

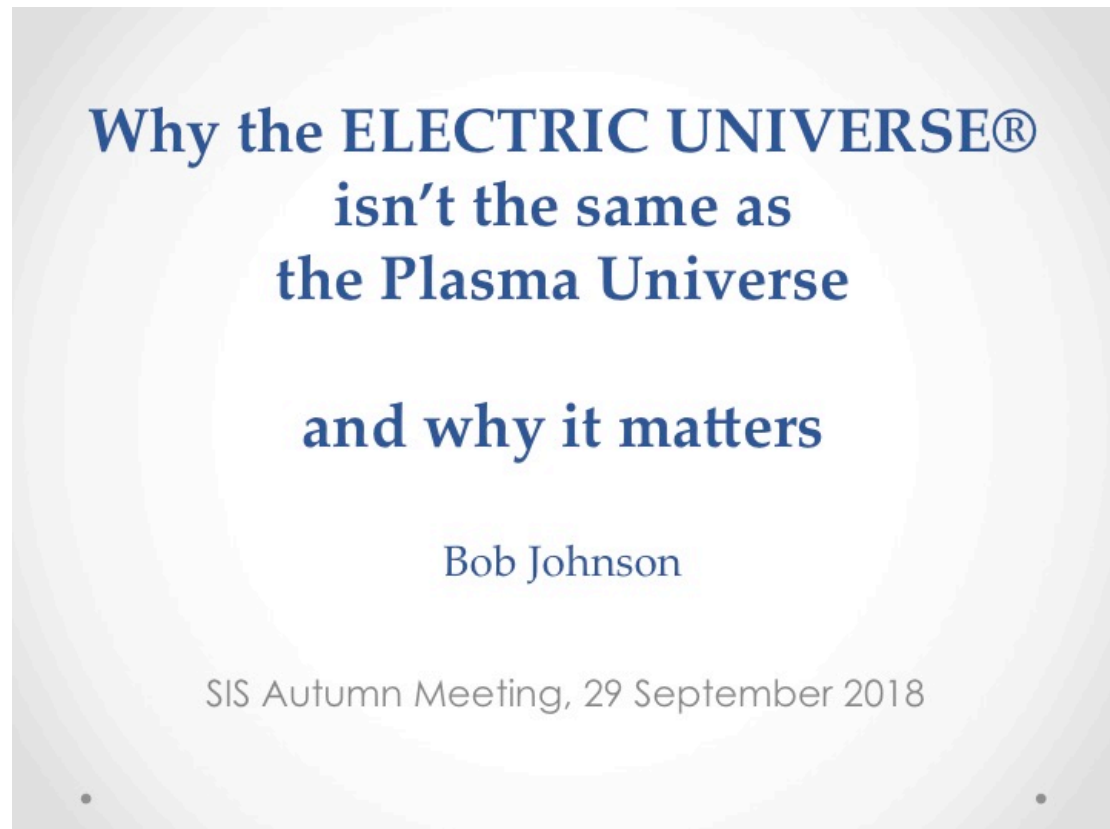
Why the ELECTRIC UNIVERSE® isn't the same as the Plasma Universe and why it matters

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Presentation to the SIS Autumn meeting, 29 September 2018

(Text in orange was omitted from the talk for the sake of clarity.)

Notes and references follow the text and slides.



What I want to do today is to examine the relationship between the ELECTRIC UNIVERSE® and the Plasma Universe, or EU and PU for short.

The ELECTRIC UNIVERSE®

A movement promoting a model of
the Universe

&

The model itself

Just so that we're all clear about the terminology, when I use the term ELECTRIC UNIVERSE or EU, I'll be referring both to the movement and their model of how the Universe works. The other terms will become clear as we go along.

I hope to show you that even though the EU agrees with the PU in recognising the need for incorporating plasma physics into astrophysics, the EU and the PU have very different fundamental principles, objectives and *modus operandi*.

In particular, the EU promotes one model to the exclusion of all others but this may not be the right one. The future of the Plasma Universe, or rather the future of Plasma Cosmology in general, may lie in a completely different direction.

Two Questions

- **Is the EU the same as the PU?**
- **Why does it matter?**

The boundaries between the ELECTRIC UNIVERSE and the Plasma Universe often seem to have been blurred to the point where it's sometimes hard to tell the difference. Critics of the EU certainly seem to think the EU and the PU are the same thing; they then dismiss them both in the same breath. But is the EU the same as the PU? And why does it matter whether it is or it isn't?

The first question can be answered very easily.

Is the EU the same as the PU?

PU: Tony Peratt

*'The purpose of this book is to address the growing recognition of the need for **plasma physics in astrophysics.**'*

Physics of the Plasma Universe, 1992

EU: Dave Talbott

*the results of the SAFIRE experiment show 'a desperate need for a new perspective in planetary science, one which recognises **charge exchange between celestial bodies**'*

Top 10 Reasons why the Universe is Electric, 6, 19:20

Tony Peratt, author of *Physics of the Plasma Universe (PPU)*¹, wrote in the introduction to the first edition that:

'The purpose of this book is to address the growing recognition of the need for plasma physics in astrophysics.'

He went on to suggest that the PU is the unified discipline of the study of cosmic plasma and astrophysics together.

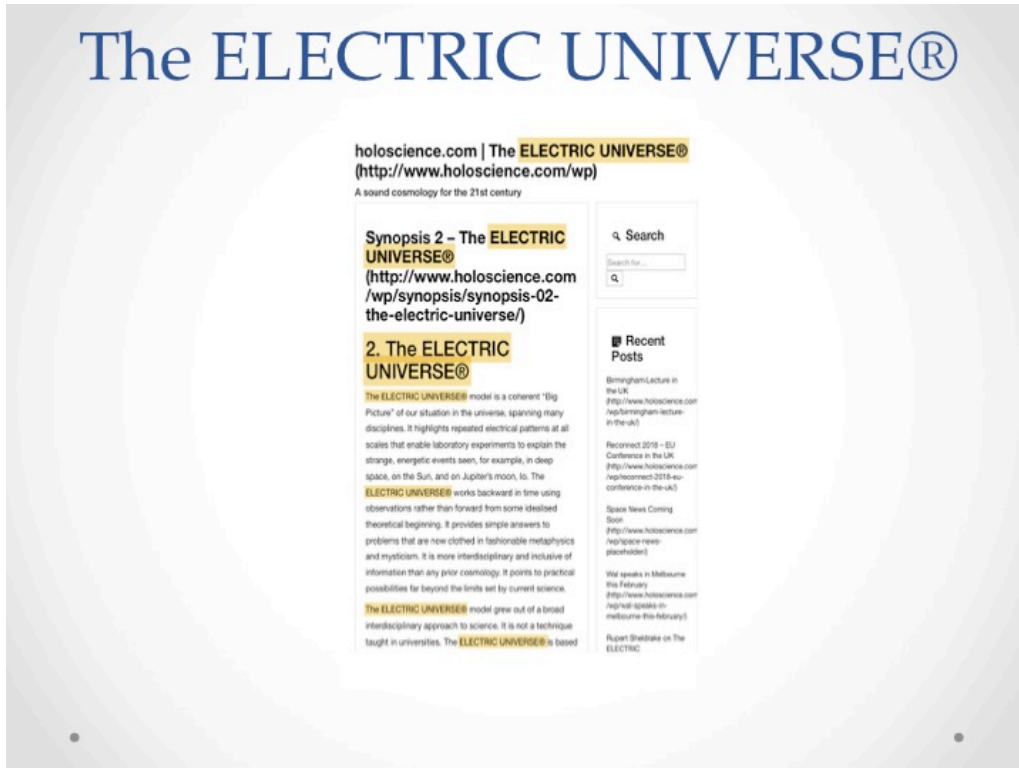
In contrast, the EU² have recently stated on YouTube³ that the results of the SAFIRE experiment show:

*'a desperate need for a new perspective in planetary science, one which recognises charge exchange between celestial bodies.'*⁴

Similarly, Thornhill has written that *'[Velikovsky's] basic premise of planetary encounters has been confirmed and the details fleshed out to an extraordinary degree.'* and that there is a *'crucial distinction between the planetary catastrophism of the ELECTRIC UNIVERSE and that of neo-catastrophists who attempt to explain the evidence for planetary encounters in terms of cometary phenomena.'*⁵

Obviously that model of *'charge exchange between celestial bodies'* and Velikovsky's near-collisions of the planets within the last few thousand years is particular to the EU; it's not found in Peratt's PPU or anywhere else in plasma physics or astrophysics.

The ELECTRIC UNIVERSE®

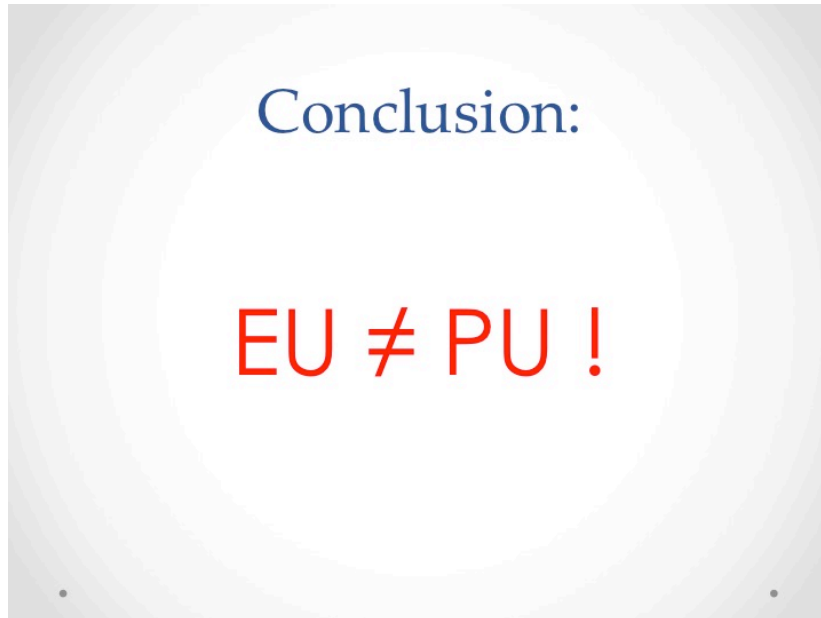


There's another major difference as well: the ThunderBolts Project™ which is '*A voice for the EU*' seems to have been set up to sell their main product: the EU model. Here's an extract from Thornhill's 'holoscience' website – as you can see, he never misses an opportunity to remind readers that 'the ELECTRIC UNIVERSE' is a registered trademark! The EU is a very commercial organisation.



You can even buy the T-shirt!

In contrast, Peratt's PPU is a plasma physics textbook.



So the EU certainly isn't the same as the PU; they're as different as chalk and cheese!

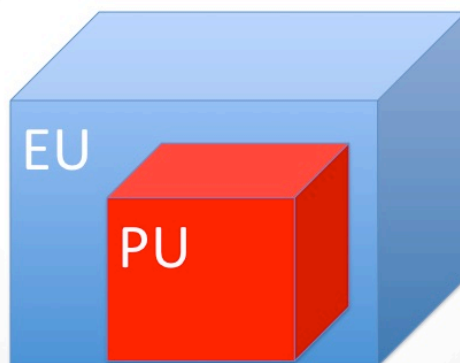
We could perhaps stop there, but the second question of why it matters is going to take a little longer to answer and involve looking in more detail at the reasons why the EU isn't the same as the PU.

What is the relationship between the EU and the PU?

