## *Preface*

In recent years we have read about the 'discovery' of black holes, neutron stars, cosmic strings, and such things as dark energy and invisible matter. Anyone who reads Sagan, Hawking, and the other popular astronomy writers can see how complicated and counter-intuitive the concepts of modern astrophysics are becoming. Even so, until recently, I assumed that astronomers and astrophysicists knew what they were talking about.

Now – I'm sure they do not.

It was when astrophysicists began saying things that I, as an electrical engineer, knew were wrong that I began to have serious doubts about their pronouncements. But I agonized over whether those doubts were legitimate. Even though my life-long avocation has been amateur astronomy, my formal background is in engineering – not astronomy or cosmology.

Earning a doctorate in electrical engineering eventually led to my teaching that subject at a major university for thirty-nine years. What troubled me most was when astrophysicists began saying things that any of my junior-year students could show were completely incorrect.

If astrophysicists were saying things that were demonstrably wrong in ***my*** area of expertise, could it be that they were making similar mistakes in their own field as well? I began to investigate more of the pronouncements of modern astrophysicists and the reasoning behind them. This book is an account of what I unearthed when I started digging into this question.

It is becoming clear that knowledge acquired in electric plasma laboratories over the last century affords insights and simpler, more elegant, more compelling explanations of most cosmological phenomena than those that are now espoused in astrophysics. And yet astrophysicists seem to be intent on ignoring them. Thus, lacking these fundamental electrical concepts, cosmologists have charged into a mind-numbing mathematical *cul de sac*, creating on the way a tribe of invisible entities – some of which are demonstrably impossible.

I have tried to hack a path through these hypotheses, contradictions, and alternative explanations that will be clear and understandable for the average interested reader to follow. The answers to the questions we ask are not stressfully convoluted and arcane – rather, they are logical, straightforward, and reasonable – and long overdue.

I hope your journey through these pages will be meaningful, educational, perhaps exciting, and most important of all, eye-opening.

# Chapter 1

## *Introduction*

A revolution is beginning in astronomy and cosmology that will rival the one set off by Copernicus and Galileo. The stream of increasingly bizarre pronouncements coming from astronomers and cosmologists has recently encountered a serious challenge. This challenge is led by a cadre of scientists and engineers, several of whom were Nobel Prize winning pioneers. They are offering simpler, verifiable explanations about the makeup and functioning of the cosmos. Their new ideas, in more ways than one, are ***electrifying*** the discourse in astrophysics.

The defenders of the present cosmological realm are resisting this intrusion into their once exclusive domain. But on-going discoveries about how electric plasma behaves in space are relentlessly forcing dramatic changes in the way we view the universe. The discipline of ***electric***

***plasma physics*** – which until lately has been outside the realm of astronomy – is quickly displacing many of the outmoded theories of traditional cosmology and astrophysics. We now know that cosmic space is full of electricity (electric plasma) and over the last several decades the study of this form of matter has developed into an established body of scientific knowledge.

Image by the author

**Figure 1:** The Veil Nebula, a twisting cosmic plasma located in the summer constellation Cygnus.

## Questions and Answers

When we were children, most of us looked up in awe at the night sky at one time or another and asked, "What are stars, Daddy? What lights them up?" He might have answered, "They're little Suns – just like our Sun, but far, far away."

None of us was told that the stars worked electrically. Everyone knew the stars were not electric lights.

As we grew up, we may have read science books in which astrophysicists declared that stars are continuously burning hydrogen bombs – and that they condensed from spinning clouds of gas and dust. Today they tell us that stars even more massive than our Sun are rotating faster than dentists' drills. They say that in the cores of galaxies, monstrous invisible Black Holes suck in everything around them, even light – but that 'little black holes' spit jets of matter back out. And they claim that 96% of the material in the entire universe is invisible. Are these responses any more believable or satisfying than those that Daddy offered us?

Can you make sense out of press releases and TV programs that attempt to explain the newest astronomical 'discoveries' – things like invisible dark energy, warped 11-dimensional spaces, and black holes that spit out matter? If not, you have lots of company.

The time to search for some realistic, intelligent, scientific answers has arrived. And those sensible answers are out there for those who are ready to listen.

