SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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SETI League Marks Fifty Years of SETI Science

LITTLE FERRY, NJ.., 19 September 2009 -- Exactly fifty years ago, on 19 September 1959, there appeared in the British science journal Nature a brief article by two scholars, which marked the birth of the Search for Extra-Terrestrial Intelligence (SETI) as a scientific discipline. *Searching for Interstellar Communications* laid out the fundamental precepts of SETI as an observational science. Today, in 62 countries around the world, more than 1500 members of the non-profit SETI League look back on this seminal article, and ponder how far we've come in the past half-century.

The article's authors, Giuseppe Cocconi and Philip Morrison, were then professors at Cornell University in New York. Morrison went on to distinguish himself as a prominent physics and astronomy professor at the Massachusetts Institute of Technology (MIT), while Cocconi became a central figure in the emerging field of particle physics at CERN, the European Centre for Nuclear Research. Morrison passed away in April 2005, and Cocconi in November 2008. This brief five-page paper is counted today among their most significant accomplishments, and contributes to their lasting legacy.

Unbeknownst to Cocconi and Morrison, at the time of their landmark publication Frank Drake, a young radio astronomer at the National Radio Astronomy Observatory (NRAO) in West Virginia, USA, was setting up equipment to perform the very experiment which the two professors were proposing in print. Drake's *Project Ozma* surveyed two nearby sun-like stars, for just a few weeks, at but a single frequency, for electromagnetic evidence of other technological civilizations. He found none.

Subsequent SETI projects have expanded the search space to billions of channels and thousands of stars. Still, we have detected no definitive, repeatable evidence of extraterrestrial civilizations. Yet our technology and search strategies continue to improve, just as public acceptance of (and enthusiasm for) SETI science continues to increase. So, The SETI League and other organizations continue the research born just fifty years ago today.

The concluding words of the famous Cocconi and Morrison article are just as valid today as they were a half century ago: "The probability of success is difficult to estimate; but if we never search the chance of success is zero."

Largely using radio telescopes and optical telescopes, SETI scientists seek to determine whether humankind is alone in the universe. Since Congress terminated NASA's SETI funding in 1993, The SETI League and other scientific groups have privatized the research. Amateur and professional scientists interested in participating in the search for intelligent alien life, and citizens wishing to help support it, should email join@setileague.org, check the SETI League Web site at http://www.setileague.org/, send a fax to +1 (201) 641-1771, or contact The SETI League, Inc. membership hotline at +1 (800) TAU-SETI. Be sure to provide us with a postal address to which we will mail further information. The SETI League, Inc. is a membership-supported, non-profit [501(c)(3)], educational and scientific corporation dedicated to the scientific Search for Extra-Terrestrial Intelligence.

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The Faraway World: Looking for Dark Matter

By Michinao Sakamoto, Kanagawa-ken Japan

Summary

This paper proposes a thought experiment in which the universe is composed of real and imaginary parts which compliment each other, and will eventually cause the current expansion to become a contraction, leading to an ultimate Big Crunch.

Abstract

Results from the Cosmic Background Explorer (COBE) and the Wilkinson Microwave Anisotropy Probe (WMAP), show that normal matter accounts for only 4% of all matter and energy in the universe. The remainder is a "dark side" composed of dark matter and energy. This paper attempts to illuminate this dark side by hypothesizing an anti-matter world, with energy that is in the process of conversion to matter existing between galaxies. With this in mind, I describe a scenario in which the expansion of the universe will at some point become a contraction and cause a cyclical regeneration through another Big Bang.

Introduction

Observations from COBE and its successor, WMAP, have presented humanity with major questions concerning the composition of the universe. The results to date indicate that normal matter does not exceed 4% of the total energy density of the universe. The remaining 96% is a combination of as yet unidentified dark matter and dark energy. While there are hopes for a breakthrough in the LHC experiments, full clarification of this issue is difficult.