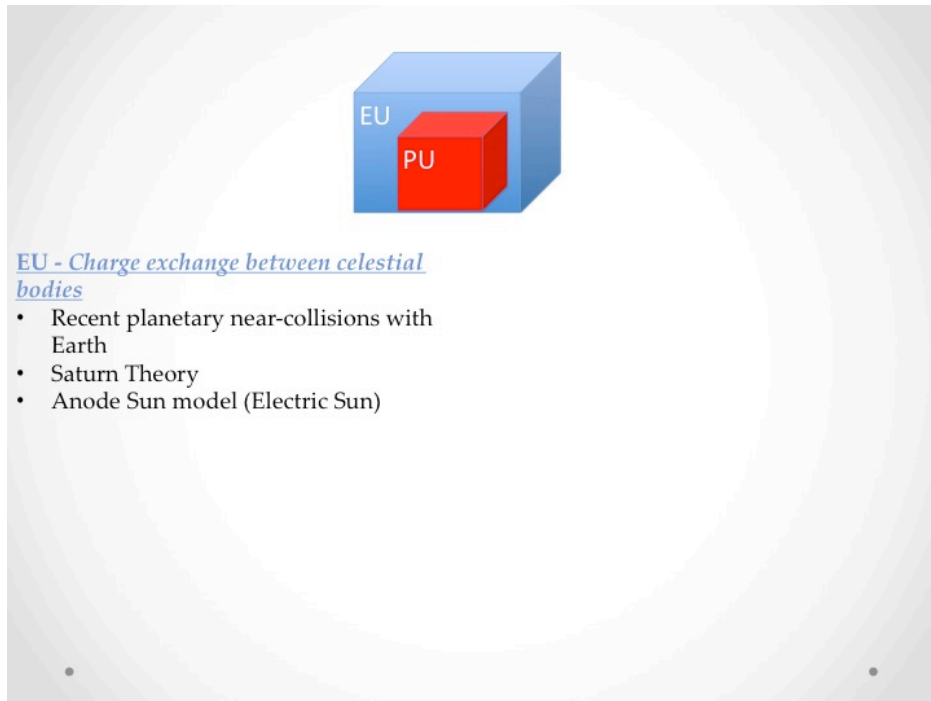
If the EU isn't the same as the PU then what relationship do they have?

Thornhill has stated on his 'Holoscience' website that the EU '*is more interdisciplinary and inclusive of information than any prior cosmology*'⁶ or in other words there's more to the EU than you get with the PU. There's no obvious indication in the EU publicity that they are being selective about which parts of the PU they include, so let's assume to start off with that the EU includes the whole of the PU.

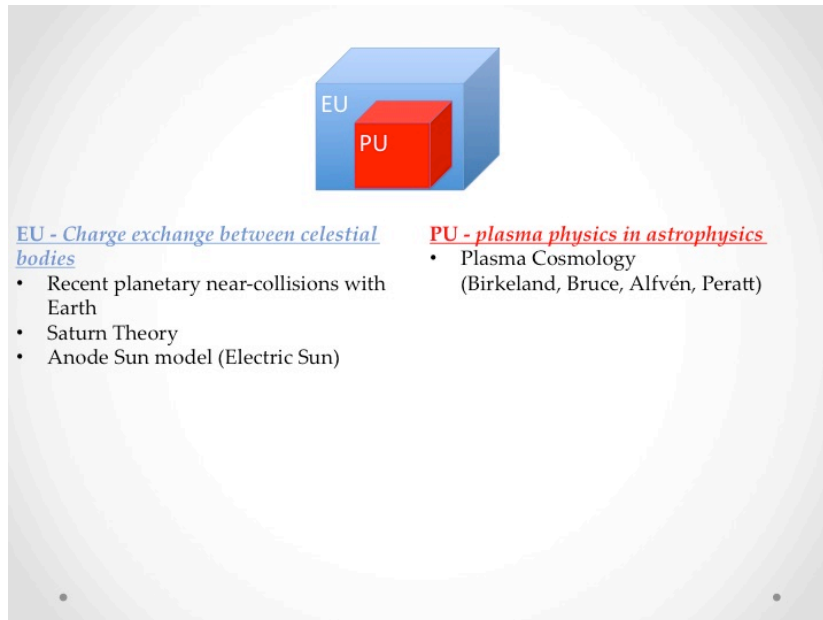
If the EU includes the PU:



Adopting their commercial approach, this would be like a special offer along the lines of '*Buy the EU theory and get the PU free*'. But let's check what's in the box before parting with any money!⁷



The EU's hypothesis of charge exchange between celestial bodies and Velikovsky's near-collisions of those charged planets with Earth within the last few thousand years effectively defines the EU box. We can put a number of other hypotheses in the EU box as well, including the Saturn theory, and Juergens' Anode Sun model together with its later development, the Electric Sun. None of these are in the PU part.

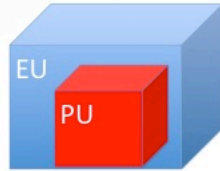


Inside the PU box, according to the EU's sales pitch, is the whole of plasma cosmology which was built on Birkeland's foundations by scientists such as Alfvén and Peratt.

A background sketch may be useful here: in the early 20C, Birkeland postulated the existence of charged particles in what was then supposed to be the 'vacuum' of space; unfortunately Birkeland died in 1917, leaving the proponents of the 'space is a vacuum' view led by Chapman largely free to dictate the course of astrophysics in the years that followed⁸; as Peratt later wrote, '*It was not until 1974 that space probe measurements decided the controversy in Birkeland's favour.*'⁹

In 1950 Alfvén and his colleague Fälthammar had published 'Cosmic Electrodynamics' in which they argued in favour of including electric currents in the understanding of space plasmas. Alfvén continued to promote the role of electric currents in space until his death in 1989. In 1992 Peratt coined the term 'Plasma Universe' to describe the new discipline which is also sometimes referred to as 'Plasma Cosmology'; he later extended the scope of the PU by identifying the relation between petroglyphs and the types of plasma formations he'd seen in his work on high energy plasma discharges at the Los Alamos research laboratory¹⁰. Inclusion of this aspect of the PU is the primary difference between the first (1992) and second (2015) editions of his book 'Physics of the Plasma Universe'.

Meanwhile, in 1944 Bruce had hypothesised about an 'All-Electric Universe' based on his hypothesis that the Sun's photosphere consisted of electric arc discharges; also, Velikovsky had published 'Cosmos without Gravitation' in 1946 and 'Worlds in Collision' in 1950. Both men continued to develop their hypotheses until their deaths, coincidentally both in 1979. As we've seen, the modern EU movement derives largely from Velikovsky but it also draws on Bruce's work. So we can already see the different strands of the PU and EU thinking emerging.



EU - Charge exchange between celestial bodies

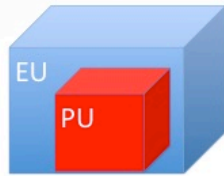
- Recent planetary near-collisions with Earth
- Saturn Theory
- Anode Sun model (Electric Sun)

PU - plasma physics in astrophysics

- Plasma Cosmology (Birkeland, Bruce, Alfvén, Peratt)
- Birkeland Currents, plasma filaments in space, double layers, parallel electric fields, etc.
- Birkeland's terrella experiments
- Petroglyphs as historical records of plasma events

Inside the PU box are Birkeland Currents, plasma filaments in space, double layers, parallel electric fields and many other aspects of plasma behaviour that anyone who follows the EU will be familiar with. Also in the box is recognition of the value of Birkeland's terrella experiments in helping to demonstrate that phenomena such as the auroras can be explained by considering charged particles in space; and Peratt's more recent hypothesis that petroglyphs could have been records of plasma events seen in the heavens within the last twelve thousand years or so.

So are the EU simply continuing that tradition of extending the range of the PU after inheriting Alfvén's mantle, as has sometimes been suggested? It would be nice to think so but we've already had a hint that this is somewhat misleading – what you get in the EU box is very different to the contents of the PU box and would not be seen as a *valid* extension of PU theory by the pioneers, as Peratt himself made clear in the Introduction to the 2015 edition of his PPU¹¹



EU - Charge exchange between celestial bodies

- Recent planetary near-collisions with Earth
 - Saturn Theory
 - Anode Sun model (Electric Sun)
- = **speculative proposals and visual analogies relying on the PU evidence 'in the EU box'**

PU - plasma physics in astrophysics

- Plasma Cosmology (Birkeland, Bruce, Alfvén, Peratt)
 - Birkeland Currents, plasma filaments in space, double layers, parallel electric fields, etc.
 - Birkeland's terrella experiments
 - Petroglyphs as historical records of plasma events
- = **plasma physics**

In a nutshell, the PU is based on sound plasma physics backed up with laboratory research and detailed mathematical modelling. This includes both fluid analysis and kinetic Particle-in-Cell models requiring massive amounts of computer time on the largest machines available. The EU, on the other hand, is largely based on speculative proposals and visual analogies; these are backed up by claims that genuine examples of plasma behaviour in space are evidence for their own model based on close encounters between charged planets.

This 'sales technique' of mixing of PU fact and EU theory is easy to miss if you're not looking carefully.

We can see the EU's sales technique in action when we look closely at their YouTube video series 'Top 10 Reasons why the Universe is Electric' (T10R). Episode 2 is an especially good example.

Top 10 Reasons (T10R) why the Universe is Electric



Top 10 Reasons the Universe is Electric: #2 Filaments in Space | Space News

Episode 2 – ‘Filaments in space’ does present a lot of genuine evidence for filamentary behaviour of plasma in space including lightning discharges and sprites in the Earth’s upper atmosphere; electric currents between Jupiter and Saturn and their respective moons; and the filamentary nature of penumbral filaments on the Sun. But these genuine examples of plasma behaviour are intermixed with key claims of the EU’s model such as ‘*in the EU, all stars are positively charged anodes*’, the erroneous claim that magnetic ropes have been found stretching from the Sun to Saturn, and much more.

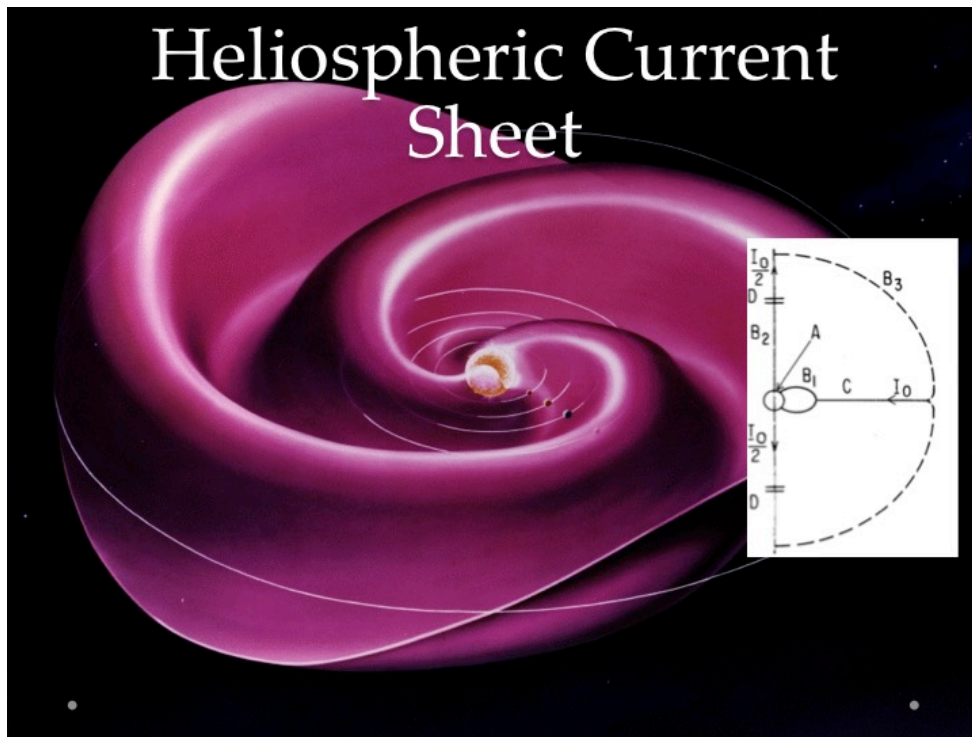
Use of the evidence

- these pieces of evidence 'All attest to the electric circuitry in the solar system.' - T10R, 2, 8:05
- Yes, an electrified heliosphere does mean an Electric Sun – Dave Talbott 20.10.17

It's claimed that these pieces of genuine evidence '*All attest to the electric circuitry in the solar system.*' Talbott has stated the implications of this finding elsewhere:

*'I do not believe that anyone following the fact-based discussions in recent years, including five full-length documentaries, more than a hundred episodes of Space News, and 31 episodes of our Discourses on an Alien Sky, would want to suggest that evidence for an electrified heliosphere is lacking. (Yes, an electrified heliosphere does mean an Electric Sun.)'*¹²

Sounds convincing, doesn't it?



