



## *Report June 2, 2024*

### **Summary:**

- **Awe and Science of a Total Solar Eclipse**
- **Why Believe Our Results are Real?**
- **Boron-Fusion Interest at Germany Conference**
- **New Video - If the Big Bang Didn't Happen, What Did?**

We apologize for missing the April report, things got too busy for us. We will be sending an additional report very soon.

## **Awe and Science of a Total Solar Eclipse**

On April 8 millions of people saw the awesome spectacle of a total solar eclipse, as the path of totality swept over thousands of miles of a densely populated swath of North America, including many large and medium cities. LPPFusion's Chief Scientist Eric Lerner and CIO and Director of Communications Ivy Karamitsos were among those millions, taking in totality in a valley surrounded by the jagged mountains of the Sierra Madre Occidental in Mexico.

Total solar eclipses create awe in almost all viewers in many ways. There is the sudden transformation in a second of the crescent, but still blazing, familiar sun to the weird but beautiful solar corona, surrounding the perfectly black moon. There is the bizarrely inverted scene of the black-hearted pearly sun dominating the sky, ten times brighter than a full moon, yet back at its core, and twilight 360 degrees around the horizon. Through binoculars there are also the pink tongues of flame of the prominences arcing out from the central black against the coronal white.

A somewhat quieter, but nonetheless important aspect of total solar eclipses' awesome character is their awesome predictability. The certain knowledge that a few minutes after the sun's life-giving brilliance disappears, it will suddenly reappear cleanses the spectacle of all terror for modern viewers, a terror that must have been all too real for our distant ancestors. We take perhaps a bit for granted that the exact path and timing of the eclipse is accurately predicted by scientists, years and even decades in advance. Yet this degree of exact prediction stands in considerable contrast with the uncertainty of the cloud cover, revealed in local detail only as the partial eclipse progressed, and accurately predicted regionally only days prior.

This predictability is a product of correct scientific methods and the overthrow of wrong methods, methods which unfortunately still persist in some field of astronomical study. While ancient astronomers back to the Babylonians and the Mayans were able to determine certain cycle of eclipses and Ptolemy with his earth-centered system and

epicycles could also make some rough predictions, the accuracy was insufficient to be actually useful, as modern astronomy is, in saying exactly where the total eclipses would occur.

Some “predictions” of Ptolemy were actually fudged data dishonestly created from others’ observations, as modern scholars have proved. Other involved logical contradictions, where Ptolemy used two different formulae to calculate the moon’s distance from the Earth, so at a given moment, the moon had one distance for one calculation and a different one for another. And some phenomena, such as annular eclipses just short of totality, were not predicted at all, even though they were well known. Ptolemy and his successors could refine their predictions based on past errors, but they could not create new predictions good enough to be useful in the way modern ones are. Of course, modern ones derive from the Scientific Revolution that replaced the geocentric cosmos with the heliocentric, gravitating one of Copernicus, Galileo, Kepler and Newton.

Yet today, as viewers of LPPFusion’s cosmology videos know, many prominent cosmologists (specialists in a very small, although prominent, part of today’s astronomy and astrophysics) defend a hypothesis, the Big Bang, that produces only wrong predictions. They defend the same Ptolemaic method that defines science, wrongly, as a method of explaining observations already made, rather than predicting new ones.

In our work in fusion, we have to make the right predictions to make progress. When our predictions are wrong, we have to find out what was wrong in our theory and test our new ideas decisively by getting the right predictions of new experiments. In the next story, [“Why believe our results are real?”](#) we show how correct theories, derived from natural phenomena, led to our record-breaking experimental results. We’re confident we’ll have some new confirmations of predictions coming very soon. We’re not yet near the level of accuracy or our colleagues in planetary dynamics. But the development of fusion energy promises changes in society as profound as those brought about by the discoveries of the Scientific Revolution that led to today’s solar eclipse predictions.

Nothing matches a total solar eclipse. But bringing the energy that drives the sun to earth to power humanity’s future will be exciting in a different way.



*Figure 1. Totally eclipsed sun and Venus as viewed from Valle de La Bufa near Chavarría Nuevo, Mexico. Observers saw much less prominent clouds and a much sharper corona than this phone could record, since like all cameras, it exaggerates contrast. More coming in future update.*

## Why Believe Our Results are Real?

People sometime ask us: “How can we believe that you are getting the results you claim? There are so many big claims of breakthroughs in research.” So, here’s a brief summary. In science, the only test of validity is experimental and observational confirmation of predictions, made before the observations.

LPPFusion’s predictions have been confirmed by experiment and observation and checked by our peers. Back in 1985, Eric Lerner, (now LPPFusion Chief Scientist) with guidance from Dr. Vittorio Nardi and Dr. Winston Bostick of Stevens Institute, pioneers of fusion energy and [astrophysics research](#), published a [detailed quantitative model](#) relating quasars and the dense plasma focus (DPF) device that Nardi and Bostick were working on. This peer-reviewed paper connected basic phenomena in nature—quasars—with similar, but far smaller, processes in the fusion machines.

