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Plasma Astronomy: A Different View - Part 2

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Introduction

Among people interested in the Bible and the origin of the universe, several questions can arise. One, that of the apparent great age of stars, has been dealt with in several previous articles.^{1,2,3} This article deals with another question that can arise in the cosmology arena: the validity of *plasma astronomy* and *plasma cosmology*. The relevance of this question is in part due to its providing solutions to several problems in conventional astronomy and cosmology, its potential validity in future research, as well as its being a component of the cosmology model of Setterfield.⁴

First, briefly I will explain what plasma astronomy is. Plasma astronomy refers to the incorporation of plasma and electromagnetic concepts in astronomy. Plasma itself is a collection of electrically charged particles, so electromagnetism is implicit with plasma. As pointed out in the previous article of this series, astrophysicists have not been trained in plasma concepts, so it is not surprising that conventional astronomy has not applied plasma/electromagnetism in astronomy as much as some plasma scientists think should have been done.

Why does this matter? As with arguments against a faster speed of light in the past, there have also been arguments against plasma astronomy. These arguments are largely not valid. (In this article we shall examine some of them and see why they are not valid.) However, readers of those arguments against plasma astronomy might come to

reject valid, useful science. One example of a useful scientific model, not the only one, is the cosmology of Setterfield, which incorporates some concepts of plasma astronomy. Setterfield's cosmology model solves many problems, including the famous starlight and time problem, as well as providing a mechanism for speedup of nuclear decay. Both these have been major problems for many young earth creationists. Therefore, it seems helpful to point out the problems with the arguments against plasma astronomy, so we might not reject such useful scientific models for invalid reasons.

Arguments against plasma astronomy appear in various places, including an article described as a review of plasma astronomy by Danny Faulkner, published in the *Answers Research Journal*.⁵ Faulkner's review was based largely on a single book:

In many respects my review of plasma astronomy will amount to a review of Scott's book.⁵

The relevant book, on which Faulkner's review was based, is *The Electric Sky*, by Donald E. Scott.⁶ Scott is professor emeritus of electrical engineering at the University of Massachusetts, Amherst and author of a college electrical engineering textbook. He has spoken for NASA at the Goddard Space Flight Center as an invited speaker for the Engineering Colloquia Series on the topic of plasma astronomy.⁷

¹ Spears J (2022 Aug) Faster than light - part 2. <https://tasc-creationscience.org/article/faster-light-part-2> Accessed 2023 Jan 04

² Spears J (2021 Mar) Does changing speed of light violate energy conservation? <https://tasc-creationscience.org/article/does-changing-speed-light-violate-energy-conservation> Accessed 2023 Jan 04

³ Spears J (2022 May) Faster than light. <https://tasc-creationscience.org/article/faster-light-0> Accessed 2023 Jan 04

⁴ For more information on Setterfield's cosmology, see Spears J (2022 Nov) Plasma astronomy: A different

view. <https://tasc-creationscience.org/article-topics/setterfield> Accessed 2023 Jan 26

⁵ Faulkner DR (2013) An evaluation of plasma astronomy. *Answers Res. J.* 6:303–320. <https://assets.answersingenesis.org/doc/articles/pdf-versions/arj/v6/evaluation-plasma-astronomy.pdf> Accessed 2023 Jan 17

⁶ Scott DE (2006) *The Electric Sky: A Challenge to the Myths of Modern Astronomy*, Mikamar, Portland

⁷ Scott DE (2009 Mar 16) Plasma physics' answer to new cosmological questions. <https://www.youtube.com/watch?v=oUDzd5GJ-6E>

Having read the Faulkner review and also having read the book on which the review was largely based, I come to a different, more positive, view about plasma astronomy. In this article, I focus on claims from the Faulkner review that the effects of electricity in space are negligible. I provide evidence that electrical effects and phenomena in space are, rather than negligible, significant.

Theological note: there may be mention below of processes that form galaxies and/or stars. One potential question or argument regarding the plasma astronomy model regarding formation of stars and galaxies is that the creation of God is replaced with natural processes, thus “doing away with” miracles and with God’s creation. However, God’s use of natural processes does not mean that God was not the creator. God used the wind in the Red Sea-crossing according to the Bible, so we cannot rule out God’s using natural processes if He so chooses! Also, in the Setterfield cosmological model, these processes would have been sped up to such a degree that, according to physics-based calculations, light would have appeared on Day 1, the sun would have appeared on Day 4, and light would have been sped up such that the entire universe could be less than 10,000 years old. All these results of natural processes would not seem to replace claims of the Bible. The natural processes described in this article, such as formation of stars, therefore differ from theistic evolution, for example, which does replace the creation of at least some animal and plant life only a few thousand years ago with gradual evolution spanning millions of years.