Plasma physicists know that 96% of the universe is ***not*** made up of 'invisible matter' but rather of matter in the plasma state. Electromagnetic forces between electrical charges are many orders of magnitude stronger than Newton's gravitational force, and we are finding that deep space is filled with electrical charges and magnetic energy. In fact, using the accepted estimated value of the magnetic field strength in the volume between our Sun and its nearest stellar neighbor, this field stores an amount of energy that would keep the Sun radiating for about 200 years[1].

Astrophysicists do not study experimental plasma research in graduate school[2]. They rarely take any courses that discuss Maxwell's equations[3] and electromagnetic field theory. Thus they

[1] E.J. Lerner, Private communication.

[2] "Double Layers and Circuits in Astrophysics," Hannes Alfvén, *IEEE Transactions on Plasma Science*, Vol. PS-14, No. 6, Dec. 1986

attempt to explain each new discovery using what they do study – gravity, magnetism, and fluid dynamics – the Seventeenth and Eighteenth Century tools of their forefathers, Kepler and Newton. Consequently their methods have not kept up with the science of the Nineteenth Century, let alone the Twenty-First. No wonder they do not understand that many cosmic phenomena are due to forces other than gravity, fluid flow, and the magnetism of lodestones. When questions arise about the failure of their incomplete models, cosmologists often invoke 'new properties' of magnetic fields – properties that magnetism simply does not have, or they propose the existence of unobservable entities and forces. They almost never reexamine their basic assumptions or rethink their hypotheses.

The cosmos in fact does not contain the mysteriously undetectable entities that present astrophysical theories require. Modern, straightforward explanations of all the phenomena astronomers find so enigmatic are now available to us. Anyone interested in astrophysics needs to become aware of the properties of the ***electric plasma*** that fills more than 99% of the universe. Ours really is an Electric Sky.

## Alfvén's Warning

In February 1981, eleven years after Swedish electrical engineer Hannes Alfvén won the Nobel Prize in Physics, he published yet another book[4]. This one was called ***Cosmic Plasma***[5]. By disregarding Alfvén's new text, as they had his earlier works, the astrophysics community did not heed his warnings that they were working their way down a dead-end path strewn with errors of understanding. The complicated maze that astrophysics has become in the last few years is a direct result of years of ignoring Alfvén's work and his advice. Hannes Alfvén is the central figure in the emerging electric plasma cosmology.

All our space probes that have been equipped to detect separated electrical charges – electric plasma – have found it, lots of it. The behavior of these plasma clouds is scalable, that is to say, giant cosmic plasmas behave in much the same way (obey the same physical laws) that small laboratory plasmas do here on Earth. Therefore we are able to create accurate models of cosmic-scale phenomena in the lab and study them.

## Technology and Science

People have great confidence in science these days. Recent advances in medicine, communications technology, computers, chemistry, genetics, and information science have made our lives better. We look at the achievements in these fields of human endeavor and acknowledge them with admiration. "These scientists, doctors and engineers ***really*** know what they are doing."

Today most people have cell phones. New surgical procedures, hospital techniques, instrumentation, and medicines are saving, prolonging, and improving the quality of our lives. We have digital devices we can put in our pockets that hold 6000 books, more than most people read in a lifetime. Through GPS receivers we can tell exactly where we are anywhere on the surface of Earth. The latest stock market report is available to us while we are mountain climbing in Asia. We flew to the Moon decades ago and we have sent landers to Venus and Mars. We have orbited Jupiter and Saturn and visited several of their moons. Presently another of our interplanetary probes is on its way to Pluto. Four deep-space probes are now near the outer limits of our Sun's reach – the heliopause. We have orbiting, computer-driven telescopes that can see a thousand times better than the largest earthbound optical observatories of only a few decades ago.

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[3] The fundamental mathematical relationships upon which all of mankind's electrical knowledge is based.

[4] Other books by Alfvén (1908-1995) are: *On the Origin of the Solar System* (1954); *Atom, Man and the Universe* (1964); *Worlds – Antiworlds: Antimatter in Cosmology* (1966); *The Great Computer: A Vision* (1968); *Living on the Third Planet* (1972); *Evolution of the Solar System* (with G. Arrhenius) (1976). Also see http://plasmauniverse.info

[5] *Cosmic Plasma*, by H. Alfvén, D. Reidel Pub., 1981.

