiomatic transformation. The idea is to discover how the human mind, like the universe as a whole, changes in different ways from a lower domain to a higher domain of density and of intensity of organization, as Vernadsky's Geosphere, Biosphere, and Noosphere; and that can only take place in correlated physical space-time with increases in energy-flux-density of the physical universe as a whole. In other words, plasma cosmology is the science of the economy of the universe. Take the following jump for size.

**Figure 3** Anthony Peratt

As Alfven stated in the article that Peratt quoted in Chapter 13 of his book, it is now time to discover "the properties of ambiplasma." In his model of the metagalaxy, developed in his 1966 book, *Worlds-Antiworlds*, Alfven conceived of an ambiplasma universe that was pulsating from increases and decreases in energy-flux-density. The following ambiplasma Klein model has become my higher hypothesis. Alfven wrote:

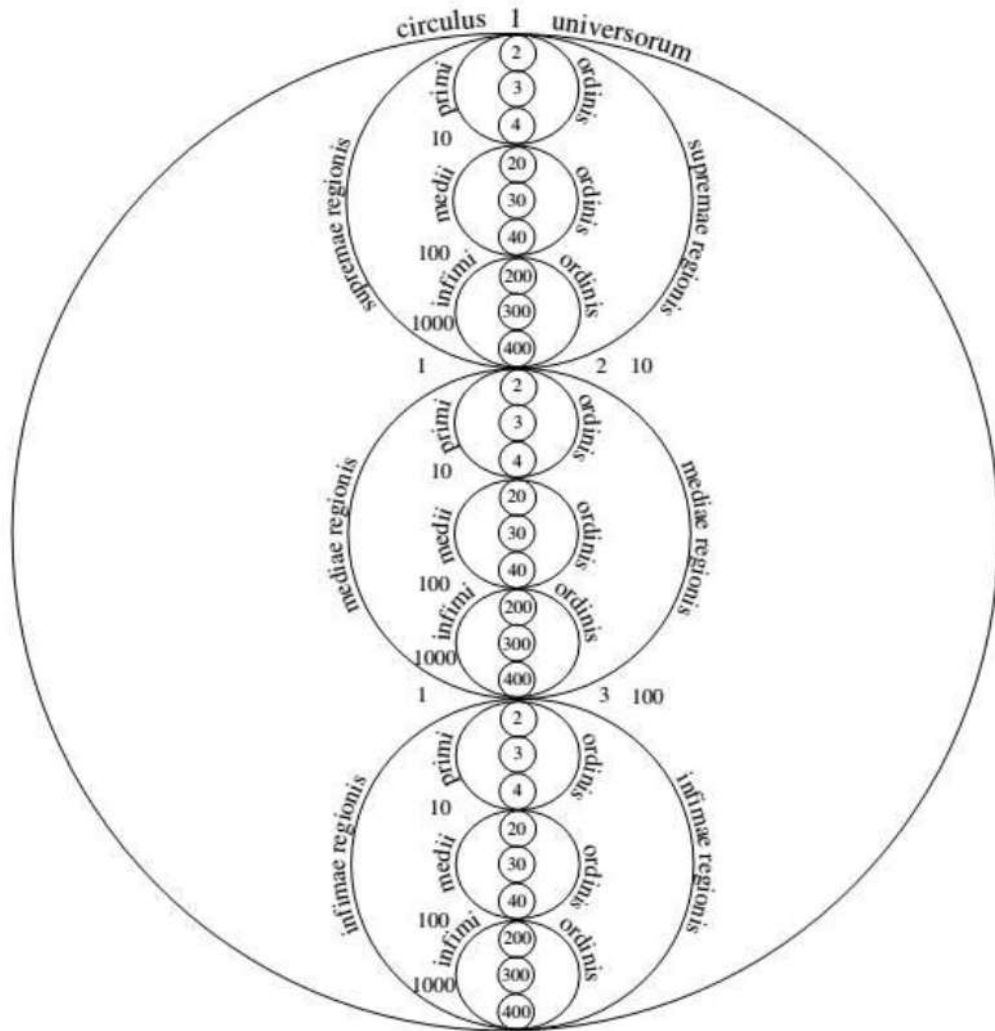


“It is possible that there are some basic laws of physics that we have not found in the laboratory but that could be discovered by cosmological research, as is claimed by some cosmologists. I do not think this is very likely. To me the most promising approach appears to be to learn how to apply the laws of physics already discovered in the laboratory, rather than to speculate about undiscovered laws. With this approach we are led to study cosmology along the lines of Oskar Klein; he postulates symmetry between ordinary matter and antimatter throughout the cosmos, and a metagalaxy with an initial state of contraction giving way to the expansion we are observing now. To follow this theory into all of its consequences, we need to know a great deal more about the properties of ambiplasma (mixed matter and antimatter) than we do now. Before long we will find ourselves involved into a nuclear and particle-physics problems of a kind that has not yet been studied.” (Hannes Alfven, [\*Plasma Physics Applied to Cosmology\*](#), Physics Today, 1971.)

Alfven’s provocative insight into the *Cosmic-Triple-Jump* is right, and I cannot help but to add that his triply-connected epistemological frame of mind is the pathway to discover the new type of problems that Alfven is referring to. I recall for the reader the Cusa illustration of how this Christian Theologian conceived of the action of transformation by the Holy Trinity in the universe. With reference to Plato, it is essential to locate the three axiomatic levels of knowledge as three transfinite levels of sense perception, consciousness, and self-consciousness with the corresponding reference to the scale domains of laboratory experiment, magnetosphere, and interstellar clouds.

This discovery of principle among numbers does not imply that the Universe is mathematical or logical; that would be a very stupid and arrogant assumption to make. Too many mathematicians have made that mistake. So, I advise you stay away from such mathemagicians, unless you want to reduce your thinking to a deductive method of reasoning as in the Euclidean Q.A.D., and think with a crooked mind for the rest of your life. The worst aspect of this form of

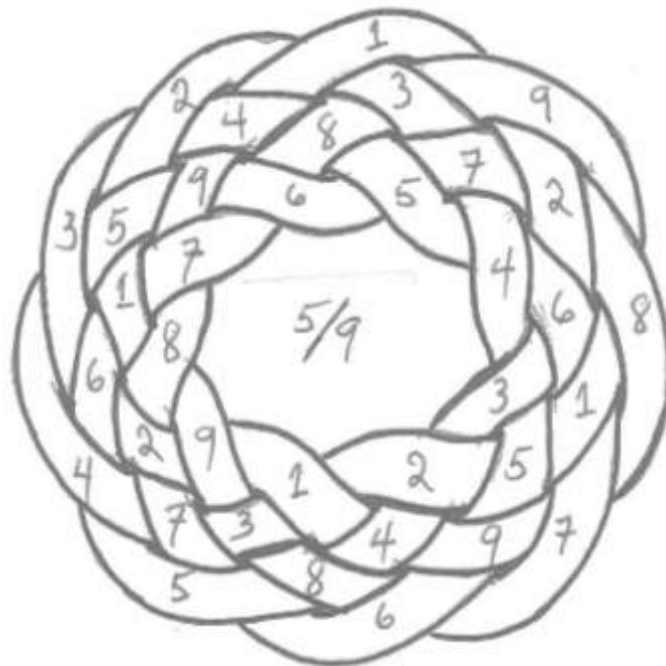
brainwashing comes from the Newtonian-Cartesian-Bertrand Russell form of action-reaction of push-and-pull which destroys your creative ability to think from the future. The best way to look at this has been provided by Cusa *from both the top-down-and-the-bottom-up*.



**Figure 4** Cusa's idea of a contracted multiply-connected universal least action as a contracted reflection of the Trinity to the third power. "If, as the subject-matter requires, you look at the diagram with your mind's eye, then mysteries that are surely important and that are hidden to many will be made known to you." Cusa, [DE CONIECTURIS](#).