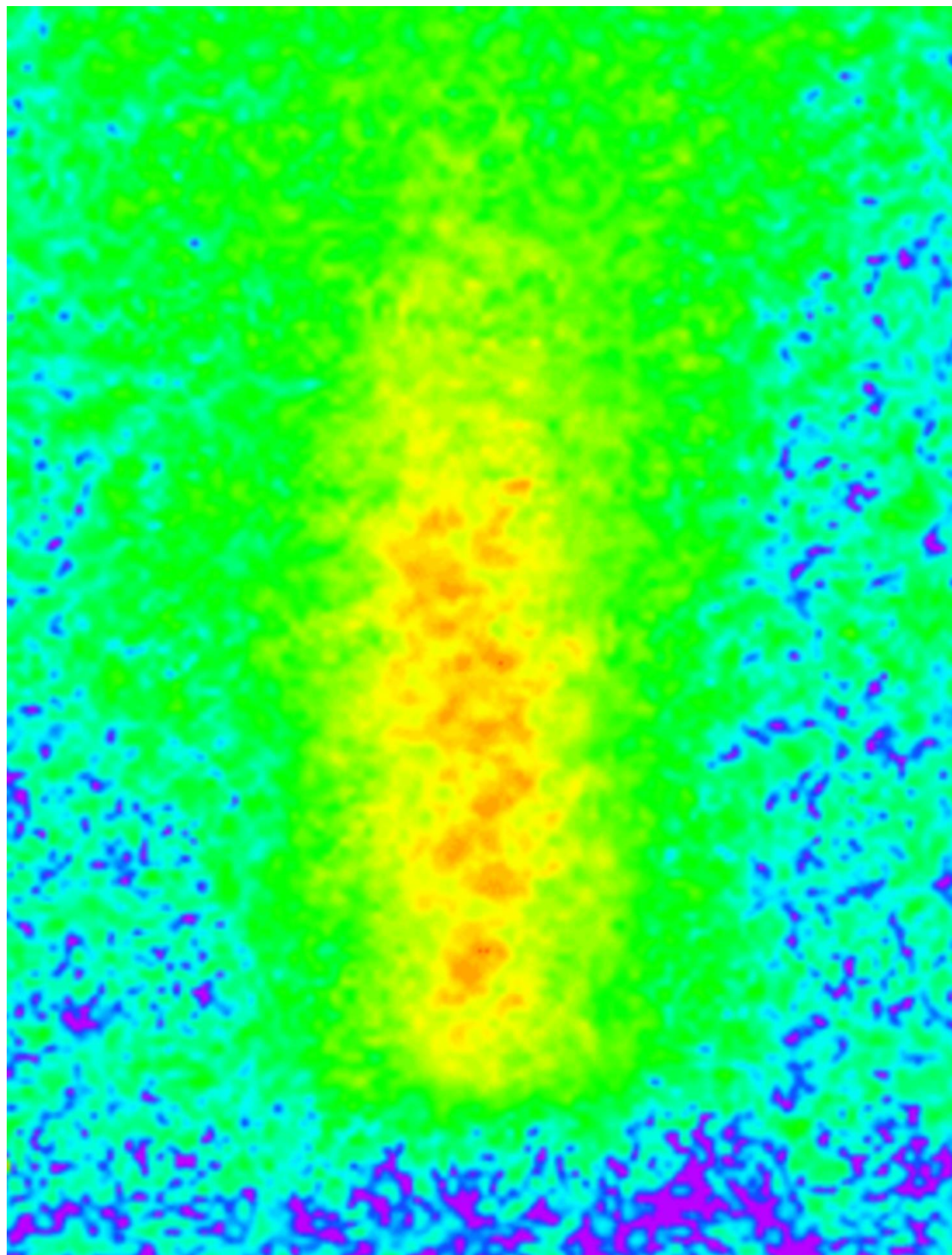
These theories were an elaboration of the work of [Hannes Alfvén](#), who won the Noble Prize in Physics in 1970 for his widespread contributions to plasma physics. Dr. Nardi had introduced Lerner to Alfvén’s work. Lerner later met and was mentored by Alfvén himself.



*Figure 2. Nobel Laureate and plasma pioneer Hannes Alfvén (left) chats at his home in San Diego with Eric Lerner (right) and colleague Anthony Peratt after a 1989 workshop on Plasma Cosmology.*

This model of the DPF as a miniature quasar led eventually to LPPFusion's work on the same device. In 1994-2001, we worked on other groups' machines with a tiny amount of funding from NASA's Jet Propulsion Lab. While it took a while to raise the money for our own laboratory and device, we built that in 2009.