In this article, I focus on symmetry and cyclicality as major characteristics of nature and apply them to the question of the composition of the universe. Within four-dimensional spacetime, I envision an "imaginary space" composed of anti-matter, in which imaginary time flows *(1)*, and offer here a thought experiment, a "binary cyclical theory", in which a drastic reduction of the dark portion occurs *(2)* and the expansion of the universe will at some point in time become a contraction and bring about a cyclical regeneration *(1)*.

Two worlds

When the Big Bang and the subsequent period of accelerated expansion and ultra-high temperatures (referred to as inflation) ended, and the universe began to cool, a large amount of particle pairs were generated. These either underwent rapid pair annihilation, or escaped to free space to later collide with other particles, leading either to annihilation (creating energy) or bonding (creating elementary particles) *(3)*. In an analogy with Kobayashi–Maskawa theory, particles and anti-particles are formed in separate zones principally due to CP symmetry breaking *(3)*. As these zones become larger due to gravitons and gravitinos (yet to be discovered), which are assumed to be responsible for gravity, the nature of time is determined in each zone. Taking supersymmetry into consideration, I suggest that "imaginary time", expressed through imaginary numbers, began together with our real time. Due to the fact that CP symmetry breaking is only revealed when expressed using imaginary numbers *(3)*, in contrast with our "real space", regions of "imaginary space" are formed, which requires imaginary numbers to be described. Again, based on the theory of CP symmetry breaking, it has been proposed that the current macrocosmos was formed as two symmetrical universes, within which either matter or anti-matter was dominant.

The question arises as to where this "imaginary space" exists in four-dimensional space-time. I believe that it is not something that exists as a segment of three-dimensional space, but rather can be thought of as being in a state of quantum mechanical "superposition" *(2,3)*. Even time is interpreted as having a duality, similar to Bohr's complementarity principle. Naturally, relativistic effects also occur in imaginary space. The Higgs boson, for which there is hope of discovery in the LHC experiments, exists in both worlds. In addition to the Higgs theory, through the movement of galaxies, the rotation of the earth, through the energy originating from microscopic living things, particles are formed and become elementary particles in an appropriate form. This process is also thought to be that which produces the dark matter and energy present in the universe. In addition, if imaginary space exists, it is possible that black holes represent a link between normal and imaginary space. As their intense gravity increases by swallowing other celestial bodies, it is suggested that they ultimately explode into another universe, like a ruptured bag turned inside out, in effect becoming white holes.

Cyclic regeneration

The results of COBE suggest that the universe will continue to expand indefinitely. However, I believe the expansion will slow down and become a contraction, ultimately leading to a Big Crunch, which begins the next cycle. It is thought that dark energy, assumed to account for 73% of the total energy and matter of the universe, follows a path to materialization, and that the overall mass of matter in the universe will increase. Together with the mass associated with black holes, which are believed to exist throughout the universe and are produced by aging stars, if this newly created matter increases the overall density of matter in the universe above a critical value, at some point in time the universe will begin to contract due to mutual gravitational forces. Although it is not certain when this transition will occur, it should be after a sufficient amount of energy has been converted into matter, probably best described as when "that which is dark turns grey". In looking at the universe as a bi-polar system of matter and anti-matter as described above, I believe that the conditions for this reversal to occur are the same in both of these worlds and that it will occur at almost the same time in both. Once this switch to contraction occurs, in contrast to the period of expansion that now exists, gravity should begin to act between the stars in an ever-accelerating manner. The contraction will accelerate until the so-called event horizon (the Schwarzschild radius) is reached and the temporal wall separating the two worlds is annihilated. At this point, matter and anti-matter will collide on an unprecedented scale and the whole universe will be annihilated in a manner similar but opposite to the initial period of inflation, as everything is converted to energy at an unimaginable speed and scale. This is the big crunch and it could easily lead to another big bang, resulting in everything starting over again. This scenario can also explain the unimaginable energy of the Big Bang.