It is not mathematics which measures the universe; it is an ordered *space-time-measure-of-change* which measures the universe and makes it progress. And the way to change is with the spiraling multiply extended motion of physical space-time; that is, the Cusa-Leibniz-Gauss-Riemann “quantum” of least action. Here, Gauss is in agreement with Cusa and Leibniz who had also discovered a similar “congruence” in their respective researches on God and on the notion of preestablished harmony in the universe. I refer more specifically to **DE CONIECTURIS** by Cusa, and **THE MONADOLOGY** by Leibniz.

The beauty of this idea is that it is a very playful way of combining numbers 1, 3, and 9 into 27 combinations. I did something analogous with my little exercise on the Solfège Torus with a P/T ratio of 5/9 in my April 2016 report, and whose total is of 27 poloidal waves.



Coincidence? No. Congruence? Yes. My question, therefore, is why would the Theory of Numbers, The Plasma Universe, and the Holy Trinity be so connected? This is also for me the most amazing epistemological connection among theology, epistemology, physics, and music. Does anyone have any insight into this amazing congruence? Here is the hypothesis that I can sum up in the following little exercise.

**Figure 5** The Solfège Torus with P/T ratio of 5/9

The idea of the Solfège Torus is to count as many poloidal waves as the number you start with or arrive at in the process of rotation, and it doesn't matter what level of powers you use. It could be infinite, for all I know. You can start from anywhere and the same power process will unfold. For example, if you follow the wave with your finger, clockwise, from 1, 2, 3, 4 to 5, you will have

rotated one complete poloidal wave around the Torus. The idea is to count the number of poloidal waves, as long as you can. It is the triply-connected timing cycle that counts.

Next, since the first clockwise poloidal wave ends at 5, do similar wave motions 5 times, from 5,6,7,8,9, and then from 9,1,2,3,4, then from 4,5,6,7,8, then from 8,9,1,2,3, and finally from 3,4,5,6,7. Then, continue counting 7 waves until you end at 8, and so forth. By arriving at 8, you will have discovered the actual geometrical pathway of primitive roots as Poincaré had discovered it. In this case, which is not a primitive root, the entire clockwise series of the Solfège Torus is: 1, 5, 7, 8, 4, 2, which gives you a total of 27 poloidal waves. Note, however, that you have skipped three numbers, 3, 6, and 9.

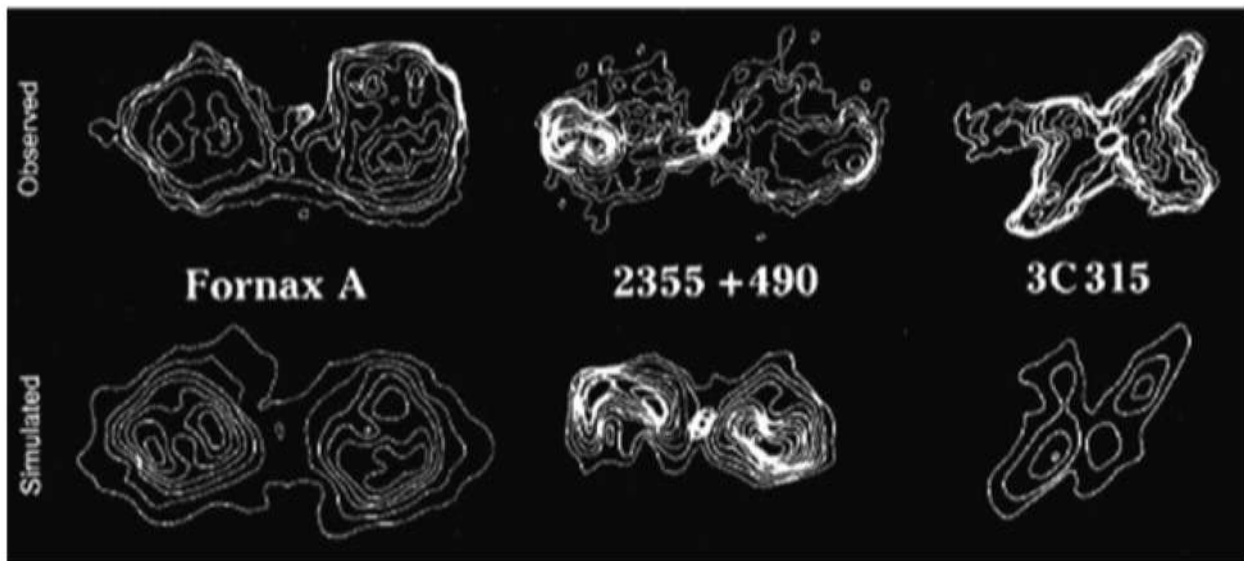
On the other hand, if you move counterclockwise, using only 3 three times ( $3 \times 3 \times 3$ ) as the number of poloidal waves, you will complete the cycle by generating the series 3, 9, and 6 for a total of 27 waves. The two series always move together with the same number of waves, and never interfere with each other, like an ambiplasma of matter and antimatter pulsating indefinitely between minimum and maximum of transformation. Moreover, is it so strange that antimatter can be generated in our own atmosphere from thunderstorms? (See [Antimatter Explosions](#))

This Torus process is something I discovered 20 years ago just for the fun of it; but, it turned out to be more interesting than mere child's play. Just to demonstrate that geometrical closure exists in the universe; would it make sense to look at this Solfège Torus as a pathway for generating ambiplasma?

At any rate, the fallacy of composition to avoid is searching for a "look alike" phenomenon between the mind and the universe. That's the wrong way to proceed. That's precisely the bad habit of the deductive method of sense perception that has to be thrown out of our minds if we wish to be creative. The "look alike" idea is nothing but a trap of sense perception projected onto the dimly lit wall of Plato's Cave. It's an illusion. Don't bother with it, because what you are searching for is not of an equivalence of appearance, but a proportionality or analogy in the

process of composition. Take the case of Peratt's simulation analogs between the laboratory plasma and the cosmic plasma.

How can a linear scale extension of 27 orders of magnitude be congruent with a non-linear changing universe? How do large orders get replicated in the small? How does that congruence relate to the ambiplasma of a double layer?

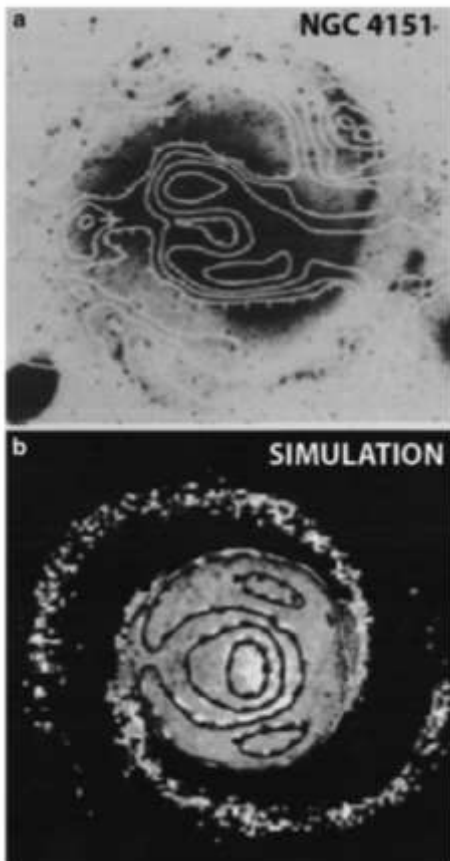


**Figure 6** “*Top*: Synchrotron isophotes of double radio galaxies. *Bottom*: Simulation analogs at time 10.4-58.7 Myr. Time increases from left to right. ([\*Physics of the Plasma Universe\*](#), p. 368)

There is definitely a “look alike” aspect between the cosmic plasma and the laboratory plasma; however, the lawful connection between the two does not lie in their similarity, but in their transformation in proportional time. It is the changing process of their composition which is of interest in both cases. That being the case, what is the physical space-time significance of examining such a universal magnitude of change? Are there other similar types of changes in the relationship between laboratory and cosmos? Is this a unique occurrence in the universe?