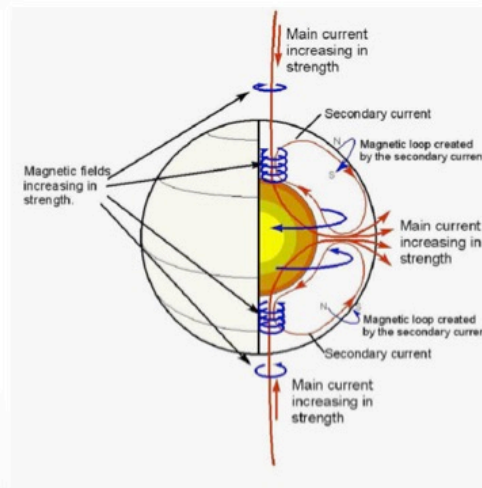
But what's not mentioned is that the existence of the Heliospheric Current Sheet (HCS) extending throughout the heliosphere has been recognised by astrophysicists for decades but they would not agree that this means that the Sun is Electric. Alfvén's diagram of the complete circuit of the HCS current shows it passing *above the photosphere* from the equatorial plane to both poles, along the rotational axis and returning back to the equatorial plane at some unspecified distance from the Sun, but even Alfvén didn't take the fact that the heliosphere was electrified to mean that the Sun itself is Electric. On the contrary: Juergens, who invented the model of an electrically-powered Sun,¹³ complained bitterly that Alfvén wouldn't endorse it.¹⁴

What Juergens wrote about Alfvén is seldom mentioned by the EU so here it is for the record:

'Hannes Alfvén has been a pioneer in seeking understanding of the cosmic roles of electricity and magnetism. Yet, by accepting the prevailing notions that the universe is inherently neutral and that the stars are powered internally, Alfvén has effectively sealed himself off from discovering many important electrical phenomena; thus he has uncovered little fundamental information about the universe from his electrical studies.'

Juergens was obviously disappointed that Alfvén didn't support his theory but Alfvén was the better scientist: he won the Nobel Prize! In contrast, we'll see later how Juergens misinterpreted the evidence he relied on for his Anode Sun model.

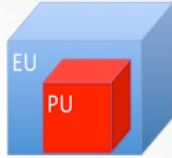
The EU HCS circuit



Episode 2 shows Donald Scott's diagram indicating how the EU theorists modify Alfvén's HCS electric circuit by routing the current *through the photosphere* so that it enters and leaves the body of the Sun - but I've shown previously that Alfvén's HCS circuit is correct; Juergens' model with the current entering and leaving the photosphere is contradicted by the actual evidence.^{15,16}

The EU have now abandoned Juergens' 10 billion Volt model in favour of a 'Hybrid' model in which the Sun is partially driven by an un-quantified amount of incoming current which in turn is supposed to drive fusion in the photosphere. This Hybrid Electric Sun model retains Juergens' key concept of an Anode Sun with currents entering and leaving it; the granulation of the photosphere is still supposed to be indicative of the behavior of an anode in an electrical circuit. However, I showed here last year¹⁷ that this 'hybrid' concept is also flawed; the electric discharge activity seen in the solar spectra is coming from coronal loops and chromospheric flares, not from the photosphere.

It's only in EU theory that one finds an Electric Sun; it's not in the PU box of proper plasma physics.



EU - Charge exchange between celestial bodies

- Recent planetary near-collisions with Earth
- Saturn Theory
- Anode Sun model (Electric Sun)

= speculative proposals and visual analogies relying on the PU evidence 'in the EU box'

EU claims:

- "Yes, an electrified heliosphere does mean an Electric Sun"

PU - plasma physics in astrophysics

- Plasma Cosmology (Birkeland, Bruce, Alfvén, Peratt)
- Birkeland Currents, plasma filaments in space, double layers, parallel electric fields, etc.
- Birkeland's terrella experiments
- Petroglyphs as historical records of plasma events

= plasma physics

PU science not in the EU box:

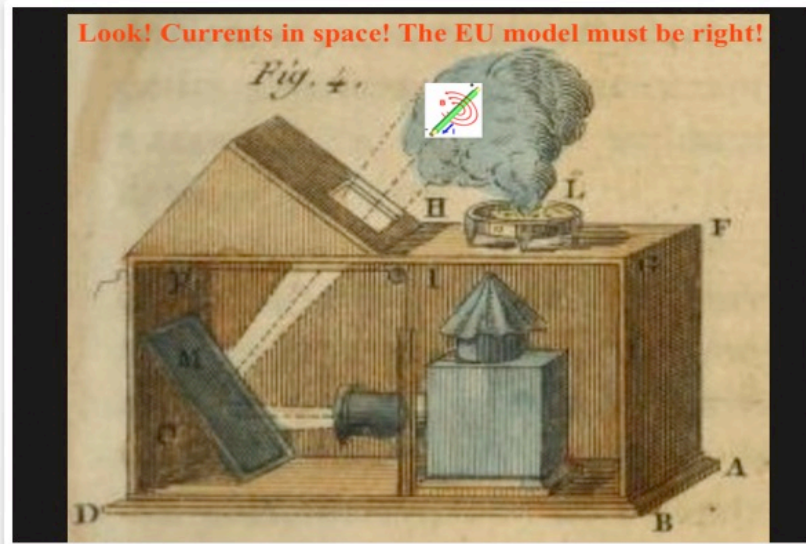
- Alfvén's HCS circuit \neq an Electric Sun

So we need to update our diagram to include the EU claim about an electrified heliosphere, but also to note that Alfvén's HCS circuit has been omitted from the PU box, and that it doesn't imply an Electric Sun.

T10R Episode 2 continues: at ~9:30 the commentary states that '*filaments are acknowledged nearly everywhere*' and this is simply taken as direct confirmation of Thornhill & Talbott's claim in their book 'The Electric Universe'¹⁸ that stars are formed in a z-pinch between twin Birkeland Currents (BCs).

This episode concludes with a discussion of the magnetic fields which have been identified '*everywhere we look*' in space but '*we don't know how these vast fields are generated ...*' [13:35]. Apparently, '*astronomers must recognize the electric currents required to produce and sustain the magnetic fields*' [14:05, *emphasis added*]; this harks back to the central claim of Episode 1 – 'Galactic Magnetic Fields' that '*Currents generate magnetic fields*'; Notice how the PU fact is followed by the EU theory. This is then followed by reference to Peratt's simulations of two BCs interacting to form a spiral-galaxy-like pattern and it ends with the statement that Alfvén wrote that '*space is filled with currents*' [~15:30] which lends authority to what you've just been told.

Smoke & Mirrors



• Original illustration by Guyot [Public domain], via Wikimedia Commons •

When you look carefully you can see that T10R Episode 2 is a classic example of the ‘smoke and mirrors’ technique: genuine evidence for electric currents in space and valid statements such as ‘*for several years astrophysicists have recognised the electrical currents connecting Saturn and Jupiter to their moons*’ [~8:00] are being used to persuade the audience to believe the EU’s ‘Big Picture Illusion’ that electric currents are the primary factor, magnetic fields are secondary,¹⁹ and therefore the EU model must be right.

Michael Armstrong, the man behind Mikamar publishing who have produced many of the EU’s books, wrote elsewhere about a critical article on the EU in Vice.com that it was ‘*A Masterful mix of some factual information, canted innuendo, misinformation, and misrepresentation.*’²⁰ It seems to me that that’s a case of the pot calling the kettle black when we consider Episode 2 of T10R!

Where do the EU's currents come from?

- in the EU space has a vast substructure .. of **electric potential**, typically extremely subtle at any point but sufficient to affect cosmic directionality.
[T10R, 3, 8:35]
- i.e. cosmic Potential Differences cause currents
- The Sun is an anode discharging to the planets via Birkeland Currents

But where do the PDs come from?

What the EU don't explain in Episode 2 is where the currents are supposed to come from, but we know from Episode 3 at ~8:35 that *'in the EU, space has a vast substructure .. of electric potential, typically extremely subtle at any point but sufficient to affect cosmic directionality. Both stars and galaxies occur like pearls on a string revealing a filamentary or even cellular structure to the universe ...'*

In other words, the EU simply assume that the source of the currents in space are regions of different electrical potential which are discharging via Birkeland Currents. Likewise, on a smaller scale the Sun is stated to be an anode which is delivering power to the planets which are charged to a different potential. How these regions of different potential arise in the first place is never explained.

Episode 4 'Light Bulbs in Space' develops the EU's analogy between electrically powered stars and household light bulbs both being powered from a remote generating station.

Unfortunately this episode starts off with a fundamental error: it's acknowledged that electric currents in space are recognised by the mainstream, but then it's claimed at ~1:00 & ff that the mainstream assumes that they're produced by *'mechanical and kinetic processes'*, obviously trying to equate the term 'kinetic' with simple Newtonian mechanics. More 'mechanical and kinetic' denigration occurs later. (As an aside, is it a coincidence that I'd written in favour of kinetic models of the Acceleration of the Solar Wind in an article²¹ published shortly before this episode came out?)

Kinetic modelling

- Dismissed by the EU in T10R episode 4 as merely a 'mechanical' process i.e. not involving electricity
- But 'kinetic modelling' is the proper term for Particle in Cell models that Peratt and other use to model currents and Double Layers in plasma!

Oops!

What's very concerning is that the EU are showing that they don't understand the term 'kinetic' despite continually trumpeting Tony Peratt's computer modelling of plasma; these Particle-in-Cell computations are based on kinetic modelling! In fact the whole EU argument requires the kinetic approach to modelling plasma behaviour; this approach can replicate features such as currents and double layers which the alternative 'fluid' approach can't do.

If the EU don't even understand the terminology then how can we trust their interpretation of the plasma physics?

Pulsars according to Don Scott

- "A Pulsar = a 'plasma bridge' between two closely-orbiting binaries, one of which is being charged by an external current." [Don Scott, draft of T10R, Episode 5]

There's more unsupported speculation in the episode which follows. The draft of T10R Episode 5 posted on 14.11.17 looks at pulsars. This episode describes pulsars in terms of Scott's hypothesis of a 'plasma bridge' between two closely-orbiting binaries, one of which is being charged by an external current. **By analogy with lightning in the ionospheric cavity on Earth**, Scott suggested that this might be the explanation of pulsar behaviour if the system was acting as an oscillating **resistive-capacitive** electric circuit discharging along the plasma bridge.

Pulsars Revisited

- "A Pulsar = a 'plasma bridge' between two closely-orbiting binaries, one of which is being charged by an external current." [Don Scott, draft of T10R, Episode 5]
- *Radio engineers have shown that a plasma bridge between binaries couldn't produce the stable oscillations observed from pulsars !*

[Alex Jarvie, 2017]

Comments were invited privately on this draft of episode 5 but unfortunately for Scott's hypothesis, a keen supporter of the EU pointed out that radio engineers have shown that a plasma bridge between binaries couldn't produce the stable oscillations observed from pulsars!

There *are* many puzzling aspects of pulsar behaviour which appear to require a plasma-based explanation but Scott's speculations are clearly as impractical as his diagram of the HCS and Electric Sun that we saw earlier.

Charged planets etc.

- *electric charge exchange between the Sun and the planets is the best explanation for many phenomena unexplained in standard astronomy* [T10R, 6, 7:40]
- *It's the electric current system connecting Earth and Sun which drives our weather* [T10R, 6, 5:30]
- *Evidence for electric currents throughout space is now undeniable a major obstacle is a lingering belief that science discovery has emphatically contradicted: that celestial objects cannot have any net charge separation* [T10R, 8, 0:30]

Episodes 6 & 7 concentrate on 'Charged Planets', once again using valid evidence of electrical activity to support the EU's various contentions that '*electric charge exchange between the Sun and the planets is the best explanation for many phenomena unexplained in standard astronomy.*' [6, 7:40]; '*It's the electric current system connecting Earth and Sun which drives our weather.*' [6, 5:30]; '*It has always been EU's position that the planet's powerful auroras, polar storms and magnetic field [etc.] are induced²² by powerful Birkeland Currents from the Sun focused at the planet's poles.*' [7, 5:00]; and similar categorical statements of how the solar system works - according to the EU!