Charge Cancellation in Space?

One common idea about space, which is recently being shown more and more to be questionable as more data comes in, is that stars have no electrical charge. This idea was mentioned in the Faulkner review:

Stars don’t appear to have net charge.⁵

But the *solar wind* is flowing. The solar wind is the electric current powering the aurora borealis or Northern Lights on Earth. This solar wind consists of electrically charged particles and, thus, is an electric current by definition. Electric currents mean electric charges. Even if the electric currents are produced by magnetic fields, the electric currents produced by the magnetic fields would still move charges (per the definition of electric current). This would result in changing the net electric charge of regions of space.

There is significant observational evidence of electric currents in space, *thousands of light years in length* (see the Cosmic Electric Currents section below).

The assertion of no electric currents means no magnetic fields. But astronomers have admitted magnetic fields in space. So electric currents must be there too, and electric

currents *require charge difference*. Magnetic fields produce electric currents, which require multiple electrically charged regions of different charges!

The Faulkner review also questions plasma astronomy on the claimed basis that in most cases the charges cancel out.

This ostensible “cancelling out” is contradicted by the fact that over 99 percent of the visible matter of the universe is *not* common matter of everyday experience in which electric charges do cancel out, but is plasma, in which electric charges do *not* cancel out. *By definition*, plasma consists of charged (*not* electrically neutral) particles. If and when charges cancel out in a body or particle, that particle or body’s electrical charge is neutral. Therefore, in plasma, the plasma particle’s internal electric charges *do not cancel out*. And, on an even larger scale than that of individual particles, plasmas also contain entire regions of charge difference in which the charge of the various regions has *not* cancelled out.

Another misconception regarding galaxies, resulting from assuming stars have no charge, is dealt with below.

Galaxy Formation

The Faulkner review states, in the section on galaxies, that (emphasis added):

Second, spiral structure of galaxies includes *many stars that don’t appear to be charged*, so it is difficult to conceive *how electromagnetic forces can move stars*.⁵

Both points asserted in the above quotation (regarding charge of stars and motion of stars by electromagnetic forces) will be considered below.

Error regarding charge of stars

The above quote from the Faulkner review assumes that stars have no charge. As pointed out above, the solar wind is the result of a star (the sun) that has a charge—the solar wind being an electric current, which by definition is charges in motion.

Error regarding movement of stars

The Faulkner review states that “it is difficult to conceive how electromagnetic forces can move stars.” Movement of stars by electromagnetic forces is not a problem; it is less of a problem than movement by gravity, in fact. Per plasma astronomy, the spiral structure of galaxies results from electromagnetic plasma phenomena and forces.

Stars are not initially moved to their positions by plasma (electromagnetic) forces! Instead, they are *formed in place* by those forces according to Setterfield.

During this formation process, the individual particles being accreted are not electrically neutral and do have an electrical charge. The individual particles therefore can be and are moved into place (accreted) by electromagnetic

forces. The final result, the star, is not the same as these formative ions per plasma astronomy, any more than the dust or gas particles that are hypothesized in some cosmological models is the same thing as the star that is supposedly formed from the dust or gas.

Also, what forces actually do move stars per conventional astronomy? Gravitation is the obvious answer. For example, dark matter is invoked to explain the motion of galaxies as being driven by gravitation. We ought to note here that gravity is literally trillions of trillions of times *weaker* than the electromagnetic forces of plasma astronomy. So, if gravity can move stars in galaxies, how much more can electromagnetic forces move stars! To put it another way, plasma astronomy's forces are literally trillions of trillions of times stronger than the mainstay of conventional astronomy that moves stars and galaxies, i.e., gravitation.

So, after stars form, they can indeed be affected by plasma electromagnetic forces. In fact, the mystery of galactic rotation curves is solved by those plasma electromagnetic forces, with no need of extra gravitation provided by invoking mysterious dark matter; this was covered in part 1 of this series.⁴

A complex process

The process of formation of a galaxy is not as simplistic as the Faulkner review seems to imply. Galaxy formation per plasma cosmology involves Marklund convection, the Bennett pinch (also known as Z-pinch), and Birkeland currents.⁸ The distinction between the complexity of processes of the plasma model and the simplistic view apparently assumed in the review is large.