What is the characteristic time reversal process that is evolving between the simulated images and the observed images, from left to right? The point that Peratt made about this relationship is of a crucial significance, because he identified his

method from the future; that is, as a method of forecasting the future from a process of transformation of the past. As in the case of Birkeland, which we will study in a moment, Peratt looks at the cavity of the heavens as a projected domain of illusions that requires to be corrected by the human mind in his laboratory. Since any observation of the heavens is an observation of the past, we are, therefore, properly within the scope of a Platonic Cave experiment whereby whatever is demonstrated in the laboratory, becomes the paradigm of what can be forecast in the cosmic regions. Peratt wrote:



“Likely not recognized before Alfven and Bostick, is the fact that each of the two time intervals between the three different galaxies, at the top, represents a span of time of about 20 million years, while the intervals between the different moments of the laboratory plasma experiment, in the bottom, represents a few microseconds. If the top set of recordings is projected onto the bottom set of recordings, as if through a conical projection of millions of years long, everything is mapped as being the same including the proportional magnitudes of time. One now has the ability to forecast what a double radio galaxy will be like millions of years into the future.” ([\*Physics of the Plasma Universe\*](#), p. 368)

**Figure 7** “(top) HI distribution superimposed on an optical photograph of NGC4151. (bottom) Simulation magnetic energy superimposed on simulation galaxy. In both cases a ‘horse shoe’ cusp, opening towards a spiral arm, surrounds a magnetic field HI/minima core. Within the cusp, two magnetic fields /HI peaks are observed.” ([\*Physics of the Plasma Universe\*](#), p. 370)

Thus, Peratt shows how to make the axiomatic jump between the past and the future by time reversal. He takes the last stage of Radio Galaxy 3C 315 of **Figure 6** and he projects it into the future by rotating it into a spiral galaxy, which becomes NGC 4151 of **Figure 7**. Again, the importance, here, is not the ability to forecast the similarity, but to forecast the process of change.

The reason why Peratt's plasma universe is so coherent is because it is "holistic" and the two "crucial elements" to connect in order to make it coherent are the human mind and the universe, not simply by mapping one plasma onto another. Again, Peratt's discovery is not what a galaxy will "look like" millions of years from now, or what the numerical scale values between the simulation and the observation are going to be, but what the magnitude of the human mind's ability to forecast the future becomes by changing the past from the future. Indeed, when different moments of physical space-time proportionality between simulation and observation become feasible, then a new window into the future of science opens up for the benefit of mankind. The question is: Will the rest of mankind seize the moment?

### 3. WHAT HANNES ALFVEN CONTRIBUTED TO EPISTEMOLOGY

*"In astrophysics, matter is often in a state that we cannot study in the laboratory. For example, even if we cannot clarify the nature of nuclear forces by studying superdense stars, such as pulsars, we must learn to apply nuclear physics to problems of which we have no direct experience in the laboratory."*

Hannes Alfvén, [Plasma Physics Applied to Cosmology](#), Physics Today/February 1971, p. 28.

In his 1971 article on [Plasma Physics Applied to Cosmology](#), Hannes Alfvén made a very important contribution to epistemology by focussing on the application of laboratory results rather than cosmological observations. In view of the increasing chaotic state of cosmology since that time, it has become evident that Alfvén's focussing on the basic laws discovered in the laboratory had to become the standard for plasma physics researchers around the world. This view

has been rejected by the official British scientific community, to this day, because it undermines completely the Newtonian assumption of knowledge based on sense perception.

In a sense, Alfven's scientific method was completely anti British because it was based on a Platonic type of laboratory experiment. Alfven's method did not merely apply to the study of the plasma domain, but also required "natural philosophy" (epistemology) because he considered that it was vital to use the human mind as the primary laboratory instrument in order to correct any wrong observations about the outside world. Alfven put the problem in the following manner:

"The smashing victory of the theoretical approach over the experimental approach lasted as long as a confrontation with reality could be avoided. However, from the theoretical approach, it was concluded that plasmas could easily be confined in magnetic fields and heated to such temperatures as to make thermonuclear release of energy possible. When attempts were made to construct thermonuclear reactors, a confrontation between the theories and reality was unavoidable. The result was catastrophic. Although the theories were "generally accepted" the plasma itself refused to believe in them. Instead the plasma showed a large number of important effects, which were not included in the theory. It was slowly realized that one had to build up new theories but this time in close contact with experiments." (Hannes Alfven, *RELATIONS BETWEEN COSMIC AND LABORATORY PLASMA [PHYSICS]*, Annals of the New York Academy of Sciences, Volume: 257, August 1975, p. 180)

Of course, Alfven's approach was rejected by the British, most notably by physicist, Sydney Chapman and his student V.C.A. Ferraro. To this day, the Chapman-Ferraro theory of current in plasma systems have excluded the Birkeland and Alfven theory, because the British approach is more mathematically elegant and no scaling of cosmic plasma to laboratory size is mathematically acceptable. If ever there was a nice Plato versus Aristotle fight during the twentieth century, this is the one.



If rejection from public opinion were to be the refusal to recognize a great mind's existence, as Lyn put it, then Hannes Alfvén would be the proof that the British world keeps ignoring great geniuses, even after their deaths. More than even the difficult ideas of Einstein, the British have rejected Alfvén's ideas because they were completely undermining their view of the world.

The point to understand, here is that Alfvén and Birkeland have been rejected, because their methods implied crucial axiomatic changes in the human mind that most scientists are afraid of applying to themselves. The irony, however, is that the rub is located in the Cosmic-Triple-Jump; that is, in the very notion of scaling.

The discovery of scaling cosmic plasma down to laboratory levels is the proof that Plato is right and Aristotle is wrong. And, the proof can be found in the terrella experiment that Birkeland conducted when he demonstrated that when a magnetized sphere was immersed into a plasma environment, luminous rings, corresponding to the aurora zones, were generally produced.

Aurora Borealis are one of the best Astronomical experiments of Plato's Cave, because no one, in his sense certainty, can believe that such a projection on the dimly lit wall of the night sky can be produced by the Sun. This experiment was so unbelievable to the British that when Birkeland made it the Chapman-Ferraro theory was immediately concocted for the explicit purpose of burying Birkeland's crucial discoveries. As Alfvén put it:

“In cosmic plasma physics the experimental approach was initiated by Birkeland, who was the first one to try to connect laboratory plasma physics and cosmic plasma physics. (Neither of the terms was used at that time!) Birkeland observed aurorae and magnetic storms in nature, and tried to understand them through his famous terrella experiment. He found that when his terrella was immersed in a plasma, luminous rings around the poles were produced (under certain conditions). Birkeland identified these rings with the auroral zones. As we know today this was essentially correct. Further he constructed a model of the polar magnetic storms, supposing that the auroral electrojet was closed through vertical currents (along the magnetic field

lines). Also this idea is essentially correct. Hence although Birkeland could not know very much about the complicated structure of the magnetosphere, research today follows essentially Birkeland's lines, of course supplemented by space measurements.

“Unfortunately, the progress along these lines was disrupted. Theories about plasmas- at that time called ionized gases- were developed without any contact with the laboratory plasma work. In spite of this - or perhaps because of this - the belief in them was so strong that they were applied directly to space. The result was the Chapman-Ferraro theory, which soon got generally accepted to such an extent that Birkeland's approach was almost completely forgotten. For thirty or forty years it was often not even mentioned in text books and surveys, and all attempts to revive it and develop it were neglected. Similarly, the Chapman-Vestine current system, according to which magnetic storms were produced by currents exclusively flowing in the ionosphere, took the place of Birkeland's three-dimensional system.” (Hannes Alfvén, *RELATIONS BETWEEN COSMIC AND LABORATORY PLASMA PHYSICS*, p. 179.) (See also Hannes Alfvén and Gustaf Arrhenius, [\*Structure and Evolutionary History of the Solar System\*](#), Reidel Publishing Company, Holland, 1975, p. 118.)