Episode 8 continues with the theme of charged planets, exploring Electrical Planetary Scarring. It begins: '*Evidence for electric currents throughout space is now undeniable ... and is more and more routinely acknowledged by cosmologists & astrophysicists .. but ramifications have been slow to effect any meaningful change in consensus scientific theory; .. a major obstacle is a lingering belief that science discovery has emphatically contradicted: that celestial objects cannot have any net charge separation ...*' [0:30 & ff]

As we've seen in previous examples, alternative explanations are never given a hearing: genuine evidence of currents in space is taken to verify the EU model based on charged celestial bodies being the source of electrical discharges between them, and astrophysicists are told they need to catch up.

Whose 'desperate need'?

- the results of the SAFIRE experiment show a **desperate need** for a new perspective in planetary science, one which recognises charge exchange between celestial bodies [T10R, 6, 19:20]

The underlying philosophy is revealed in the interesting statement we saw before about the results of the SAFIRE experiment which were claimed to show a '*desperate need for a new perspective in planetary science, one which recognises charge exchange between celestial bodies.*'²³

It seems that the desperate need is the EU's own - to gain acceptance of their particular interpretation of the undoubted electrical activity in the solar system and beyond.

Another feature of the EU publicity is their frequent misrepresentation or misinterpretation of the original sources. In many instances they may not be directly to blame for the misunderstanding because they tend to rely heavily on secondary sources such as popular science websites and similar media for their information and it often happens that these sources have given a particular slant to the research which is not apparent in the original papers.

On the few occasions when the EU do refer directly to a peer-reviewed source, they still manage to interpret it in a way which suits their model but one which isn't necessarily in line with the original paper.

Juergens' Misrepresentations

- X Charge on Sun causes dipole field
 - X Electrons moving too slowly away from Sun
 - ? 'Good' Solar Wind model – with a 400V Sun!
 - X Solar output does not vary with cycle
- = evidence for Juergens' 10 billion Volt Anode Sun ??**

This failure to accurately represent the original sources can be traced back to Juergens himself where, as I showed in 2013²⁴, of the four key sources he cited in support of his 10 billion Volt Anode Sun model, three actually contradicted his interpretation and the fourth showed that a mere 400 V potential drop near the Sun was sufficient to explain the relevant observations.

A recent example will serve to demonstrate that the problem of misinterpretation continues.



In Episode 7 of the T10R series reference is made at ~15:00 to a 2016 discovery by Jasinski *et al* of a magnetic flux rope apparently stretching between the Sun and Saturn. The EU state that this flux rope is traversing the vast distance between the two bodies, a point reinforced later at ~15:40 when they state that the flux rope extends ‘nearly 900 million miles from the Sun to Saturn’.

However, at ~15:15 the commentary also refers to a UCL news report²⁵ in which Jasinski is quoted as saying in an interview that Saturn’s magnetosphere behaves similarly to Earth’s magnetosphere. Because the well-known Solar Wind – Magnetosphere Coupling mechanism (see my paper on Tectonic Uplift²⁶ for a detailed discussion) doesn’t involve a flux rope stretching from the Sun, this immediately raises the question, what does the original paper by Jasinski *et al*²⁷ actually say about the Saturnian flux rope?

Key points from that paper include the following (emphasis added):

p6713: ‘Conditions at Saturn’s magnetopause are at times conducive to multiple X-line reconnection and flux rope generation’

p6720 ‘Discussion & Conclusions

We have presented the first detection of a [Flux Transfer Event]-type flux rope at Saturn’s dayside magnetopause. The Cassini spacecraft passed from the magnetosphere, where it observed five [Travelling Compression Regions] and then passed into an open flux region where energized magnetosheath plasma was observed as well as the FTE-type flux rope. ... Cassini then crossed into the magnetosheath, where the plasma increased in density, before finally traversing the bow shock and into the solar wind.’

Figure 2 of the paper confirms Cassini’s trajectory from Saturn’s magnetotail around to the dayside of the magnetopause and shows exactly where the flux rope was found. (I’d like to show you it but it’s copyright!)

Similarly, the UCL news report gives further details (emphasis added):

‘A twisted magnetic field structure, previously never seen before at Saturn, has now been detected for the first time, ...’

‘When the Sun’s magnetic field interacts with the Earth’s magnetic field (the magnetosphere), a complex process occurs called magnetic reconnection which can twist the field into a helical shape.’

The flux rope is at Saturn!

- The flux rope is located on the dayside of the boundary of Saturn's magnetosphere. There's no support whatsoever for the EU's claim that it stretched ~900 million miles to the Sun
- 'Magnetic Rope observed for the first time **between** Saturn and the Sun' UCL News Report, 6 July 2016
- 'Flux transfer event observation at Saturn's dayside magnetopause by the Cassini spacecraft' Jasinski et al 2016

It's clear both from the original paper and from the full UCL news report that the flux rope is located on the dayside of the boundary of Saturn's magnetosphere, as indicated in the diagram from the UCL news report which the EU showed in Episode 7.

There is no support whatsoever for the EU's claim that it stretched ~900 million miles to the Sun.

What The EU appear to have done, perhaps inadvertently, is to read what they want to read in the UCL news report titled

*'Magnetic Rope observed for the first time **between** Saturn and the Sun'* [6 July 2016]

and interpreted the word 'between' as meaning "**stretching** 900 million miles between the Sun and Saturn".

However, the title of the original paper by Jasinski *et al* is

*'Flux transfer event observation **at Saturn's dayside magnetopause** by the Cassini spacecraft'*

If you read the original paper, or even the full UCL news report, then it's clear that the use of the word '*between*' in the title of the news report must mean 'located between', not 'stretching between' as the EU claim. To rely on a particular interpretation of just one word in the title of a popular news report is cherry-picking in the extreme!

We've spent some time on this one point because firstly it's an important piece of claimed evidence for the EU's model of Birkeland Currents connecting the Sun and the planets which must now be discarded; and secondly because it shows just how careful one must be not to simply believe everything the popular science media or the EU says. **You have to go back instead to the original sources and check what the researchers actually wrote.** Time and again, you find that the original research doesn't back up the EU's spin.

Misrepresentations and False Dichotomies

- The EU claim that the Standard Solar Model (SSM) suffers from various anomalies and so the EU alternative of an Electric Sun must be correct

False on two counts!

- SAFIRE: is the Electric Sun a better model than the purportedly 'gravity-only' Standard Solar Model?

*= a straw man 'gravity-only' SSM -
and the Electric Sun isn't the only model
which includes plasma effects*

Another example of the EU's misrepresentation of the facts **for their own ends** is in their constant claims that the Standard Solar Model (SSM) suffers from various anomalies and so their alternative of an Electric Sun must be correct. Firstly, this is a false dichotomy – even if the claimed anomalies with the SSM were substantiated this does not imply that there is only one alternative. Secondly, as I showed in a recent paper²⁸, the claimed anomalies **in the EU book 'The Electric Universe'**²⁹ and referred to regularly in EU publicity do not stand up to scrutiny. (I also offered another alternative model in that paper but the details aren't relevant here.)

The SAFIRE project was also founded on the same false dichotomy. It's presented as being an experiment to test whether the Electric Sun³⁰ is a better model than the purportedly 'gravity-only' Standard Solar Model (SSM) with its claimed anomalies. The basis of the 'test' is to demonstrate electrically-driven plasma effects in the laboratory which bear some similarity to plasma effects on the Sun. Then, relying on the claim that a gravity-only SSM can't explain these phenomena, the Electric Sun is declared the winner.

But note that this requires misrepresentation **both** of the SSM **itself** and of astrophysicists' understanding of the electromagnetic processes in the Sun's atmosphere. The EU have set up a straw man 'gravity-only' SSM and claimed that only their model includes known plasma behaviour. It's no surprise that on those terms the Electric Sun comes out on top, as SAFIRE was designed to show.

It's also worth remembering that SAFIRE was promoted on the basis that no-one apart from Quinn and colleagues³¹ had repeated Birkeland's terrella experiments using modern equipment. In the first place, that's incorrect: there have been at least sixteen other groups who've carried out terrella experiments during the intervening century³². Secondly, the background has changed enormously since Birkeland's day. As we've seen, Birkeland was striving to demonstrate that there were charged particles in interplanetary space which drove the auroras on Earth, but the presence of plasma in space has been an accepted fact since 1974.

There's little point in repeating Birkeland's experiments now because his key finding is well known, but SAFIRE's real purpose was very different: unlike any of the previous terrella experiments, it was apparently designed to 'prove' one particular model by demonstrating examples of electrical behaviour in plasma and then claiming them as evidence supporting only the EU model.



Since the commissioning of the SAFIRE project the EU have started to claim that they are experimental scientists like those in the Age of Reasonxxx; at one point, Adrian Gilbert's promotion of his EU-UK 2018 conference headlined the EU as 'The New Enlightenment'³³ but once again we have to ask, is this true or is it just marketing spin? I suggest that designing an experiment to 'prove' a particular theory is very different to the ground-breaking research done by the scientists in the Age of Reason and so Gilbert's suggestion that the EU represent a new Enlightenment has no more validity than the suggestion that the EU have inherited Alfvén's PU mantle.

So far we've seen that what's in the EU box isn't what you might expect from their sales pitch. It's not a scientific extension of PU theory: it's a particular model that's been erected on the foundations of PU theory and dressed up in plasma clothes but if you look underneath the window dressing you'll find that it's not what the EU want you to think it is.

More freebies in the EU box

- free association with a group which spends an inordinate amount of time denigrating all mainstream astrophysicists and cosmologists
- incessant misrepresentation of the state-of-the-art in mainstream science
- failure to acknowledge that there is a significant minority of plasma scientists who are using the kinetic/particle approach to analysing space plasmas

Another thing you'll find in the EU box is your free association with a group which spends a lot of time denigrating mainstream astrophysicists and cosmologists, not to mention most scientists in general. This endless stream of criticism is apparently intended to distinguish the EU as the only group of people on the planet who have the slightest idea of what is really going on, especially when it comes to the role of electricity in space. It's not surprising that no-one in the mainstream uses the term 'PU' when it's closely associated in their minds with people who indulge in this form of abuse.

The EU also incessantly misrepresent the state-of-the-art in mainstream science. **As has been observed by others familiar with the EU's methods**, For example, they generally deny that mainstream scientists have any recognition of electrical activity in comets and the rest of outer space, whereas in reality electrical processes are widely recognised.³⁴ On the few occasions when the EU need to acknowledge that astrophysicists have referred to electrical activity then, as we saw above, there is usually a caveat which suggests a lack of complete understanding of the process, i.e. that the scientists concerned don't fully appreciate the role that electricity is playing or where it comes from.

On a similar theme, as I pointed out in my presentation to the SIS last year³⁵, the EU consistently fail to acknowledge that there's a significant minority of plasma scientists who are arguing for the kinetic or particle approach to analysing space plasmas. Sadly they, like the EU, are struggling to make their voice heard against the majority view that there can be no electric fields in space because of plasma's very high conductivity. The 'consensus' scientists still prefer the 'fluid analysis' approach championed by Eugene Parker and others who prefer to analyse plasma behaviour in terms of the magnetic field; this approach is easier because it allows the equations to be solved directly.

The alternative 'kinetic' approach has to rely on computers to carry out the number crunching to produce a solution of the complex equations for each particle separately. The benefit is that the kinetic approach can model currents, double layers and parallel electric fields which are needed to explain plasma behaviour in some situations.

Dualism in cosmic plasmas

- 'Since the beginning of the century physics has been dualistic in the sense that some phenomena are described by a field concept, others by a particle concept. This dualism is essential also in the physics of cosmic plasmas: **some phenomena should be described by a magnetic field formalism, others by an electric current formalism.**'

H. Alfvén, 'Electric Currents in Cosmic Plasmas',
Reviews of Geophysics, 15(3), 1977, pp. 271-284

But you wouldn't know that from listening to the EU !

However, as Alfvén pointed out in 1977³⁶, there are many situations in which the magnetic approach is perfectly adequate:

'Since the beginning of the century physics has been dualistic in the sense that some phenomena are described by a field concept, others by a particle concept. This dualism is essential also in the physics of cosmic plasmas: some phenomena should be described by a magnetic field formalism, others by an electric current formalism'

There is room for both approaches as long as the limits of applicability of the fluid analyses are recognised, as some plasma physicists such as Parks³⁷ have been arguing for many years.