Final thoughts

Like much of cosmology, the scenario I have outlined here, in which this universe will not meet its end by expansion, is just a hypothesis. However, all intelligent beings such as ourselves wish to ponder the nature of the "universe". With this in mind, in proposing this hypothesis I have taken imaginary numbers, which are commonly used for computation, from inside the box known as mathematics and brought them into the real world. In the future, I hope that verification of this scenario can be supplied by upcoming giant accelerator experiments.

References

1. S. Hawking in *The Universe in a Nutshell*, (Bantam Spectra, 2001).
2. Hawking and L. Mlodinow in *A Briefer History of Time*, (Bantam Books, 2005).
3. Kobayashi in *Kieta Hanbushitsu (in Japanese)*, (Blue Backs, 1997). ❖

IAC Report

For the 38th consecutive year, members of the global SETI community gathered at the annual International Astronautical Congress (IAC) for a Symposium on Extraterrestrial Intelligence. This year's IAC was held in Daejon, Korea from 12 to 16 October 2009, and attracted thousands of astronautics professionals from dozens of countries. Coordinated by Doug Vakoch and Seth Shostak (both of the USA), the SETI Symposium consisted of two sessions.

SETI I: SETI Science and Technology was chaired by Claudio Maccone (Italy) and Seth Shostak (USA), with H. Paul Shuch (USA) serving as rapporteur, and included five presented papers. The session featured the annual Rudolph Pesek Lecture, this year delivered by Prof. Myung-Hyun Rhee of Yonsei University, Seoul. SETI II: Interdisciplinary Aspects was chaired by Doug Vakoch (USA) and H. Paul Shuch (USA), with John Traphagan (USA) serving as rapporteur, and featured six papers, including the annual Billingham Cutting Edge Lecture (documented elsewhere in this newsletter). Abstracts to all of the SETI Symposium papers may be found online at http://iaaseti.org.

The next International Astronautical Congress will be held in Prague, Czech Republic, 27 September to 1 October 2010. The following year, we will meet in Capetown, South Africa, 3 to 7 October 2011, and plans are now underway for an Autumn 2012 IAC in Naples, Italy. All of these events will include the usual SETI I and SETI II technical sessions (SETI Science and Technology, and Interdisciplinary Aspects, respectively), as well as the annual meetings of the IAA SETI Permanent Study Group.

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Event Horizon

SearchLites readers are apprised of the following conferences and meetings at which SETI-related information will be presented. League members are invited to check our World Wide Web site (www.setileague.org) under *Event Horizon*, or email to us at info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

January 25 - 26, 2010: The detection of extra-terrestrial life and the consequences for science and society, Royal Society, London UK.

February 12 - 14, 2010: Boskone 47, Boston MA.

February 21, 2010, 8:30 - 11:30 AM PST: SETI Turns 50 Symposium, at the American Association for the Advancement of Science annual meeting, San Diego CA.

March 20 - 21, 2010: Society of Amateur Radio Astronomers regional meeting, Stanford University, Palo Alto CA.

April 17, 2010, 0000 UTC - 2359 UTC: Eleventh annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 18, 2010: Sixteenth SETI League Annual Membership Meeting, Little Ferry NJ.

April 24 - 25, 2010: Trenton Computer Festival, Ewing NJ.

April 26 - 29, 2010: Astrobioloby Science Conference 2010, League City, TX.

June 4 - 6, 2010: Rochester Hamfest, Rochester NY.

July 4 - 7, 2010: *Society of Amateur Radio Astronomers* Conference, NRAO Green Bank WV.

July 22 - 24, 2010: Central States VHF Conference, St. Louis MO.

September 2 - 6, 2010: *Aussiecon 4*, 68th World Science Fiction Convention, Melbourne Australia.

September 27 - October 1, 2010: *61st International Astronautical Congress*, Prague, Czech Republic.

October 4 - 8, 2010: *Second IAA Symposium on Searching for Life Signatures*, Milton Keynes, UK.

November 17 - 18, 2010: *IAA 50th Anniversary Celebration*, Washington, DC.

November 19 - 21, 2010: Philcon 2010, Cherry Hill, NJ.