We have put our faith in scientists and engineers, and it has clearly paid off – except in astronomy (and possibly archeology and geology).

Why would we want to single out these fields and cast doubt on their results?

The answer is because there are no tangible, usable products from which we can judge the validity of theories emanating from sciences that deal with events that happened long, long ago, and far, far away. Professional astronomers judge their success by the degree to which other astronomers believe and accept their ideas. They do not produce results that we, the public, can physically evaluate: They just send up rockets, take pictures of the night sky, write papers, and tell us impressive stories about how it supposedly works and how it supposedly got there. Most of their recent explanations are counterintuitive and almost impossible to understand. This does not mean everything they claim is necessarily wrong, but how can we actually verify what they are telling us?

The same question can be raised about the archeologists: They dig holes around the world, they look at bones and shards, they write papers, and they tell impressive stories about mankind's history. Theoretical geologists also tell impressive stories about how the continents have shifted and how and when the mountains formed.

Both these groups are considered successful if other archeologists and geologists accept their hypotheses. Popularized versions of their theories are published in *Scientific American*, *Discover*, and *National Geographic*. None of these fields (archeology, geological history, and astronomy) is able to produce results that can be tested experimentally. So how can these researchers judge the correctness of their conclusions without considering a *range of possible explanations* that are based on different assumptions?

This book will not specifically address problems in geology or archeology. They are mentioned here only for completeness – to point out that both these branches of science have difficulties similar to astrophysics. There is almost no way to judge the validity of theories that deal exclusively with phenomena that happened long, long ago and far, far away – with things that we cannot directly get our hands on. This is not the fault of the investigators in those areas; it is simply an inherent problem for them. How do they cope with it? This is one of the questions the first few chapters will address.

There is an important difference between science and technology. An old professor of mine, who was Russian, once said to me, "Do you know how they used to test a new bridge in Russia? They put the engineer who designed it ***under*** the bridge, and then they marched the army across it." Astrophysicists do not design anything that we can march the army across. But today, if you are an engineer who designs a bridge that falls down or a cell phone that does not receive a signal, your failures will quickly be embarrassingly obvious to all. The fruits of technology are real and are testable (do they work?). Most of the results of the science of astrophysics are not testable.

We ought to question whether our trust is as well placed in the untestable pronouncements of astrophysicists as it is in the work of the engineers and technicians who give those scientists the tools they use. There is no doubt that the Hubble Space Telescope, the Spitzer infrared orbiting telescope, the Chandra orbiting x-ray observatory, SOHO[6], and the magnificent, new, big, ground-based telescopes are all genuine ***technical*** marvels. The images and data that are retrieved from them are stunning in clarity and precise in detail. They produce real and accurate scientific data. But are the published interpretations and hypotheses that attempt to explain this data as accurate as the tools that provide that data in the first place? We must learn to distinguish between the quality of the ***technical tools*** that are used and the quality of the ***scientific conclusions and theories*** that are being formulated by those who use those tools.

[6] The SOlar and Heliospheric Observatory. http://sohowww.nascom.nasa.gov/

## Where We Are Headed

In this book, we will look at many of the theories of present-day astrophysics and compare them to corresponding answers that have arisen from the study of electric plasma. But before we can propose any new alternative cosmology – a Plasma Cosmology to replace the presently 'accepted' astrophysical and cosmological belief structure – we have to examine some of the basic problems inherent in those accepted ideas. Before we buy into any new way of looking at the cosmos, we need to ask, "What's wrong with the old way?" To answer this, we must establish some fundamental guidelines about how a true science discovers knowledge. We must be clear in our own minds how to distinguish between science and pseudoscience. There are basic requirements and inherent limitations involved in the scientific method with which we must be familiar. In fact there is more than one scientific method, and we have to be clear about the differences among them.

When a dentist repairs a cavity in your tooth, the first thing he does is to excise the decay. The first third of this book is similarly devoted to exposing many of the things that are wrong with the present paradigms of astronomy and cosmology. These first six chapters are not intended to be an indiscriminate rant against mainstream science but rather a dispassionate exposé of some of its real deficiencies. We must take a cold, hard, analytical look at the methods of modern science in general and astrophysics in particular.