But you wouldn't know that from listening to the EU. One has to wonder why the EU refuse to acknowledge the one group of mainstream scientists they are in at least partial agreement with. Surely they're not trying to reserve the turf exclusively for themselves so that the non-PU aspects of EU theory aren't swept away when the mainstream astrophysicists move in? That really would be a 'dog-in-the-manger' attitude to the progress of science!

As we've seen, you're buying into this whole pattern of behaviour when you subscribe to the EU. It's in the EU box along with the rest of their theories. We can add these to our diagram on the EU side, along with the 'missing' kinetic approach on the PU side.

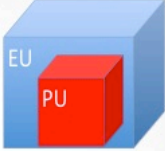
EU - Charge exchange between celestial bodies

- Recent planetary near-collisions with Earth
- Saturn Theory
- Anode Sun model (Electric Sun)

= speculative proposals and visual analogies relying on the PU evidence 'in the EU box'

EU claims:

- "Yes, an electrified heliosphere does mean an Electric Sun"
- Currents in space are due to Potential Differences
- Flux ropes from Sun to planets
- Constant denigration of mainstream scientists



PU - plasma physics in astrophysics

- Plasma Cosmology (Birkeland, Bruce, Alfvén, Peratt)
- Birkeland Currents, plasma filaments in space, double layers, parallel electric fields, etc.
- Birkeland's terrella experiments
- Petroglyphs as historical records of plasma events

= plasma physics

PU science not in the EU box:

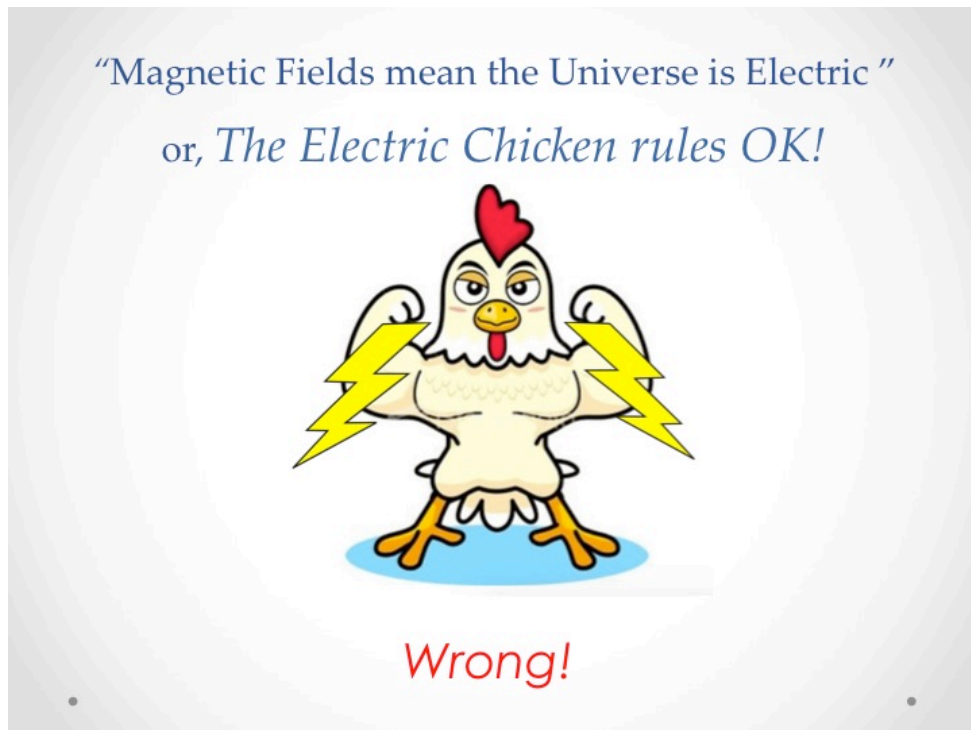
- Alfvén's HCS circuit \neq an Electric Sun
- Kinetic modelling

But now we need to look at what else is missing from the PU box **that really should be there if our initial assumption that the EU includes the whole of the PU is correct.**

You may have noticed that we've only barely mentioned Episode 1 of T10R so far. The title of that episode is '*Galactic magnetic fields*' and it presents another of the EU's central claims that '*Currents generate magnetic fields*'. As we saw above, Episode 2 confirmed the EU view that '*electric currents [are] required to produce and sustain the magnetic fields*'. The EU claim that the fact that magnetic fields are present throughout the cosmos must be direct evidence of currents in space and hence support for their model.

This is incorrect.

I need to spend a bit of time explaining why it's incorrect because it goes to the heart of the whole EU approach: in their view, magnetic fields arise exclusively from electric currents and therefore the magnetic field must be relegated to a supporting role at best. This is diametrically opposite to the majority mainstream view. However, whilst I agree that the consensus view is too skewed towards the role of magnetism at the expense of electric currents, I'm equally convinced that the EU's approach has gone too far the other way by insisting on the primacy of their Electric Chicken over the Magnetic Egg.



It is undeniable (as the EU like to say) that plasma obeys Maxwell's Equations but Maxwell was well aware that electricity and magnetism are two sides of the same coin. In any non-static situation, a changing electric flux is associated with a non-zero magnetic field; likewise, a changing magnetic flux is associated with a non-zero electric field. However, the two situations aren't entirely symmetric because, **as the first of Maxwell's Equations shows**, a magnetic field can also be generated by an electric current. It's apparently this last point that the EU base their claim on.

As we saw above, the EU insist that the electric currents arise because of '*a vast substructure of electric potential*', i.e. Potential Differences (PDs) between different regions of the cosmos. But where do those PDs come from? The EU are silent on this question.

It seems to me that we have a situation analogous to the question of where does the matter in the Universe come from originally? The Big Bang model offers one possible solution involving a massive free lunch out of nowhere; in contrast, the EU suggest that the Universe has always been there.

Well, if so then why couldn't the cosmic magnetic field always have been there as well? Or, if you prefer a more deterministic model, remember that every electron and every proton has its own magnetic moment, i.e. it comes complete with a small magnetic field. Combining a proton and electron into a Hydrogen atom doesn't destroy their fields and so most particles in the Universe still have magnetic fields of their own, whether or not there was a Big Bang Beginning.

/....

It's inconceivable to me that you could have any matter particles in the Universe without having regions of seed magnetic field from all these particles. Simple random distributions of the particle density, their spin directions and their mutual effect on each other would mean that there would inevitably be some regions with a bit more magnetic field and some with less; some regions where the average of all the particles' field directions was pointing one way and others where it was pointing another way, and so on. Just think of the effect a bar magnet has on iron filings, for example, or of the way two bar magnets try to align with each other.

(Note that similar arguments can't be used to justify the EU's presumption of initial weak Potential Differences throughout the cosmos: the EU's all-important Coulomb Force prevents charge separation on any significant scale!)

These principles of magnetic field generation have already been recognised. For example, *'in a Biermann battery' magnetic fields develop 'spontaneously', that is, from initially being zero, when there are non-parallel gradients in electron temperature and density.'*³⁸

Were currents involved in any of this? No, at least not in the form that the EU maintain must be the source of all magnetic fields. OK, one could argue that an electron orbiting a proton in a Hydrogen atom is a current and this process is what makes an iron bar into a magnet, but the field was there first - and there's no PD driving the electron round its orbit!

Without the magnetic fields of the proton and electron, when they recombined to form a Hydrogen atom the electron would have piled straight into the proton due to the Coulomb force between them - that's the electric force which is the most important force in the Universe according to the EU.

Just think about that. Without the magnetic part of the Lorentz Force $q(\mathbf{v} \times \mathbf{B})$ arising from motion of a charged particle across a magnetic field, the formation of the simplest of all atoms would be impossible. The magnetic field is essential.

Magnetism and Currents

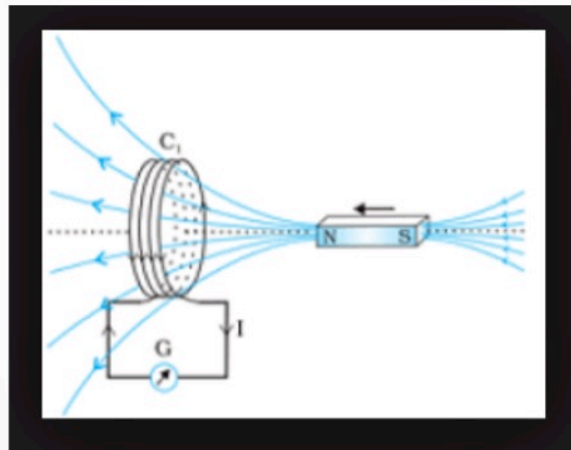
- You can't have an electric current without magnetism, but you can have magnetism without a current.
- Stationary electrons and protons still have magnetic moments !
- Moving the electrons relative to the protons creates a current and this generates *more* magnetic field

But what force moves the electrons?

And so it is in plasma in space. You can't have an electric current without magnetism, but you can have magnetism without a current. An electron still has its magnetic moment even when it's stationary. You get more magnetism if you move it relative to a proton and create a current but there has to be some force to move the electron.

That force may be a PD, which the EU insist is the only possibility **but without explaining where the PD comes from.**

Faraday's Law of Induction



But the PU box has another method of generating motion. It's called an electromotive force (**emf**) and it comes about because of Faraday's Law of Induction; it works like this:

If you change the magnetic flux then you generate a curl³⁹ of the electric field which causes an emf which makes all the electrons in a conductor move. Suppose for example that you have a ring of conducting material through the centre of which there is some magnetic flux from a bar magnet nearby. Now change that flux by moving the magnet closer. This immediately results in a change in the amount of curl of the electric field. This causes an emf and so all the electrons in the conducting ring simultaneously start to move around the ring. Their direction of motion is such as to oppose the change in the magnetic flux by generating new magnetic flux to try to restore the original amount of the field; that's known as Lenz's Law. It's as though the magnetic field has some sort of inertia and resists being changed.

The moving electrons constitute a current around the ring. But notice that there's no PD anywhere! There's only an emf. That's induction at work. And of course plasma is a conductor so you can imagine as many conducting rings as you like in a region of plasma. All the electrons will be affected if the magnetic flux changes, and currents could arise anywhere because of the change of flux. That change may come about if the region of plasma expands or contracts so as to include more external flux through any selected conducting closed path.

But emfs also arise because of the magnetic Lorentz Force $\mathbf{F} = q(\mathbf{v} \times \mathbf{B})$ whenever plasma moves across a background magnetic field without necessarily expanding or contracting.⁴⁰ For example, if there's a region of plasma in interstellar space which is moving across the background galactic field then an emf will be generated in the plasma and Birkeland Currents will appear without a PD in sight. Magic? No, just Faraday's Law of Induction at work, generating currents in a plasma from nothing more than a magnetic field and relative motion.

An electric chicken emerging from a magnetic egg !



The EU's Electric Chicken has just emerged from a Magnetic Egg!

And this brings us to another point: magnetic energy can be stored in plasmas.⁴¹ What's more, as Alfvén recognised⁴² but the EU always deny, it can also be 'frozen in' and carried along by plasma in certain situations depending on the properties of the plasma such as temperature, electron density and the relative strength of the magnetic field permeating it. For example, the Solar Wind carries magnetic field away from the Sun all the time⁴³. **This plays a key role in its interaction with the Earth's magnetosphere, a point we'll come back to later.**

Another good example of magnetic fields being carried by moving plasma is Coronal Mass Ejections, especially the 10% or so of them which form what are classified as 'magnetic clouds'. These are in fact huge plasmoids, i.e. self-contained and highly organised plasma structures.

The term 'plasmoid' was coined by Bostick to describe these plasma structures; he also demonstrated that plasma has a natural ability to interchange magnetic and kinetic energy, **perhaps always tending towards equipartition of the two in any situation**⁴⁴. Whilst electric currents may arise during the process, Bostick's experiments showed that motion across the magnetic field is the primary driver. Likewise, Alfvén showed that currents will arise when a drifting magnetised plasma is able to induce them in a conducting circuit located around the drifting plasma.⁴⁵

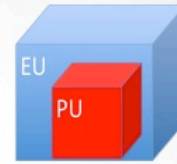
And so once again we see that the magnetic field often plays a much more important role than the EU allows it to do. It really is a chicken-and-egg situation in plasma. But you won't find induction or any other role for magnetism inside the EU box according to the various T10R episodes⁴⁶ or their other publicity. Presumably that's because it would undermine their central claim that electric currents from charged planets, stars and PDs in the cosmos are the most important aspect of the Universe. Whatever the reason, we'll have to update our diagram again.