Although the fight against the British on this and other matters have not abated since then, the real underlying issue, here, is the underlying epistemological nature of the human mind. What Alfvén and Birkeland have developed is a true experimental natural science of the universe, which includes the transformation of the human mind into it. This is what the British can't accept: why must the human be included into science and why must the mind change? “*We are who we are.*”

A case in point is Alfvén's discovery of MHD, for which Alfvén won the Nobel Prize of Physics in 1970. In the abstract of his 1942 article, Alfvén wrote the following axiom-busting statement: “If a conducting liquid is placed in a constant magnetic field, every motion of the liquid gives rise to an E.M.F. [Electro Magnetic Field] which produces electric currents. Owing to the magnetic field, these currents give mechanical forces *which change the state of motion of the*

liquid. [my emphasis] Thus a kind of combined electromagnetic-hydro-dynamic wave is produced which, so far as I know, has as yet attracted no attention.” titled: Hannes Alfven, [Existence of Electromagnetic-Hydrodynamic Waves.](#))

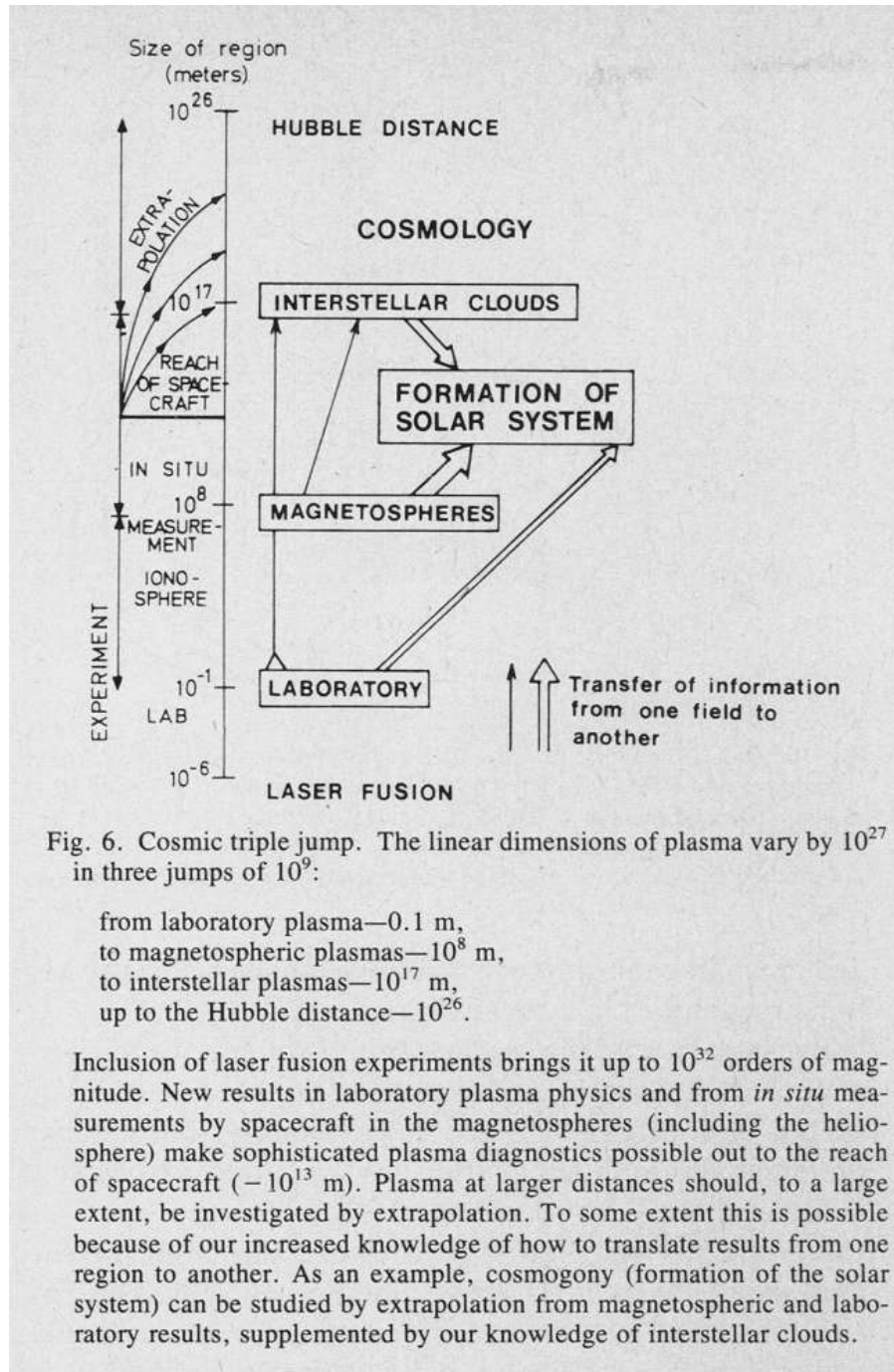


Fig. 6. Cosmic triple jump. The linear dimensions of plasma vary by  $10^{27}$  in three jumps of  $10^9$ :

from laboratory plasma—0.1 m,  
to magnetospheric plasmas— $10^8$  m,  
to interstellar plasmas— $10^{17}$  m,  
up to the Hubble distance— $10^{26}$ .

Inclusion of laser fusion experiments brings it up to  $10^{32}$  orders of magnitude. New results in laboratory plasma physics and from *in situ* measurements by spacecraft in the magnetospheres (including the heliosphere) make sophisticated plasma diagnostics possible out to the reach of spacecraft ( $\sim 10^{13}$  m). Plasma at larger distances should, to a large extent, be investigated by extrapolation. To some extent this is possible because of our increased knowledge of how to translate results from one region to another. As an example, cosmogony (formation of the solar system) can be studied by extrapolation from magnetospheric and laboratory results, supplemented by our knowledge of interstellar clouds.