April 16, 2011, 0000 UTC - 2359 UTC: Twelfth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 17, 2011: Seventeenth SETI League Annual Membership Meeting, Little Ferry NJ.

October 3 - 7, 2011: *62nd International Astronautical Congress*, Cape Town, South Africa.

April 21, 2012, 0000 UTC - 2359 UTC: Thirteenth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 22, 2012: Eighteenth SETI League Annual Membership Meeting, Little Ferry NJ.

September 2012 (dates TBA): *Sixth International Congress for Radio Astronomy* , Heidelberg, Germany.

October, 2012 (dates TBA): *63rd International Astronautical Congress*, Naples, Italy.

April 20, 2013, 0000 UTC - 2359 UTC: Fourteenth annual SETI League Ham Radio QSO Party: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 21, 2013: Nineteenth SETI League Annual Membership Meeting, Little Ferry NJ. ❖

Executive Director Joins Korean SETI Effort

SEOUL, KOREA.., 8 October 2009 -- During a lecture tour at Yonsei University in Korea, Prof. H. Paul Shuch, executive director emeritus of the nonprofit SETI League, was today tapped to serve on the Foreign Advisory Council of the newly formed SETI Korea Society. The Society, which can be reached via setikorea@gmail.com, was organized to initiate and coordinate SETI observational projects in Korea, according to its General Secretary, Prof. Myung-Hyun Rhee.

Prof. Rhee serves as Principal Researcher at the Yonsei University Observatory in Seoul. He and Prof. Shuch met a year ago, at a UNESCO SETI meeting in Paris, and immediately began exploring collaborations between the university and the membership-supported SETI League. Also approached as advisers to the Korean SETI effort (subject to confirmation) are Alexander Zaitsev, Jill Tarter, Frank Drake, Doug Vakoch, Seth Shostak, Claudio Maccone, Dan Werthimer, and Ivan Almar. Significantly, all of these SETI scientists are members or supporters of The SETI League, which Shuch has headed since its inception in 1994.

Prof. Shuch lived in Korea from 1967 to 1969, and has visited the country on several occasions during the years since. "I regret that I am no longer fluent in the Korean language," he admits, "although that should hardly prove a barrier to we who contemplate interstellar communications!" ❖

21 meter dish at Yonsei University Observatory

Billingham Cutting-Edge Lecture

At its 2005 meeting in Fukuoka, Japan, the SETI Permanent Study Group (SPSG) of the International Academy of Astronautics (IAA) voted to establish an annual *Billingham Cutting-Edge Lecture*, as a forum to showcase breakthrough thinking in advancing the Search for Extra-Terrestrial Intelligence. The lecture honors longtime SPSG member and former chairman Dr. John Billingham, a major force for forty years in promoting innovation within the SETI field. Speakers are to be selected by the SPSG, with one Cutting-Edge Lecture to be delivered each year at the opening of the SETI II sessions of the IAA Symposium on SETI, at the annual International Astronautical Congress.

Each year, the speaker chosen for that year will be asked to present one cutting-edge idea and its potential implications for the scientific search for extraterrestrial intelligence. To help with travel expenses and/or as a small honorarium, the speaker will be paid $4000 US. Dr. Steven Dick, the first Billingham Cutting-Edge Lecturer, very kindly waived his 2006 honorarium. SPSG member Dr. Allen Tough (Professor Emeritus, University of Toronto; Chief Scientist, Invitation to ETI) has generously pledged $4000 US a year for the first five years.

The 2009 Billingham Lecture, "How Cosmological Models Should Guide SETI Search Strategies" was delivered at IAC 2009 in Daejon, Korea by James N. Gardner, a complexity theorist and science essayist whose articles and scientific papers have appeared in prestigious scientific journals, including *Complexity* (the journal of the Santa Fe Institute), *Acta Astronautica* (the journal of the International Academy of Astronautics), and the *Journal of the British Interplanetary Society*. He has also written popular articles for *WIRED*, *Nature Biotechnology*, *The Wall Street Journal*, and *World Link* (the magazine of the World Economic Forum).