EU - Charge exchange between celestial bodies

- Recent planetary near-collisions with Earth
 - Saturn Theory
 - Anode Sun model (Electric Sun)
- = speculative proposals and visual analogies relying on the PU evidence 'in the EU box'

EU claims:

- "Yes, an electrified heliosphere does mean an Electric Sun"
- Currents in space are due to Potential Differences
- Flux ropes from Sun to planets
- Constant denigration of mainstream scientists
- Magnetic fields mean the Universe is Electric



PU - plasma physics in astrophysics

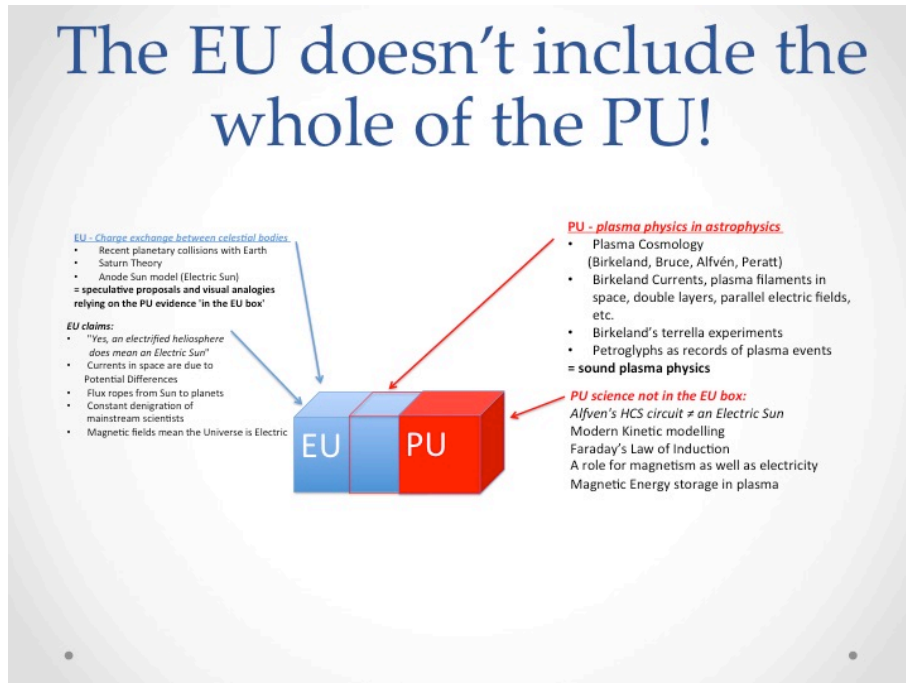
- Plasma Cosmology (Birkeland, Bruce, Alfvén, Peratt)
 - Birkeland Currents, plasma filaments in space, double layers, parallel electric fields, etc.
 - Birkeland's terrella experiments
 - Petroglyphs as historical records of plasma events
- = plasma physics

PU science not in the EU box:

- Alfvén's HCS circuit ≠ an Electric Sun
- Kinetic modelling
- Faraday's Law of Induction
- A role for magnetism & the Lorentz Force
- Magnetic Energy storage in plasma

But we've now reached the point where there's so much of the PU that's excluded from the EU box that we really should re-draw our diagram to show that the EU doesn't include the whole of the PU as we assumed initially.

The EU doesn't include the whole of the PU!



You really aren't getting everything you thought you were buying with the EU special offer!

Our new diagram shows that the EU appears to be an extension of the PU in one particular direction. But is the EU a *valid* extension of the PU? I don't think so.

The EU offers a very specific model which isn't open to development of its central theses in the way that proper science should be.⁴⁷ This cannot represent a valid scientific extension of the PU.

Moving a large part of the PU outside the EU box has another very important consequence: it means that there can be developments of PU theory which are in a different direction to the one promoted by the EU, as we saw earlier with the interpretation of the HCS. And that brings us to another feature of the EU: their dogmatic insistence that their model is the only possible alternative to the mainstream consensus model.

We've already seen how the EU misrepresent the mainstream position as an undivided one supporting a single consensus viewpoint, and deny that there are in fact a number of different views within mainstream science. But the problem goes further than that: the EU also dismiss out of hand all alternative models based on the principles which they themselves adhere to, i.e. plasma phenomena in space which could be related to historical and mythological events.

A good example is what I and Rens van der Sluijs⁴⁸ have separately referred to as 'the Gold scenario' in which extreme solar eruptions have potentially catastrophic effects on Earth because of electromagnetic induction, not because of the EU's hypothesis of a Birkeland Current **between** the Sun and Earth.

The 'Gold' Scenario

Normal situation

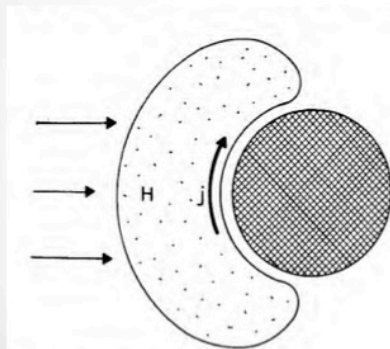


FIG. 1 — Magnetized cloud approaching the earth, showing current above the insulating atmosphere.

Extreme solar wind

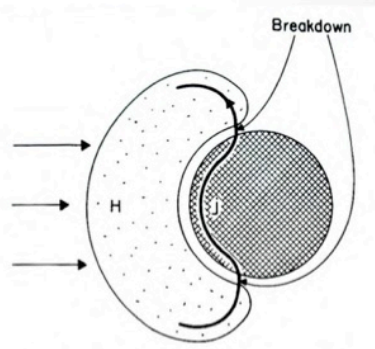


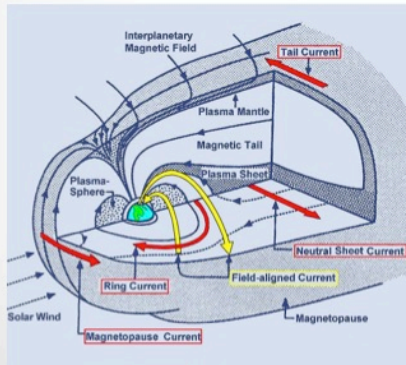
FIG. 2 — Electrical breakdown of the atmosphere that would be caused by a still closer approach. The field will then penetrate into the solid earth.

Credit: T Gold (1963) Pontificiae Academiae Scientiarum Scripta Varia

Peratt referred to Thomas Gold's work in his first paper on petroglyphs and the z-pinch.⁴⁹ Gold⁵⁰ had described how an extreme increase in the solar wind speed would compress the Earth's magnetosphere down to the point where the induced currents in the magnetopause would short out down to the surface of the Earth instead of closing through the upper atmosphere. Peratt argued that this could have caused the plasma discharges seen by the Ancients.

The Gold scenario is an extreme example of the well-known if not completely understood phenomenon of Solar Wind – Magnetosphere Coupling (SWMC) that I examined in detail in my paper on tectonic uplift⁵¹. In that paper, I showed that there is more than enough energy in a huge Coronal Mass Ejection to have caused the raising of the Andes even if only a fraction of that energy was delivered to the surface of the Earth by Gold's mechanism.

SWMC or Peratt's Birkeland Current?



• Magnetospheric current system

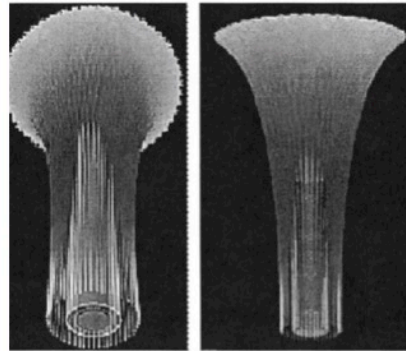


Fig. 4. Depiction of an intense auroral funnel.
Cr. Peratt 2003

Unfortunately, in his later 'petroglyph' papers Peratt moved away from his initial exploration of Gold's work and developed an EU-specific alternative explanation in the form of a massive plasma column of Birkeland Current located above the Earth's south pole; the inductive aspects of the SWMC mechanism were lost in the process. However, Van der Sluijs and I showed conclusively in 2013⁵² that Peratt's polar column cannot explain the worldwide evidence of petroglyphs as he had claimed; apparently, the value of Peratt's early insights had been compromised by his later attempt to force-fit the observations into the EU's model of BCs and the Saturn configuration.

Was Venus a comet ...?

- Velikovsky and the EU insist that Venus **was** a comet
- Velikovsky claimed that the Pañchasiddhântikâ supported this theory
- I showed that it didn't !
- Varro quoted in Augustine: Venus' orbit was altered
- ... but then it soon resumed its original orbit !

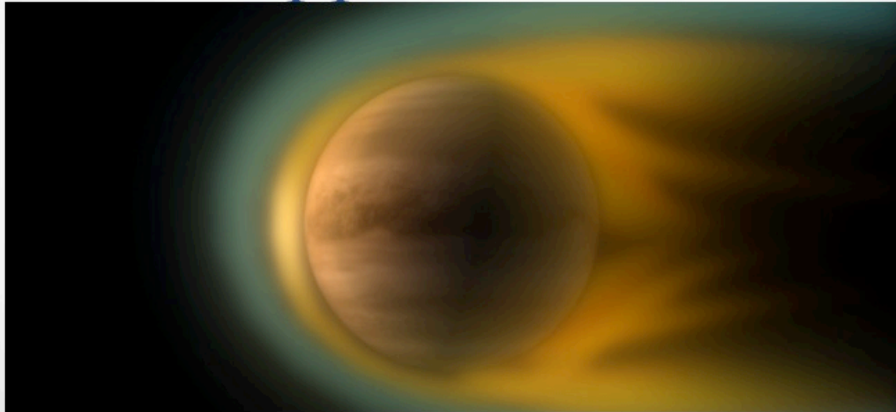
Another example of alternative models is the question of whether Venus was ever a comet. To the EU, this Velikovskian suggestion remains at the very heart of EU theory, along with the claim that Venus still carries a significant proportion of its supposedly original potential difference from the time that it was in a very different orbit. In 'Worlds in Collision'⁵³ Velikovsky based his claim that Venus had been a comet on both the mythological evidence and also on his interpretation of the anomalous numerical data contained in the ancient Hindu astronomical text known as the Pañchasiddhântikâ.

Velikovsky claimed that these ancient records of observations of the synodic periods of the planets showed that both Venus and Mars must have been on very different orbits to those they occupy at present. However, as I showed in a presentation to the SIS in 2017⁵⁴, the anomalous data in the Pañchasiddhântikâ is consistent for all five planets recorded, i.e. Mercury, Venus, Mars, Jupiter and Saturn, and it implies orbital periods for the five planets and Earth itself of only 98.5% of their present-day values. Whilst this requires an explanation⁵⁵ Velikovsky was incorrect to claim this ancient data showed that only Venus and Mars must have had orbits very different to their present ones, and to use this as strong support for his theory of near collisions between Mars, Venus and Earth in the recent past.

Similarly, both Velikovsky and the EU after him latch onto ancient reports in Augustine's writings of alterations to Venus' orbital motions; they take this as direct evidence that Venus was originally a comet which was captured by the Sun and became a planet with a near-circular orbit. However, as Rens [van der Sluijs](#) has pointed out⁵⁶, Augustine also stated that Venus soon resumed its original orbit, a fact which rules out Venus having previously been a comet.

Moreover, Rens [van der Sluijs](#) has shown in a number of articles⁵⁷ that the mythological data can be interpreted very differently: all the descriptions of Venus having had cometary characteristics, which the EU take to be evidence that Venus *was* a comet, may instead be seen simply as a description of Venus appearing *comet-like* whilst remaining in or close to its usual orbit. For example, Venus could have been seen with a tail similar to a real comet's one.

Was Venus a comet ... or just comet-like in appearance?