We here ought to note that electromagnetic forces are quite complex compared to the gravitational forces of conventional astronomy; gravity attracts only, while electric charges both attract and repel, and magnetic forces are also capable of both attraction and repulsion. To add to the complexity, electric and magnetic forces and fields interact in various ways. Some of this complexity was only first published in 2015 when Donald E. Scott, building on the work of the Nobelist Hannes Alfvén, derived a mathematical model for electric currents and their interactions with electromagnetic fields in space,

⁸ There is not space to go into all of these mechanisms in detail, but more information can be found in these sources: <https://www.plasma-universe.com/Marklund-convection/>, <https://en.wikipedia.org/wiki/Z-pinch>, <https://www.plasma-universe.com/birkeland-current/> Accessed 2023 Jan 26

⁹ Scott DE (2015) Birkeland currents: A force-free field-aligned model. *Prog. Physics* 11(2): 167–179. <http://fs.unm.edu/PIP-2015-02.pdf> Accessed 2023 Jan 17

utilizing Maxwell's equations, vector calculus, and Bessel functions.⁹

The result of Scott's current model is, surprisingly, counter-rotating cylindrical structures! However, it needs to be noted that this structure was not fully elucidated until the work of Scott. This structure describes the type of currents in space, Birkeland currents, that would be involved in forming galaxies and was apparently not completely understood until recently. This recent date of this increased understanding suggests the complexity of the processes involved in galaxy formation and the lack of complete understanding of them by even plasma astronomers before Scott's paper. Obviously, this also suggests a similar (if not greater) lack of understanding of these processes by conventional astronomers before Scott's paper (which appeared only two years after Faulkner's review).

Electric Neutrality in Space?

Faulkner's review also said (emphasis added):

The *large distances* and *electrical neutrality* of many objects involved render electromagnetic forces null. Electromagnetic forces dominate on atomic scales. Appreciable net *charges can affect lab* scales, but they *cannot* on *galactic and cosmological* scales.⁵

The above comment is unfortunately not correct. Evidence exists (and will be presented below) for electric current thousands of light years long and consisting of trillions of amperes of current.

Per A. L. Peratt, former USDOE Acting Director, National Security, Nuclear Nonproliferation Directorate in 1998, and author of a book on plasma astronomy:¹⁰

In plasma, electromagnetic forces exceed gravitational forces by a factor of 10^{36} , and electromagnetism is $\approx 10^7$ times stronger than gravity even in neutral hydrogen regions, where the degree of ionization is a miniscule 10^{-4} .¹¹

Also, from Peratt's book on plasma astronomy:

Even weakly ionized plasma reacts strongly to electromagnetic fields since the ratio of the electromagnetic force to the gravitational force is 39

¹⁰ Anthony Peratt. *Wikipedia*. https://en.wikipedia.org/wiki/Anthony_Peratt Accessed 2023 Jan 23

¹¹ Peratt AL (1995) Plasma and the universe: large scale dynamics, filamentation, and radiation. *Astrophys. Space Sci.* 227: 97–107. <https://doi.org/10.1007/BF00678070> Accessed 2023 Jan 22

orders of magnitude. ...The “neutral” hydrogen (HI) regions around galaxies are also plasmas, although the degree of ionization is only 10^{-4}Most of our knowledge about electromagnetic waves in plasmas derives from laboratory plasma experiments where the gases used have a low degree of ionization, 10^{-2} – 10^{-6} .¹²

Electrical neutrality in the cosmos, at the scale of not just stars but galaxies, can be shown to be false on the basis of the existence of magnetic fields, which require electric currents and charge difference (non-neutrality) in order to exist.

To quote Barry Setterfield,

A weakly ionized (1%) gas may be considered a plasma since it will behave in the same way as fully ionized plasma. Even weakly ionized plasma has a strong reaction to electric and magnetic fields.