The only way we can judge the scientific output of astrophysics is to ask: Is there a better way of looking at the cosmos that answers our questions in a simpler, more straightforward way – one that does not require hypothetical entities and counterintuitive notions? Has the astrophysics field kept up to date with the rest of science? Is it making use of all the modern scientific tools, techniques and data that are available? Is it open to hypotheses that look at old data in new ways? These questions will be explored in the first three chapters.

In order to make informed judgments about how stars can affect each other (or possibly collide), we need to have a sense of how far they are from each other. We need to have an intuitive, conceptual model of how big galaxies are and how far apart they are. This is provided in chapter 4.

A key example of one of the shortcomings of present mainstream astrophysics is that so many things seem to be 'missing.' There is missing matter, invisible dark energy, invisible 'strings,' and too few solar neutrinos. These are discussed in the fifth and sixth chapters.

After detailing these criticisms in the first six chapters, we progress to the main content of this work – a description of the experimentally verified properties of electric plasma, how they pertain to what we see in the sky, and how they avoid the pitfalls we have just examined.

Beginning in chapter 7, with a sequence of scientists and discoveries that have led to our basic understanding of electric plasma, we start to see that the sky is indeed highly electrical in nature. The hypotheses of these plasma scientists on the subjects of solar, stellar, and galactic behavior are careful extrapolations of their demonstrated experimental results and physical principles. They do ***not*** involve invisible matter or unseen forces or 'new science' – claims that the laws of physics must be different out there in deep space (where we cannot falsify them) from what they are here on Earth.

We will then take a close look at some of the obviously electrical properties of our Sun, the solar system, the stars, and our galaxy. The work of Dr. Halton C. Arp on the property of starlight called 'redshift' (and the way his work has been received by the astrophysical community) is so closely entwined with the problems of accepted astrophysical theory that we devote an entire chapter to it.

Finally, we will attempt to answer the question, "So what?" Why is it important that the average person knows about what is going on now with science in general and with astrophysics in particular? How will it affect me?

## It's Time to Decide

The main thrust of this book is that the time is ripe for informed people from outside astrophysics to demand reasonable answers to reasonable questions and to evaluate what the astrophysical theoreticians have been telling us.

If, as we will claim, the causes of most of the observed phenomena of modern astronomy are electrical in nature, do you need a degree in electrical engineering before you can understand them? Indeed not. The average informed person ***can*** understand and make rational judgments about these ideas. All it requires is the time and patience to read and to think logically and critically about the issues. Some basic facts and a few new concepts will suffice. So the main goal of this work is to convince you, the reader, that you really do have both the capability and responsibility to make informed, critical judgments about the pronouncements of established scientists. A careful reading of these pages will enable you to make an informed assessment of this new plasma-based alternative cosmology.

Interested plasma scientists and electrical engineers have been thrashing out the various hypotheses of Plasma Cosmology in their conferences and publications. So far, most astrophysicists have completely ignored them. Instead of engaging in further futile attempts to persuade the astrophysical community to seriously consider these new ideas, a growing band of plasma scientists, engineers, and a few brave cosmologists and astronomers are simply bypassing them. A paradigm based on electric plasma, which does not find new discoveries to be enigmatic and puzzling but instead to be predictable and consistent, is slowly but surely gaining ground. But it may well be that general acceptance of these new ideas will have to wait until the present occupants of the astrophysics power structure have retired from the scene.

Right now what is needed most is the public's realization that astrophysics, led by insular theoreticians and not by well-informed, broadly educated scientists, has stumbled far down that erroneous path predicted by Alfvén.

A cadre of plasma scientists and engineers, who are presently employed in industry, government labs, and universities – but not in most astronomy departments – is quietly working to modernize cosmology. Will this new breed of scientists and engineers,[7] who are waiting in the wings, be called upon to clean things up? Or will the incomprehensible fog of black holes, dark energy, magically unobservable matter, and other fanciful fictions be allowed to continue to shroud our true understanding of the cosmos?

Of course, the stars are not electric lights – at least not in the sense that we know electric lights. But they ***are*** basically electrical in nature, and their observed properties can truly be understood only from an electrical viewpoint. Let us see how.

[7] See Appendix D – An open letter to the scientific community signed by leading plasma engineers and physicists.