CR. ESA <http://www.esa.int/spaceinimages/Images/2007/11/>

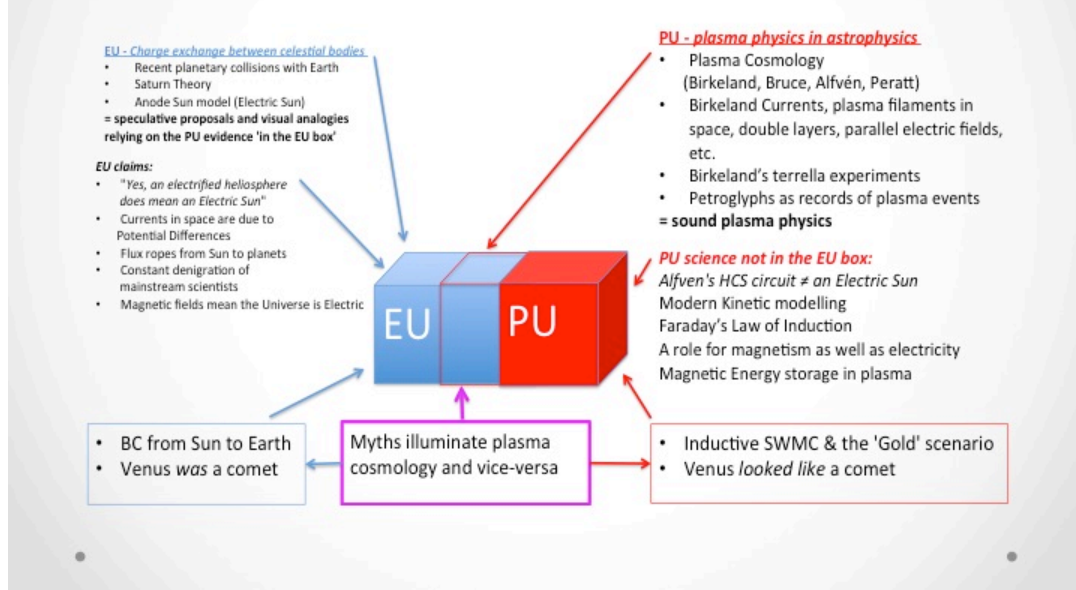
In fact modern observations have shown that Venus does have a comet-like tail although it is not visible to the naked eye⁵⁸. As the solar wind sweeps around Venus it forms an elongated magnetotail which has been found to stretch as far as Earth's orbit and also shows a remarkably 'comet-like' concentration of solar wind on both edges of the magnetotail.

As Rens *van der Sluijs* has suggested, it's possible that the solar wind flow past planet Venus increased during a period of extreme solar activity to the point where its normal magnetotail became visible to ancient peoples. So It's not a logical deduction to conclude, *as the EU theorists do*, that observations of Venus appearing *like* a comet must have meant that it *was* a comet on a different orbit.

The above examples are two of many possible ones which could have been chosen to illustrate the point that there are alternative explanations of historical and mythological records in terms of plasma phenomena; what's more, unlike the EU model, they don't require the misrepresentation or omission of parts of the evidence. But they aren't considered by the EU because they don't conform to their particular pre-conceived ideas.

We can include these different interpretations on our new diagram of the EU and PU boxes to show the different branches from the common principle that myths can illuminate plasma cosmology and *vice-versa*.

Alternative interpretations from a common principle



[FIG 6. ALTERNATIVE INTERPRETATIONS FROM A COMMON PRINCIPLE]

It's a great pity that the EU has become so dogmatic; it seems as though the EU principals have invested so much time and effort into promoting one particular model that they cannot accept any significant changes to it at this point. The irony, of course, is that resistance to change is one of the things that the EU regularly criticise mainstream scientists about. It's another example of the pot calling the kettle black.

Standards of behaviour?

- *'Failure to see contradictory evidence is not elegant'*

[Thunderbolts Project newsletter, 19 August 2018]

- *'Openness and critical scientific judgment must be partners'*

[Space News, 13 August 2018]

Similarly, the EU often try to claim the moral high ground by suggesting that the mainstream scientists aren't practicing science in the proper manner. Two recent examples will serve to represent many others. The Thunderbolts Project newsletter of 19 August 2018 states that *'Failure to see contradictory evidence is not elegant'*. Also, their Space News of 13 August states *'Openness and critical scientific judgment must be partners'*. What's breath-taking is the hypocrisy of these statements: the EU are themselves guilty of failure to see contradictory evidence, they are certainly not open to alternative ideas and they don't demonstrate critical scientific judgement, and yet they openly imply that these are the principles that should be adhered to. But perhaps all that matters to them is attracting an audience?

A 13-part series on Gaia TV?

'Shows ... cover several pseudoscientific topics such as psychic vampires, hollow earth theory, and mummified aliens.'

[Wikipedia, accessed 17.9.18]

A perfect fit with the EU!

Talking of which, the EU announced on September 16th that they are developing a 13-part series with Gaia TV; they're confident that this *'will draw substantial new audiences to the EU movement in the coming year.'* So, are Gaia TV interested in the physics or just the audience numbers? According to Wikipedia, Gaia TV is

'a subscription and streaming service for videos on yoga, fitness, personal growth, spirituality, and pseudoscience. Shows ... cover several pseudoscientific topics such as psychic vampires, hollow earth theory, and mummified aliens. This content has been criticised as misleading or falsified.'

It's a perfect fit with the EU! But it might backfire. How could anyone take their hypotheses seriously after this?

EU ≠ PU but why does it matter?

- The EU are actually holding back progress of acceptance of the role of plasma physics and kinetic modelling in astrophysics
- They're tarring the legacy of the founders of PU theory with the EU brush
- The EU are also stifling development of alternative catastrophic models of plasma behaviour linking myth to plasma cosmology

So why does all this matter? Surely the EU deserve credit, not criticism, for advancing astrophysics by bringing the electrical behaviour of plasma in space to everyone's attention? Well, no – I disagree.

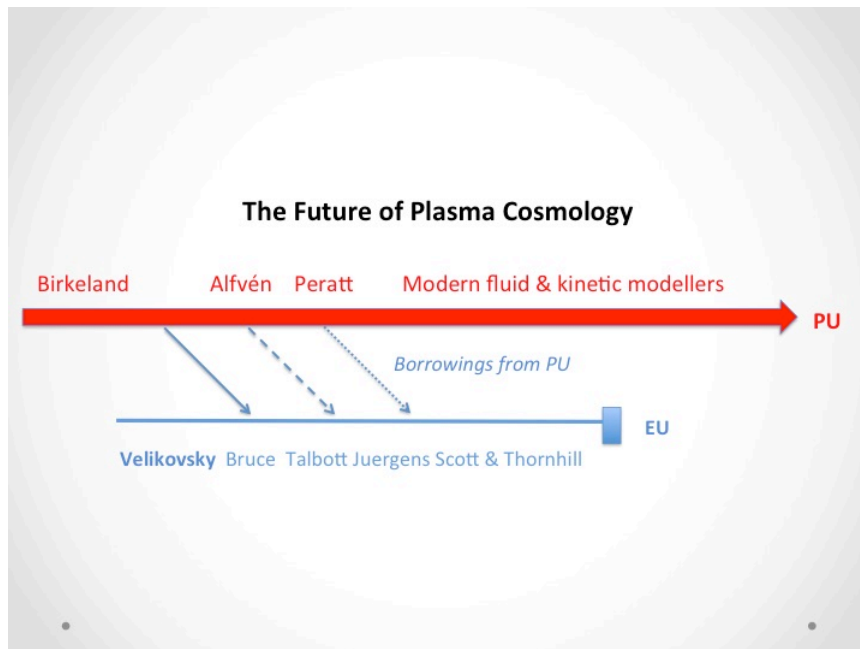
The problem is, as we've seen, that the EU are not practicing the scientific method; instead they're promoting their own particular theories for their own ends. In doing so, and by constantly denigrating all astrophysicists and cosmologists, they are making it nearly impossible for anyone in the mainstream to incorporate **plasma physics, and especially** kinetic modelling of currents, double layers and the like, into astrophysics because of fear of ridicule on the grounds that they are siding with pseudo-scientists.

So instead of 'furthering the science of astrophysics' in a 'New Enlightenment', as Gilbert suggested, the EU are actually holding back progress in the one area in which they say they would like to see progress being made.

The long-term effect of the EU's constant publicity⁵⁹ **for their highly idiosyncratic interpretation of plasma effects** is *not* going to be to demonstrate that they are the inheritors of the plasma mantle of Birkeland, Alfvén, and Peratt as they like to claim, but instead to tar the legacy of those founders of PU theory with the EU brush.

The EU are also stifling development of alternative catastrophic models of plasma behaviour linking myth to plasma cosmology. Researchers including Velikovsky, Peratt and even the EU themselves deserve credit for exploring the link between myths and electrical or plasma events in space but the EU are wrong to claim that their model is the only possible explanation.

The principle of myths illuminating plasma cosmology and *vice versa* is one which is shared between the EU and PU but the developments from that principle lead in very different directions. There are viable alternatives based on known plasma behaviour rather than on colliding charged planets, hand-waving speculations about what plasma might be capable of⁶⁰, and misinterpretations of the actual evidence. I suggest that these alternatives are much more likely to lead to a real breakthrough in understanding, both of how the Universe really works and of how plasma events might have been experienced by humankind as recently as twelve thousand years ago.



The EU approach is beginning to look very much like a dead end which leads nowhere because it's strictly limited by their dogmatic insistence on one particular model. But the good news is that when it's recognised that PU theory is not constrained by being contained entirely within the EU box then Plasma Cosmology can continue to develop independently of the EU side branch.

There are important ramifications in other areas of science too. For example, the present climate change debate pits those who argue that the change is due to anthropological factors, especially CO₂ emissions, against those who argue that natural factors are the main driver. The former are, in essence, still assuming that space is a vacuum and the only thing that can cross it is radiation. Anyone familiar with the concept of 'Space Weather' will know that this is incorrect; the question is, just how much influence can the Sun have on Earth's climate via the ubiquitous plasma?

This question is hotly debated and I have written elsewhere⁶¹ showing how the Solar Wind – Magnetosphere Coupling mechanism links the magnetosphere to the ionosphere and how the previously well-known but now largely forgotten Global Electric Circuit links the ionosphere to the surface via the climate regions of the Earth's atmosphere. This mechanism for direct solar influence on the climate relies on induction, not on some fanciful Birkeland Current connecting the Sun directly to the Earth as the EU claim, but scientifically-based proposals of plasma-based effects are unlikely to gain much traction if the PU is associated with the EU in the minds of the decision-makers and the scientists who advise them.

So it *does* matter that we keep in mind the differences between the EU and the PU, and that we remember that there are alternative explanations for all the genuine evidence of plasma behaviour which the EU erroneously claim proves that their model must be correct.