A. L. Peratt in “Physics of the Plasma Universe,” p.17, Springer-Verlag, New York (1991), stated that the ratio of the electromagnetic force to the gravitational force can be up to 39 orders of magnitude in space. This means that electromagnetic forces can be 10^{39} times as strong as gravity (That is a 1 with 39 zeros after it). This means all plasma phenomena will act more strongly and more rapidly over vaster distances than any gravitational phenomena can. This has significant implications for astronomy and cosmology.¹³

Filamentary Structure of the Universe

Other evidence for the electrical nature of space includes the filamentary structure of the universe, predicted by a Nobel-prize winning plasma scientist years before it was discovered.

Faulkner stated in his review:

Scott claimed that plasma theorists predicted the filamentary structure that shows up in galaxy distributions, but the data showing filaments began to appear three decades ago.⁵

The clear implication of this statement is that plasma astronomy cannot claim a successful prediction of the

filamentary structure of the universe before that filamentary structure was discovered.

Unfortunately, however, the above statement seems to be in error. Astrophysicists were reported to have been confounded by the universe’s filamentary structure as early as 1991, though this filamentary structure was predicted 28 years earlier by plasma astronomy:

Alfvén was the first to predict (in 1963) the large scale filamentary structure of the universe, a discovery that confounded astrophysicists in 1991...¹⁴

Hannes Alfvén was a Nobel prize-winning plasma theorist, father of magnetohydrodynamics, as well as father of plasma astronomy.¹⁵ Faulkner’s review is dated 2013. Three decades before that would be 1983. This is the time when data about the filamentary structure of the universe began to appear per Faulkner. So, a plasma theorist did predict filamentary structure *two decades before* the data began to appear to support the claim *according to the review’s own numbers* for the appearance of that data. Using Peratt’s numbers, this would have placed the prediction four decades earlier than the data confirming the prediction. Either way, the prediction was made decades before it was confirmed.

Also, Faulkner states the data “began to appear,” so this would not necessarily be the time when most astronomers believed and accepted the apparent indication of the data; they would likely have waited for more data to confirm the earlier data before accepting the structure it indicated. Thus, the time that astronomers finally accepted the filamentary structure was likely even later than the date when data began to appear, making the earlier prediction of plasma astronomers even more significant.

Cosmic Electric Currents

No electromagnetic effects at cosmological scales?

Contrary to the claim of the Faulkner review that “appreciable net charges can affect lab scales, but they cannot on galactic and cosmological scales,” electric currents have been found at very large scales, even thousands of light years long.

Evidence of large scale, “galactic-dimension,” electric currents (certainly beyond the laboratory scale to which

¹² Peratt AL (2015) *Physics of the Plasma Universe*, 2nd ed., Springer, New York, 17–19

¹³ Setterfield BJ, Setterfield HJ (2013) *Cosmology and the Zero Point Energy*, Natural Philosophy Alliance Monograph Series, 205

¹⁴ Peratt AL (1988 May) Hannes Alfvén: Dean of the Plasma Dissidents, *The World & I Online*, 190–197. Also,

Hannes Alfvén (1908-1995), <https://plasmauniverse.info/people/alfven.html> Accessed 2023 Jan 17

¹⁵ The Nobel Prize in Physics 1970 Hannes Alfvén – Facts. NobelPrize.org. Nobel Prize Outreach AB 2023. <https://www.nobelprize.org/prizes/physics/1970/alfven/facts/> Accessed 2023 Jan 10

the review limits electric phenomena) are also described by Peratt:

The observational evidence for *galactic-dimension Birkeland currents* is given based on the comparison of the synchrotron radiation properties of simulated currents to those of extra-galactic sources.¹⁶

Also, Contopoulos reported further evidence contradicting the review's statement, namely that charges cannot affect "galactic and cosmological scales" (emphasis added):

Astrophysical black holes and their surrounding accretion disks are believed to be threaded by grand design helical *magnetic fields*. There is strong theoretical evidence that the main driver of their winds and jets is the Lorentz force generated by these fields and their associated *electric currents*. *Several researchers have reported direct evidence for large scale electric currents along astrophysical jets.*¹⁷

Active galactic nucleus (AGN) jets are now being found to be composed of electric currents (emphasis added):

However, our results have now yielded *firm evidence that many—possibly all—AGN jets have inward currents along their axes and outward currents in a more extended region surrounding the jets....* It also indicates that *astrophysical jets are fundamentally electromagnetic structures...*¹⁸

New Scientist reported in 2011 regarding a paper by Philip Kronberg et al. (emphasis added):

A COSMIC jet 2 billion light years away is carrying the highest electric current ever seen : 10^{18} amps, equivalent to a trillion bolts of lightning.¹⁹