In 2012 [we published results](#) in *Physics of Plasmas*, the leading journal in field, confirming our 1985 predictions and showing that, based on this model of the dense plasma focus, we had achieved the highest confined ion energy yet reported. (This was equivalent to a temperature over 100 times that in the center of the sun). This caused quite a stir among our colleagues and this paper was **the most read** of any published by the journal that year. Today, the research service Altmetric ranks our paper's "Attention Score" among the top 3% of all papers of similar age, so our work was widely noted by our peers.



*Figure 3. This 2010 image of the core of a plasmoid (self-confined blob of plasma) in our FF-1 experimental fusion device was part of the observational evidence confirming LPPFusion's theories linking these plasmoids with quasars. The false colors trace intensity of light, red being brightest. The image shows the helical filaments (red) at the heart of the plasmoid, about 1 mm in radius (yellow zone). Image exposure time only 0.2 billionths of a second.*

We topped our own record in a [2017 paper](#) in the same journal getting over the equivalent of 2 billion degrees K. Last year we claimed in a [peer-reviewed paper](#) “ the highest confined ion energies of any fusion experiment (> 200 keV) as well as, recently, the lowest impurities of any fusion plasma. Among privately funded fusion efforts, our experiments have achieved the highest ratio of fusion energy generation to device energy input (wall-plug efficiency) and the highest  $nT$  product of  $3.4 \times 10^{20}$  keV-s/m<sup>3</sup>” The reviewers for this special issue on privately-funded fusion research were chosen from among our competitors.

So, in short, we've imitated nature, using the work of earlier pioneers like Alfvén, Bostick and Nardi, to make predictions that have been confirmed in the laboratory and validated by our peers. That's how you know what we say about our results is real, not hype.

## **Boron-Fusion Interest at Germany Conference**

Last March, LPPFusion Chief Scientist Eric Lerner attended the Open Academy annual conference in Gelsenkirchen, Germany. The conference brings together scientists, engineers, and other academics with activists seeking to change society for the better, especially stopping the ongoing environmental catastrophes. He was invited to give a presentation on the collapse of the Big Bang/cosmic expansion theory and the connections between this research and the urgent development of fusion energy.

Lerner's presentation started a lively discussion, which continued through the six-day conference, both about the evolution of the universe, but especially about hydrogen-boron fusion. While many participants were familiar with fusion energy research, they all associated it with the giant ITER project in France and deuterium-tritium fuel, which produces abundant destructive neutrons. Not surprisingly, hydrogen-boron fuel, which produces no neutrons from the main reaction and no radioactive waste at all, was news to them and there was a lot of interest in it. One participant who asked for more information was a Member of the German Parliament for the Green Party, currently part of the governing coalition.

LPPFusion will be providing the participants of the conference (and everyone else through our website) with an updated fact sheet on hydrogen-boron fusion as the only realistic alternative that can completely replace fossil fuels.

Another positive aspect of the conference was the discussion by several participants of problems in scientific methods. As many of LPPFusion videos on astrophysics have emphasized, only correct scientific method can yield valid results. But the unscientific Ptolemaic method that has so infected cosmology is not the only problem, as a number of speakers emphasized. Some methods that can produce valid science, such as reductionism, also fail by limiting scientific discussion and impeding progress on complex problems, including how to stop and reverse damage to the environment.

Finally, the conference, conducted almost entirely in German, reminded us at LPPFusion of the need to get our message out in more languages than English. It's easy now to instantly translate our pages to any language, but

until we get more material in other languages onto our website, it won't show up in foreign-language search engines. So, we'll be working on that over the coming weeks and months.

## New Video - If the Big Bang Didn't Happen, What Did?

The Big Bang hypothesis is falling apart, washed away by the flood of data from JWST and other telescopes. Its predictions are contradicted by over a dozen separate data sets. But if the Big Bang didn't happen, what did? In this new video series, *Cosmic Evolution*, LPPFusion Chief Scientist Eric Lerner describes the real story of the history of the universe, starting as far back as we can now see. This is a history based on real observations and on physics theories that scientists have developed and tested in the laboratory and that underlie our whole technology. Understanding the processes that generated the awesome cosmos that we now see helps us to harness these processes here on earth—especially to develop cheap, clean, safe and unlimited fusion energy.

In Episode 1, [“If the Big Bang Never Happened, What Did?”](#) Lerner describes the basic scientific methods that must be used to replace myths with real knowledge of cosmic evolution. He then describes the earliest phase of evolution we have evidence for, the formation of giant filaments of plasma billions of light years across, held together by huge currents and magnetic forces. These filaments, formed over trillions of years, gave rise to the largest structures we now see, like the recently discovered Big Ring and Big Arc.

The debate on the Big Bang is evolving rapidly in 2024. We'll be commenting soon on Dr. Rajendra's Gupta's new work, trying to bridge the gap between the Big Bang and observations with an older Bang and a step away from expansion as the explanation of the redshift.

Cosmology today, fusion lab report tomorrow—stay tuned to our updates!