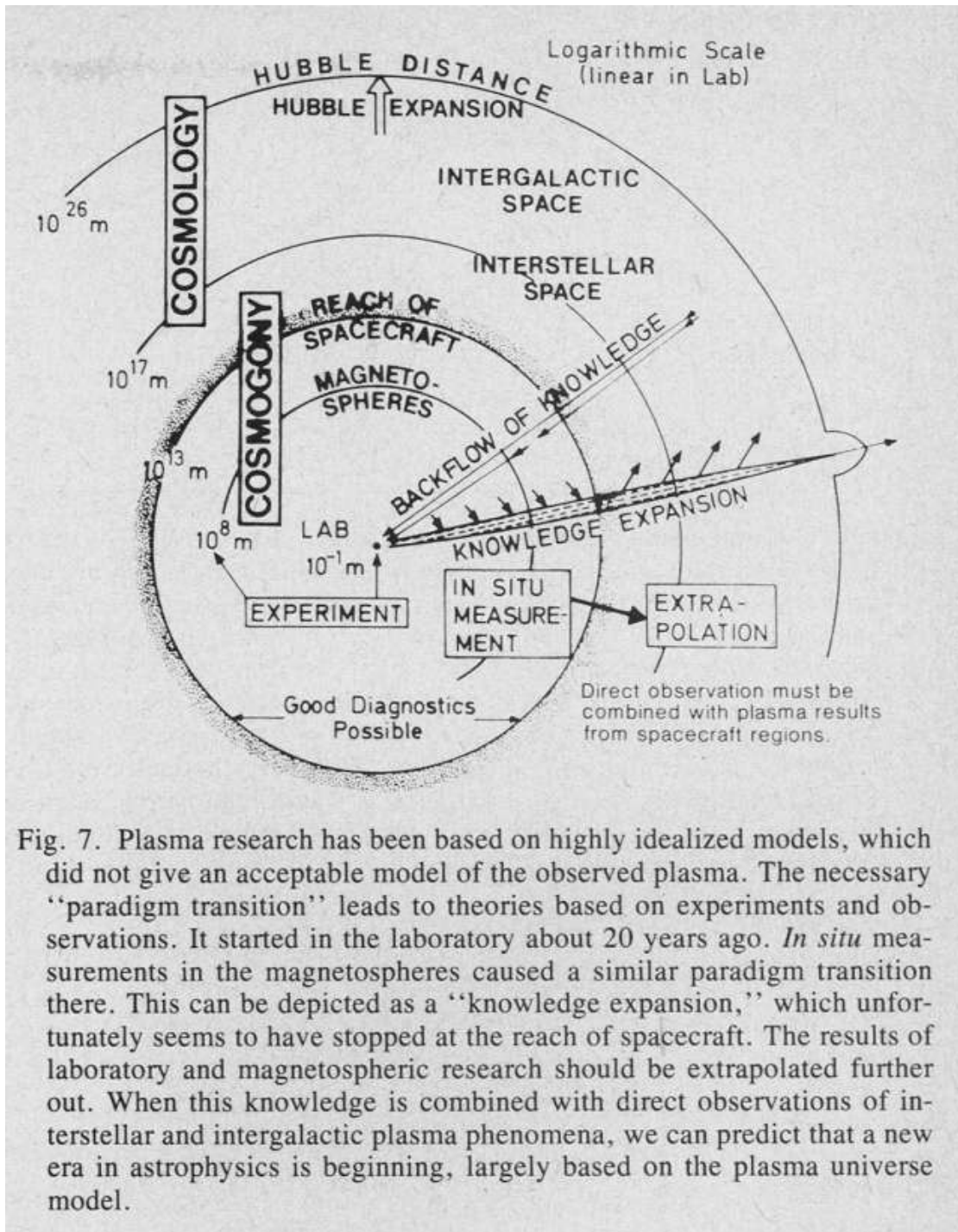


Fig. 7. Plasma research has been based on highly idealized models, which did not give an acceptable model of the observed plasma. The necessary “paradigm transition” leads to theories based on experiments and observations. It started in the laboratory about 20 years ago. *In situ* measurements in the magnetospheres caused a similar paradigm transition there. This can be depicted as a “knowledge expansion,” which unfortunately seems to have stopped at the reach of spacecraft. The results of laboratory and magnetospheric research should be extrapolated further out. When this knowledge is combined with direct observations of interstellar and intergalactic plasma phenomena, we can predict that a new era in astrophysics is beginning, largely based on the plasma universe model.

**Figure 8** Original Cosmic-Triple-Jump illustration from Hannes Alfvén, *DOUBLE LAYERS AND CIRCUITS IN ASTROPHYSICS*, IEEE TRANSACTIONS ON PLASMA SCIENCE, VOL. PS-14, NO 6. DECEMBER 1986, p. 187.

The irony, here, is that this MHD model is also a model for the transformation of the human mind because the fundamental characteristic of the magnetic field is its ability to transform the field itself, as the universe and self-consciousness change themselves as a whole.

Alfven ended his 1975 paper by making a call for a return to "Natural Philosophy" ("reine Naturwissenschaft") which, in my book, must also include a return to the necessary unity between *Geisteswissenschaften* and *Naturwissenschaften* (the mental and natural sciences). As Alfven put it: "We should remember that there once was a discipline called "Natural Philosophy" ("reine Naturwissenschaft"). Unfortunately this discipline seems not to exist today. It has been renamed "science" but science of today is in danger of losing much of the Natural Philosophy aspect." (Ibidem, p. 791.)

The Cosmic-Triple-Jump as described originally by Alfven, represented for



him a paradigm shift in the scientific way of thinking about the universe, that is, an actual axiomatic change in the way of thinking. Alfven made explicit reference to that "paradigm transition" as "knowledge of expansion."

The point I wish to make with this is that there is no way to sweeten such an axiomatic change and no amount of interdisciplinary collaboration that will make the medicine less bitter to take. You have to make the jump or you don't; that is all there is to it. *Either you accept being rejected by public opinion, especially among your peers, or you can't be creative.*

**Figure 9** Hannes Alfvén ( 1908-1995) Photo credit: Welinder Jaeger Bergne)

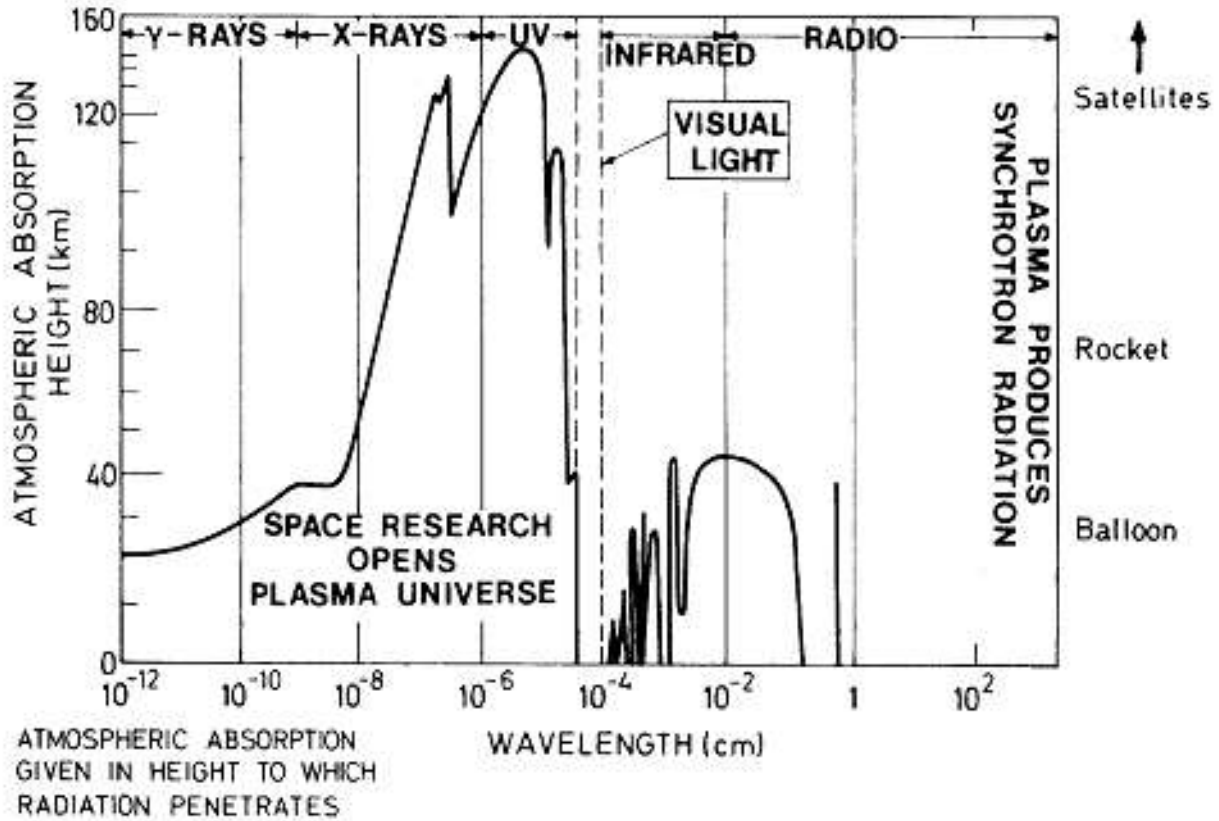
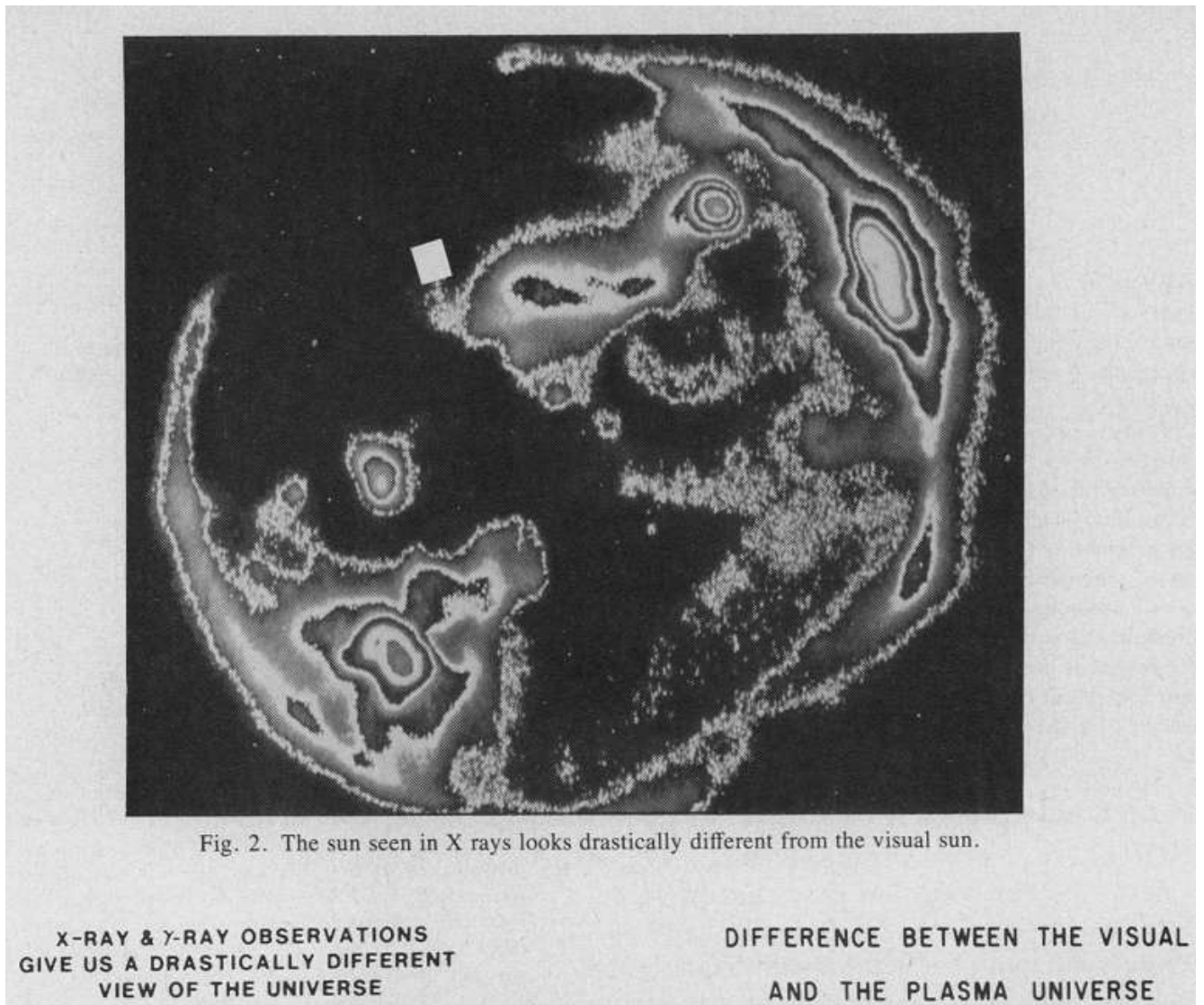