R J Johnson August 2018

Notes and References

- ¹ A. L. Peratt, *Physics of the plasma universe*. New York: Springer-Verlag, 1992. 2nd. Edn. Springer, N.Y., 2015. DOI 10.1007/978-1-4614-7819-5
- ² This paper uses the term ‘EU’ both for the model and for the group which promotes it; the meaning will always be clear from the context.
- ³ YouTube video series ‘Top 10 Reasons why the Universe is Electric’ (henceforth T10R); playlist at <https://www.youtube.com/playlist?list=PLwOAYhBuU3Uez8f1P6ZyYdi90Egln3rX5> Retrieved 15.7.18. (There are only 8 episodes available at the time of writing.)
- ⁴ T10R, 6, 19:20 (Note: this and the following references to the T10R episodes adopt the format ‘T10R, <Episode no.>, <time>’).
- ⁵ W. Thornhill’s ‘Holoscience’ website, the ELECTRIC UNIVERSE® Synopsis 3, <http://www.holoscience.com/wp/sample-page/> & ff, accessed 26.8.18
- ⁶ W. Thornhill’s ‘Holoscience’ website, the ELECTRIC UNIVERSE® Synopsis 2, accessed 26.8.18
- ⁷ This paper is not going to cover the wider claims of the EU’s ‘Big Picture’ which fall under the definition of Cosmology as Natural History, such as Thornhill’s Electric Gravity model, his Hollow Earth theory, and the role of electricity in EU geology etc.; instead this paper is limited to the narrower definition of plasma cosmology in space. I hope to cover the other matters in a subsequent paper.
- ⁸ A. L. Peratt. ‘Birkeland and the Electromagnetic Cosmology’, *Sky & Telescope*, May 1985
- ⁹ A. L. Peratt, 1985. *Op. Cit.* [8]
- ¹⁰ (1) A. L. Peratt, ‘Characteristics for the Occurrence of a High-Current, Z-Pinch Aurora as Recorded in Antiquity’. *IEEE Transactions on Plasma Science*, 31(6), 2003, pp. 1192-1214. (2) A. L. Peratt, J. McGovern, A. H. Qöyawayma, M. A. van der Sluijs & M. G. Peratt, ‘Characteristics for the occurrence of a high-current Z-pinch Aurora as recorded in antiquity, Part II: Directionality and source.’ *IEEE Transactions on Plasma Science*, 35(4), 2007, pp. 778–807. (3) A. L. Peratt & W. F. Yao, ‘Evidence for an intense solar outburst in prehistory.’ *Physica Scripta*, 131, 2008, pp. 1–13.
- ¹¹ See e.g. the Introduction to the 2nd. edition of Peratt, 2015 *Op. Cit.*[1]
- ¹² D. Talbott, Intersect email forum, 20.10.17, emphasis added
- ¹³ R. E. Juergens, ‘Plasma in Interplanetary Space: Reconciling Celestial Mechanics and Velikovskian Catastrophism,’ *Pensée IVR II* (Fall 1972), pp. 6-12. *Velikovsky Reconsidered*, Doubleday & Co., N. Y., 1976, pp. 137-155. First presented at the Lewis & Clark Symposium, Portland, OR, August 15-17, 1972.
- ¹⁴ R. E. Juergens, *Ed. E. R. Milton*, ‘Electric discharge as the source of solar radiant energy’, *Kronos* Vol VIII(1), Fall 1982, p. 6
- ¹⁵ R. J. Johnson, ‘The Nature of the Sun Reconsidered’. Presentation at the Electric Universe Conference, Albuquerque, NM, January 2013. Video: <https://www.youtube.com/watch?v=JWpPetp150U>
- ¹⁶ R. J. Johnson, ‘The Nature of the Sun Reconsidered’ Updated version: Presentation at the Society for Interdisciplinary Studies autumn meeting, October 2014. Video: <https://archive.org/details/BJ251014>
- ¹⁷ R. J. Johnson, ‘The source of the Sun's electrical activity’. Presentation at the Society for Interdisciplinary Studies autumn meeting, October 2017. Video: <https://www.youtube.com/watch?v=ehgJY06sbwU&feature=youtu.be>
- ¹⁸ W. Thornhill & D. Talbott, ‘*The Electric Universe*’, Mikamar Publishing, 2002, 2007
- ¹⁹ Note that the EU’s interpretation is a complete reversal of the Parkerite mainstream position in which currents in space are held to be impossible and magnetic fields are the primary factor. This will be discussed in more detail below.
- ²⁰ M. Armstrong to Intersect email forum 17.9.17 commenting on an article on Vice.com titled ‘The People Who Believe Electricity Rules the Universe’
- ²¹ R. J. Johnson, ‘Acceleration of the Solar Wind - a new model for the generation of the necessary suprathermal electrons in the solar Transition Region’. *Chronology & Catastrophism Review* 2016:3, pp. 2-11
- ²² see note [46] below
- ²³ T10R, 6, 19:20
- ²⁴ R. J. Johnson, 2013. *Op. cit.* [15]

- ²⁵ ‘Magnetic Rope observed for the first time between Saturn and the Sun.’ *UCL Mathematical & Physical Sciences News Report*, 6 July 2016. <https://www.ucl.ac.uk/mathematical-physical-sciences/news/2016/jul/magnetic-rope-observed-first-time-between-saturn-and-sun> Retrieved 18.7.18
- ²⁶ R. J. Johnson, 2014. ‘Massive Solar Eruptions and their Contribution to the Causes of Tectonic Uplift’. *New Concepts in Global Tectonics Journal* 2(1), March 2014, pp. 16-36
- ²⁷ J. M. Jasinski *et al.*, ‘Flux transfer event observation at Saturn’s dayside magnetopause by the Cassini spacecraft’. *Geophysical Research Letters*, 43(13), 2016, pp. 6713-6723.
- ²⁸ R. J. Johnson, ‘The Electric Sun and Claimed Anomalies of the Standard Solar Model Reviewed; the Plasmoid Sun Model Revisited’. *Chronology & Catastrophism Review* 2018:1, pp. 3-19
- ²⁹ Thornhill & Talbot 2002, 2007. *Op. Cit.* [18]
- ³⁰ The Electric Sun model is based on Juergens’ Anode Sun model of an externally-powered Sun but the EU have now abandoned Juergens’ 10 billion Volt Sun model in favour of a ‘Hybrid’ model in which the Sun is partially driven by un-quantified amounts of incoming current which in turn are supposed to drive fusion on the surface of the Sun. The Electric Sun model retains Juergens’ key concept of an Anode Sun wherein granulation of the photosphere is supposed to be indicative of the behavior of an anode in an electrical circuit. I showed that this concept was flawed in 2017, *Op. Cit.* [17]; the electric discharge activity seen in the solar spectra is coming from coronal loops and chromospheric flares, not from the photosphere. Alfvén’s HCS circuit is correct; Juergens’ and the EU’s model of the current entering and leaving the photosphere is contradicted by the real evidence.
- ³¹ Quinn & Chang, 1966, Quinn & Fiorito, 1967 and Schmidt & Quinn, 1971
- ³² See e.g. M. E. Koepke, ‘Interrelated Laboratory And Space Plasma Experiments’, *Reviews of geophysics*, 46(3), 2008, p. 10 for a partial list of previous terrella experiments between 1906 and 2004.
- ³³ A. Gilbert, facebook page announcement of EUUK 2018 conference in Bath, 23 Dec 2017; I thank AG for correcting my inadvertent reference to the Renaissance instead of the Age of Reason when discussing this during my talk.
- ³⁴ M. A. van der Sluijs, personal communication, 13.7.18
- ³⁵ R. J. Johnson, 2017. *Op. Cit.* [17]
- ³⁶ ‘*Since the beginning of the century physics has been dualistic in the sense that some phenomena are described by a field concept, others by a particle concept. This dualism is essential also in the physics of cosmic plasmas: some phenomena should be described by a magnetic field formalism, others by an electric current formalism.*’ H. Alfvén, ‘Electric Currents in Cosmic Plasmas’, *Reviews of Geophysics*, 15(3), 1977, pp. 271-284
- ³⁷ G. K. Parks, ‘Why Space Physics Needs to Go Beyond the MHD Box’, *Space Science Reviews*, 113(1-2), 2004, pp. 97-121.
- ³⁸ R. Beck, 2007. Scholarpedia, 2(8):2411. doi:10.4249/scholarpedia.2411 revision #183531
- ³⁹ ‘Curl’ is a measure of the amount and direction of rotation in a vector field such as the electric field or the magnetic field. It may be helpful to think of the effect of changing the magnetic flux as creating a vortex of electric field.
- ⁴⁰ A. L. Peratt, ‘The Evidence For Electrical Currents in Cosmic Plasma’, *IEEE Transactions on Plasma Science*, 18(1), 1990, pp. 26-32.
- ⁴¹ See e.g. A. L. Peratt 2015. *Op. Cit.* [1] §3.7 Storage of Magnetic Energy
- ⁴² H. Alfvén, ‘On the theory of comet tails’. *Tellus*, 9(1), 1957, pp. 92-96.
- ⁴³ See e.g. G. G. Howes, ‘A prospectus on kinetic heliophysics’. *Physics of plasmas*, 24(5), 2017, p. 055907. ‘*Carrying along with it an embedded magnetic field, [the] solar wind varies dramatically in response to conditions at the Sun, and is strongly disturbed during periods of violent activity on the Sun’s surface.*’
- ⁴⁴ See e.g. R. J. Johnson & M. A. van der Sluijs, ‘A Note on Plasmoids on the 100th Anniversary of the Birth of Winston H. Bostick’, *Chronology & Catastrophism Review* 2016:2, pp. 43-46, for an introduction to Bostick’s plasmoids
- ⁴⁵ H. Alfvén, ‘*Cosmic Plasma*’ Ch. 3, p. 45, fig. III.1(a, b) and accompanying text). *Astrophysics and Space Science Library*, v. 42. D. Riedel, Dordrecht, 1981. ISBN 90-277-1151-8.
- ⁴⁶ The brief mention in T10R episode 7 cited above of auroral and similar phenomena being ‘induced’ by Birkeland Currents is misleading. The EU maintain that it’s the supposed Birkeland Current from the Sun which is directly driving the aurora; Scott’s papers on his BC model make this very clear. According to the T10R YouTube series, currents in the EU model are driven by PDs between the Sun and Earth, not by Faraday’s induction. Likewise, the EU’s Birkeland Currents in space are driven by unspecified PDs, not induction.

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- ⁴⁷ Admittedly, some areas of consensus-driven mainstream science aren't either, a point the EU makes loudly and often, but when you look carefully the EU are just a bad in this respect. It's another example of the pot calling the kettle black!
- ⁴⁸ M. A. van der Sluijs, 'A Geomagnetic Approach to Traditions of *Axes Mundi*', Parts I – III, *Chronology & Catastrophism Review*, 2016:2, 2016:3 & 2017:1
- ⁴⁹ A. L. Peratt, 2003. *Op. Cit.* [10.1]
- ⁵⁰ T. Gold, 'Large solar outbursts in the past'. *Pontificiae Academiae Scientiarum Scripta Varia* 25, 1962.
- ⁵¹ R. J. Johnson, 2014. *Op. Cit.* [26]
- ⁵² M. A. van der Sluijs & R. J. Johnson, 'Geometry of an Intense Auroral Column As Recorded in Rock Art'. *Journal of Scientific Exploration* 27.2, 2013, pp. 227-246. Available online: <https://www.scientificexploration.org/journal/volume-27-number-2-2013>
- ⁵³ I. Velikovsky, *Worlds in collision*. Paradigma Ltd., 1952.
- ⁵⁴ R. J. Johnson, 'The anomalous planetary periods in the *Pañchasiddhāntikā* revisited.' Presentation at the Society for Interdisciplinary Studies spring meeting, April 2017. Video: <https://www.youtube.com/watch?v=0hw109OsKtk>
- ⁵⁵ As I explained in my presentation, the options are either that the data is incorrect or the Earth's spin rate was different or the solar system was ~1% smaller; this last option opens up intriguing possibilities relating to the application of the Titius-Bode Law.
- ⁵⁶ M. A. van der Sluijs, 'Thereby Hangs a Tail'. *Thunderbolts Project TPOD* 17.12.14 <https://www.thunderbolts.info/wp/2014/12/17/thereby-hangs-a-tail/>
- ⁵⁷ M. A. van der Sluijs, (1) *Op. Cit.* [56]; (2) 'Venus' Tail of the Unexpected', *TPOD* 20.02.08 <http://www.thunderbolts.info/tpod/2008/arch08/080220venustail.htm> ; (3) 'Velikovskian Chaff and Wheat: Venus', *TPOD* 27.3.09 <http://thunderbolts.info/tpod/2009/arch09/090327chaff.htm> ; (4) 'Multiple Morning Stars in Oral Cosmological Traditions', *Numen; International Review for the History of Religions*, 56, 2009, pp. 459-476, note 21 on pp. 473-474
- ⁵⁸ See e.g. the 2007 ESA image '*Interaction between Venus and the solar wind.jpg*' http://www.esa.int/spaceinimages/Images/2007/11/Interaction_between_Venus_and_the_solar_wind2
- ⁵⁹ See the remarks by Talbott quoted in the discussion of T10R episode 2 above for an indication of how relentless this publicity has become.
- ⁶⁰ E.g. Thornhill's response to queries I raised in 'The Electric Sun Reconsidered' *Op. Cit.* [15] regarding the EU's claimed constant electric field in the 3-dimensional heliosphere was that "*plasma could behave in ways we don't yet understand and generate a constant electric field in other ways.*" Thornhill, personal communication, 27 July 2014, Toronto, noted previously in *Op. Cit.* [16]
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