Kronberg, of the University of Toronto, and colleagues measured the alignment of radio waves around a galaxy called 3C303, which has a giant jet of matter shooting from its core.²⁰ They saw a sudden change in the waves' alignment coinciding with the jet. "This is an *unambiguous signature of a current,*" says Kronberg."¹⁹

The team thinks magnetic fields from a colossal black hole at the galaxy's core are generating the current, which is powerful enough to light up the jet and drive it through interstellar gases out to a distance of about 150,000 light years. Accordingly, from Kronberg (emphasis added):

...this 50 kpc²¹ long jet. ...a direct determination of a *galactic-scale electric current* ($\sim 3 \times 10^{18}$ A), and its direction—{positive} away from the AGN.²⁰

Thus, it has been shown that indeed, *it is possible* for electric currents to travel through the vacuum of space. These currents are electromagnetic structures known as Birkeland currents that maintain their structure in the interstellar and intergalactic medium of space without dissipation over even thousands of light years of distance, due to the recently elaborated interplay of electromagnetic forces that "squeeze" the current, minimizing dissipation and maintaining the current. These forces are described by Don Scott.⁹

Kronberg's finding also relates to Faulkner's assertion that electromagnetic forces cannot have effects on a cosmological scale.⁵ Obviously, "thousands of light years" is well beyond the laboratory scale!

In light of the evidence provided, we see the Faulkner review fails to accurately depict the true situation with regard to electrical neutrality in space. This failed claim, among others, is part of the reason for the conclusions of the review. Therefore, we need to reevaluate the conclusions of the review. In general, regarding the practice of science, we ought to question scientific claims in general, including even questioning claims made in this article itself! In science, evidence should trump claims.

For more information on electric currents in space, the reader is referred to <https://youtu.be/fe0jgBqWjKI> and to <https://www.youtube.com/watch?v=cO79mMx6Ieg>.

Conclusion

We have seen evidence for several points:

¹⁶ Peratt AL (1999) The evidence for electrical currents in cosmic plasma. *IEEE Trans. Plasma Sci.* 18(1):26–32.

¹⁷ Contopoulos I (2017) Electric currents along astrophysical jets. *Galaxies* 5(4):71. <https://www.mdpi.com/2075-4434/5/4/71> Accessed 2023 Jan 18

¹⁸ Gabuzda DC, Nagle M, Roche N (2017) The jets of AGN as giant coaxial cables. *Astron. Astrophys.* manuscript no. Gabuzda-AA-Dec2017. <https://arxiv.org/pdf/1712.08414.pdf> Accessed 2023 Jan 18

¹⁹ News Staff (2011 Jun 15) Universe's highest electric current found. *New Scientist*.

<https://www.newscientist.com/article/mg21028174-900-universes-highest-electric-current-found/> Accessed 2023 Jan 20

²⁰ Kronberg PP, Lovelace RVE, Lapenta G, Colgate SA (2011) Measurement of the electric current in a Kpc-scale jet. *Astrophys. J. Let.* 741:L15 DOI 10.1088/2041-8205/741/1/L15 <https://arxiv.org/pdf/1106.1397.pdf> Accessed 2023 Jan 26

²¹ kpc is the abbreviation for kiloparsec. A parsec is ~ 3.26 light years, so the jet mentioned would be over 150,000 light years long!

1. Many arguments against plasma astronomy that may seem valid on first hearing them are found to be invalid upon closer examination.
2. In conventional astronomy, gravitational effects in many cases have been invoked, while electromagnetic/plasma effects have been ignored, such as the case of galactic rotation curves. Why not consider electromagnetic effects too?
3. There is evidence for electromagnetic phenomena in space, for particular electric currents.
4. Conventional astronomy has sometimes denied the existence of such evidence for electromagnetic phenomena, in particular electric charges and currents.



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Too quick rejection of plasma astronomy can lead to rejection of other theories depending on or incorporating plasma astronomy. This could be a serious impediment to progress in further research in cosmology and in creation/origins science. Plasma science should therefore not be rejected out of hand and should be seen as a valid and fertile field of science for origins research. ☞

COMING EVENTS

TASC Zoom Meeting, February 9, 7:00 pm EST

In the February TASC meeting, plasma astronomy will be examined. What is it? Is it relevant for creation science? Is it good science? Is it pseudoscience? Recent astronomical discoveries will be examined.

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