Fig. 1. Spectrum of the plasma universe. Atmospheric absorption given in height to which radiation penetrates. As we now can eliminate atmospheric absorption, we can observe our cosmic environment also in X rays and gamma rays, wavelengths which are mainly produced by plasma phenomena. Traditionally all our knowledge of the universe was derived from observations in the visual octave, later supplemented by radio observations. The space age has made it possible to see not only this “visual universe” but also the “plasma universe.”

**Figure 10** Alfvén's illustration of Plato's Cave. (Model of the Plasma Universe)

We cannot see Cosmic X rays or Gamma rays, we can only conceive of them and illustrate their behavior through wavelengths, because the plasma universe that produces them did not make them visible to our sense perception. Why not? Is there something going on in the Heavens that God does not want us to see? Why is the Plasma Universe 99 times more important than the one we see, and yet we

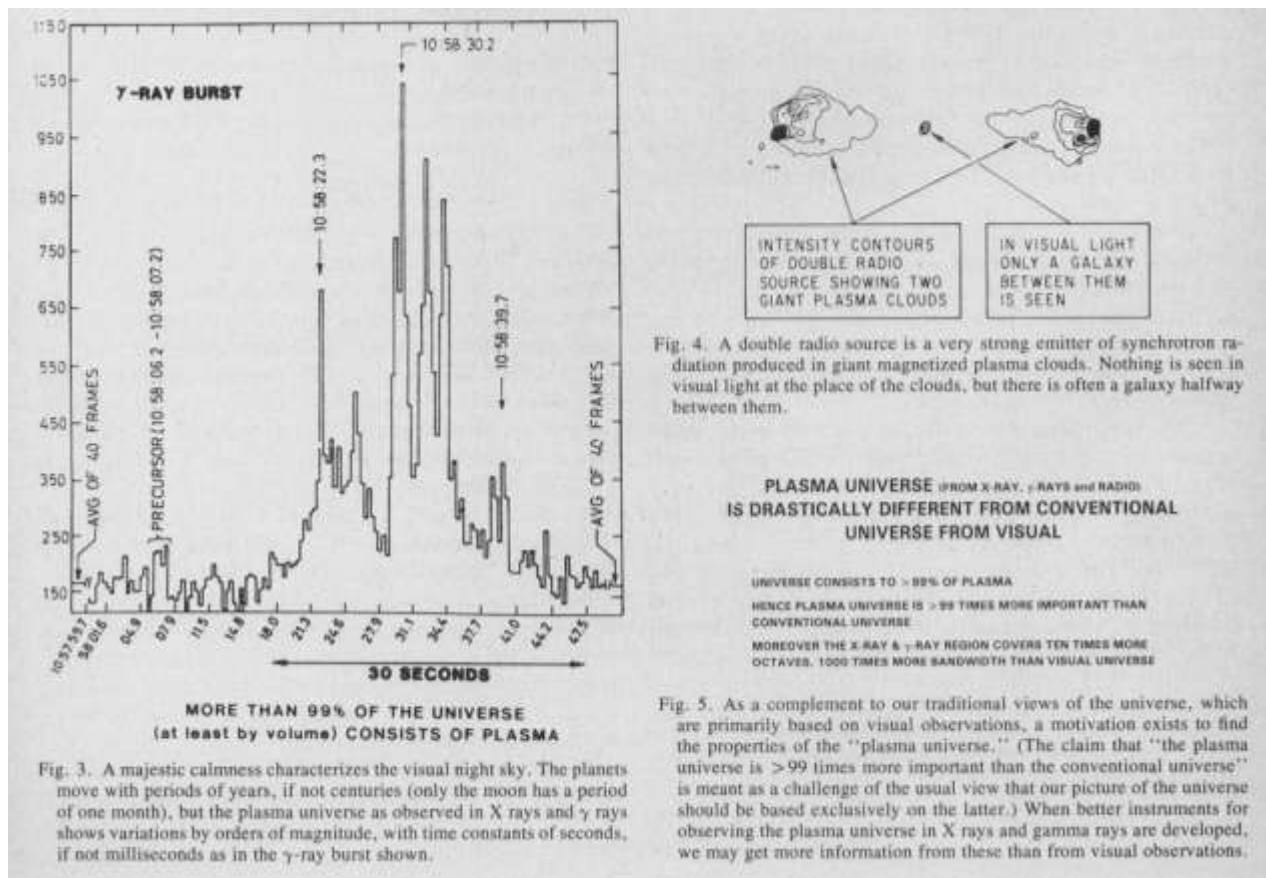
can't see it? Is someone playing a trick on us? Why has man spent over 5 thousand years believing in what he saw, only to discover, after all of this time, that this is not the real universe? Are there reasons to believe that the human mind is capable of extrapolating from the sense perception results of the laboratory to interstellar plasmas, and beyond to intergalactic regions? Alfvén said Yes.



**Figure 11** Alfvén's projection of a Platonic view of the Sun.

The irony of the 27 magnitudes of the Plasma Universe lies in the fact that the Plasma Universe is no longer the visual universe we have been familiar with, and therefore, the fallacy is that those 27 perceptual magnitudes are not true. The challenge, here, is to discover the properties of a universe that cannot be seen.

In his 1986 article, *Model of the Plasma Universe*, Alfvén added this beautifully Platonic “view” of the X-ray conceptual Sun in order to shock sense certainty. (Figure 11)



**Figure 12** The invisible Plasma Universe

What a deception. That Sun sheds more darkness than light. What is it that we cannot see, here? It looks like the time has come to get over our deception and realize that the universe was never the universe of sense perception and that our blindness was only the first step into a new way of thinking. So: What does it mean that we can no longer derive our knowledge from observation? What knowledge

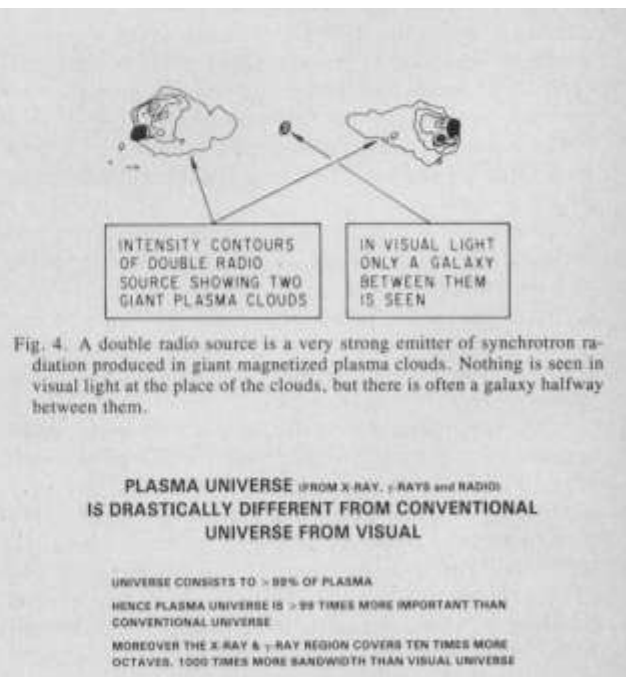


Fig. 5. As a complement to our traditional views of the universe, which are primarily based on visual observations, a motivation exists to find the properties of the “plasma universe.” (The claim that “the plasma universe is >99 times more important than the conventional universe” is meant as a challenge of the usual view that our picture of the universe should be based exclusively on the latter.) When better instruments for observing the plasma universe in X rays and gamma rays are developed, we may get more information from these than from visual observations.



awaits us outside of the very narrow visual octave of the electromagnetic spectrum?

#### 4. KRISTIAN BIRKELAND: THE BIRTH OF PLASMA COSMOLOGY

*“In the following pages it will be shown how far I have succeeded in explaining the above-mentioned and several kindred relations, starting with the assumption which, viewed from the present standpoint of natural philosophy, is a legitimate one, namely, that the sun, and especially the spots on the sun, send out into space cathode or kindred rays.”*

Kristian Birkeland, [The Norwegian Aurora Polaris Expedition 1902-1903](#)

Kristian Birkeland (1867-1917) initiated the study of plasma physics and who first made the connection between laboratory and plasma cosmology. As Alfven put it: “Birkeland observed aurora and magnetic storms in nature, and tried to understand them through his famous terrella (spherical electromagnet called Little Earth) experiment.” (Hannes Alfven, [Relations Between Cosmic and Laboratory Plasma Physics](#), Annals of the New York Academy of Sciences, Volume 257, August 1975, p. 179.)

Today, the vast majority of cosmology researchers have rejected plasma cosmology because it is contrary to the big bang theory and its accepted “scientific opinion.” However, this big bang theory poses a real problem for me, because, if nothing existed before the big bang, then, what was it that exploded at the beginning? And, if the Universe is expanding, what is it expanding into? I guess the universe must be getting bigger into nothing. Whatever happened to the idea of a self-transforming universe? Forget the Big Bang, there is no future in the past.

The creation of the “terrella experiment” was meant to be a generator of galactic ideas; that is, the generator of how the human mind interacts with the universe as a whole. This is the reason why I consider the “terrella experiment” as a crucial Platonic Cave experiment, because it considers the heavens as the dimly lit wall of illusions. The way that heaven appears to your perception is not the way

it is, in reality. In other words, Birkeland's purpose was not to simulate the formation of the solar system or the galaxy inside of a laboratory, but to simulate how God created the human mind to work like the universe as a whole.

Unfortunately, plasma physicists today are not taking into account that relationship of their minds to the universe and, instead, they get lost in the minutia of analyzing experimental effects or what appears to be acceptable to their sense perception. However interesting such studies might be, they miss the whole purpose of the relationship between laboratory experiments and cosmic physics. The reality of the physical world is those two domains unified as one.



**Figure 13** Kristian Birkeland (1867-1917) “The first space scientist.” Also held patents for the electromagnetic gun, electric blankets, solid margarine, and hearing aids. [Chapter VI. On Possible Electric Phenomena in Solar Systems and Nebulae](#)

In his famous paper [Chapter VI. On Possible Electric Phenomena in Solar Systems and Nebulae](#), Birkeland elaborated a fascinating view of what he called “The Worlds in the Universe.” In that section of his paper, he developed an interesting theory on the origin of the Universe starting from his mind. He wrote:

“From the conceptions to which our experimental analogies lead us, it is possible to form, in a natural manner, an interesting theory of the origin of the worlds. This theory differs from all earlier theories in that it assumes the existence of a universal directing force of electromagnetic origin in addition to the force of gravitation, in order to explain the formation round the sun of planets -- which have almost circular orbits and are almost in the same plane -- of moons and rings about the planets, and of spiral and annular nebulae. Even the newly-discovered, most distant moons of Jupiter and Saturn, with

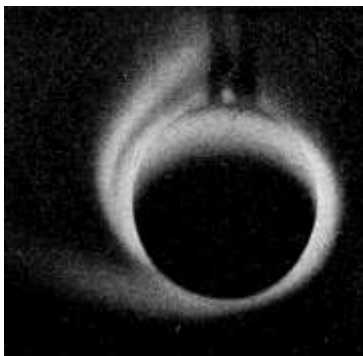
their retrograde revolution, do not place the theory in any doubtful light; on the contrary, the discovery would seem to predict that if planets are still discovered round the sun sufficiently far outside Neptune, they might also have a retrograde revolution.

“The fundamental assumption with which we shall start will correspond with one of the three above-mentioned assumptions regarding the sun. For the sake of simplicity, we will assume, in conformity with case 3 above, that all suns in relation to space have an enormous negative electric tension, different for the different stars, but which, as regards order, might be somewhere about a milliard volts for stars of a class similar to our sun.

“In this way electric discharges will be produced, among them being disruptive discharges from comparatively small areas (spots). One might imagine that radiation from these will give rise to circular currents in the star, parallel with the plane of the equator of the rotating central body, whereby the central body becomes magnetic.

“We can then begin, for instance, to seek for an explanation of the formation of spiral nebulae.” (Kristian Birkeland, [Chapter VI. On Possible Electric Phenomena in Solar Systems and Nebulae.](#))

Then, Birkeland made the following experiment in his laboratory, describing



the elementary nature of the process generating one of the 120,000 nebulas in the Universe. He demonstrated that by using continuous discharges around a magnetic cathode-globe, one can generate not only spirals symmetrically curving in two opposite positions in the plane of the equator of a celestial body, but that it could also assume the shape of a solar system as well as the shape of Saturn's rings.

**Figure 14** Magnetic globe as cathode in a large vacuum-box. (Kristian Birkeland, [Chapter VI. On Possible Electric Phenomena in Solar Systems and Nebulae](#))

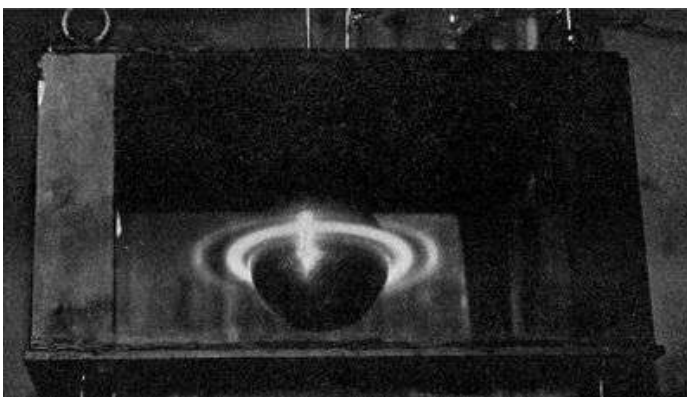
Birkeland concluded his paper with this astounding astrophysical laboratory conclusion:

“Let us now look a little more closely at the idea here put forward, namely, that the sun each day emits by electric evaporation or disintegration considerable quantities of matter in the plane of its equator which forms the part of the electric ring already mentioned, and that in earlier ages this emission of matter has been still greater.

“It is not necessary to admit at first the original nebula extended to the orbit of Neptune, as the matter is radiated by electric forces outside the system at its equator. It is very probable, moreover, that the greater part of the matter thus radiated leaves the system, and in any case takes no part in the formation of the planets.

“Our analysis will show that particles from the central body may be so ejected that they afterwards move in approximately circular paths near those in which the centrifugal force due to the revolution movement counterbalances the attraction of gravitation; and one could naturally believe that it is just these globules which condense and form large spheres.

“Our explanation will be applicable, not only to the planets round the sun, but also to all satellites round the planets. One can imagine Saturn's moons, and Jupiter's, down to the outermost, newly-discovered ones that



move round the planet in the opposite direction to the inner, originating in a natural manner from matter, which, under the action of an electromagnetic directing force, has been ejected from the planets in the plane of the equator.

**Figure 15** Replicating Saturn rings in Birkeland's laboratory.

“Looked at in this way, Saturn may still be engaged in making moons by electric radiation. Mimas, almost touching the circumference of the rings, is perhaps the youngest of the satellites.” (Kristian Birkeland, [Chapter VI. On Possible Electric Phenomena in Solar Systems and Nebulae](#))

This Birkeland conception for the formation of the planets of a solar system is very close to the later conception of the *White Owl Effect* conceived by plasma physicist, Dan Wells, during the 1970's. The beauty of Birkeland's idea is that it is demonstrated in laboratory. In the Preface of the second edition to [The Norwegian Aurora Polaris Expedition 1902-1903](#), Birkeland wrote:

"The experimental investigations which at first were designed to procure analogies capable of explaining phenomena on the earth, such as aurora and magnetic disturbances, were subsequently extended, as was only natural, with the object of procuring information as to the conditions under which the emission of the assumed hello-cathode rays from the sun might be supposed to take place.

"The magnetic globe was then made the cathode in the vacuum-box, and experiments were carried on under these conditions for many years.

"It was in this way that there gradually appeared experimental analogies to various cosmic phenomena, such as zodiacal light, Saturn's rings, sun-spots and spiral nebular.

"The consequence was that attempts were made to knit together all these new discoveries and hypotheses into one cosmogonic theory, in which solar systems and the formation of galactic systems are discussed perhaps rather more from electromagnetic points of view than from the theory of gravitation.

"One of the most peculiar features of this cosmogony is that space beyond the heavenly bodies is assumed to be filled with flying atoms and corpuscles of all kinds in such density that the aggregate mass of the

heavenly bodies within a limited, very large space would be only a very small fraction of the aggregate mass of the flying atoms there.

"And we imagine that an average equilibrium exists in infinite space, between disintegration of the heavenly bodies on the one hand, and gathering and condensation of flying corpuscles on the other." (Kristian Birkeland, [The Norwegian Aurora Polaris Expedition 1902-1903.](#))

If ever there was an appropriate conception of a self-creative process of the physical universe which included the human mind within the experiment of Plato's Cave, this is the one. Kristian Birkeland had the right approach to it, because all of the key epistemological conditions relating to both mind and matter were taken under consideration by him in his working hypothesis.

When he discussed his aim and method, Birkeland noted that whenever sun-spots were numerous the periods corresponded to increase magnetic oscillation on Earth, as was pointed out by Lamont as early as 1850. For nearly two centuries, this cause and effect relationship has been a blind spot in the minds of most scientists, because they refused to include the import of their own minds within the process. I recall, here, the essence of Birkeland's hypothesis and his emphasis on certain "enlightenment" points. Birkeland wrote:

"In the following pages it will be shown how far I have succeeded in explaining the above-mentioned and several kindred relations, starting with the assumption which, viewed from the present standpoint of natural philosophy, is a legitimate one, namely, that the sun, and especially the spots on the sun, send out into space cathode or kindred rays.

"In order to gain definite conception of the effect of such rays in the vicinity of the earth, I have again and again recourse to analogisms from my previously described experiment in which a magnetic terrella is suspended in a large discharge-tube, and exposed to cathode rays.

"The experiment, which was originally made for the purpose of finding points of support for a hypothesis for the formation of aurora, has

proved a veritable mine of wealth, in which I have constantly made valuable discoveries.” (Kristian Birkeland, [The Norwegian Aurora Polaris Expedition 1902-1903](#), Volume I, First Edition, p. 41.)

Birkeland's method, essentially, involved two processes which reflect the epistemological conditions for the experiment of Plato's Cave: one process goes from the Cosmos to the Earth, and the other process goes from the Earth to the Cosmos. Invariably, the two processes are required to be constantly corrected from the top down. Birkeland wrote:

“Starting with the hypothesis that the sun-spots are the source for the emission of cathode rays, I have endeavored to follow the process from the sun to the earth, and by analogy with the above mentioned experiment, see how some of the rays strike the earth, and some glance past it under the influence of terrestrial magnetism. This is moreover the way my friend, Professor Stormer, has taken in his mathematical investigation of the path of such rays from the sun to the earth. He has published the complete results of his investigations in a special part of the present work; but these results will already be to some extent known from his earlier papers. Here, for the first time, a detailed mathematical treatment of the aurora problem and kindred problems will be found.

“The other way is to start with the conditions upon the earth, study a single perturbation, seek for the terrestrial processes that might be able to influence them directly, and follow these up until, if possible, we are stopped at the point when the cause can no longer be sought upon the earth, but in the arrival of something from without; and here the two ways may meet.

“It is by going both ways, employing both methods, that we have thought we might have the best prospect of solving the problem.

“That which, at a certain point on the earth, and at a given moment, characterizes a magnetic perturbation, is the strength and direction of the perturbing force.

“In order, therefore, to obtain a clear conception of the perturbation, such as it actually appears on the earth, there are in particular two important points upon which enlightenment is to be sought, namely,

“(1) How is the force distributed upon the earth at the definite point of time during the perturbation?

“(2) How does the distribution of force change with time?

“The investigation of these two points has formed one of our principle tasks.” (Kristian Birkeland, [The Norwegian Aurora Polaris Expedition 1902-1903](#), Volume I, First Edition, p. 42-43.)

The challenge, here, is to apply these two Birkeland processes to the human mind as well as to the physical conditions of the cosmos, with the understanding that even though such analogies were considered to be quite natural at the time of Birkeland, they have no longer been made conscious to scientists since then. The time has come to change that.

**FIN**