James N. Gardner delivering the fourth annual Billingham Cutting Edge Lecture in Daejon.

Guest Editorial:

Properties of an Interstellar Beacon

by Jon Lomberg

There has been a good deal of discussion within The SETI League about the design of interstellar beacons on the one hand, and how to detect them on the other. Let's step back from the consideration of methods of transmission and the relative virtues of radio, optical, etc. The physics of these are well understood, so naturally it is the domain of search space that is easiest to study and manipulate. We can choose what kind of transmitters and receivers we will use. The only real progress in SETI has been the improvement of the sensitivity and bandwidth of the receivers. No doubt we will soon have the ability to monitor *most* of the radio/microwave spectrum at once. But perhaps that will not solve our problem of finding beacons.

What are the ideal properties of an interstellar beacon from a human perspective, whether sending or listening?

- It should be as easy as possible to detect.
- It should transmit/receive using technology we possess.
- It should be detectable from the planet's surface, as well as from instruments in space.
- It should be sent in as many wavelengths possible (radio, microwave, IR, optical, x and gamma)
- It should be as loud/bright as possible.
- It should be beamed directly toward us.
- It should be uninterrupted, constantly repeating some pattern.
- If there is an interval of silence between repetitions, it should be short. (Defining short and long in the context is a topic for another article. For the sake of argument let's say a duty cycle of one hour is short. A duty cycle longer than 1 day is long)

The most significant limiting factor of all METI (Messaging to Extra-Terrestrial Intelligence) done so far, as well as most attempted SETI strategies, is the "haystack" of duration (how long a beacon signal lasts) and the duty cycle (how often is it repeated). Even if we were so amazingly lucky as to reach a planet of radio-smart ETs , the chances of any of our METI transmissions being detected is small because the signals only last a short time and are not repeated. (Indeed, acquiring the signal a second time is the filter through which any possible messages must pass. All the various WOW signals we have heard have not).

It is often pointed out that sending uninterrupted powerful beacons is expensive. I would add to that annoying. Tests of tsunami sirens here in Hawaii are necessary but annoying, so they happen in my neighborhood only at 11:45 a.m.on the first Monday of each month. We want the tests and we want the test alarm to be very loud, but not happen too often.

A loud isotropic METI beacon may temporarily inconvenience somebody doing something else in the society sending the beacon. Shielded, directed beacons are less problematic locally, but also impossible to detect if you are not in the beam. So short, powerful all-directional beacons on many wavelengths may be a better fit for societies living near their own beacon transmitters. Make a really loud noise only intermittently, but one very easy to spot for the time it is on the air, whatever instrumentation you are using to listen.

Duration and power seem inversely related: the briefer the transmission, the cheaper the energy. Is it better to have a very powerful beacon at the expense of length of transmission? A brief, very powerful burst could be detectable at much larger distances than a weaker one that lasts longer.

Duty cycle is the key variable. How long does a sender wait to charge up the capacitor (or whatever) before transmitting again? How often will the neighbors tolerate it? In my opinion, senders will likely opt for briefer and stronger beacons, because they are much easier to detect and reach many more potential targets while minimizing local inconvenience. Beacons must therefore be repeated -- but at what interval?

Unless we can devise strategies that allow continuous monitoring of targets (or send repeated METI beacons ourselves) we could be looking in the right place at the right frequency-- when They are off the air. Very strong, brief bursts simultaneously in many known wavelengths and "Z-waves" (Sagan's generic term for methods we don't know about yet) would reach the greatest diversity of searchers. Senders really interested in finding others would cast their net as widely on the EM spectrum as possible.

Uninterrupted continuity of observation is the strategy that is most likely to detect intermittent but powerful beacons. A new SETI strategy would use arrays of low-cost, small receivers to look in many selected "special" directions: nearby exoplanets, sunlike stars, galactic center/anticenter axis, etc. By passing off to receivers worldwide we sustain continuous searching without a lapse. Perhaps such a search could be piggybacked on home satellite dishes, expanding on the Project Argus concept.

The reason I am unconcerned about any risk with current METI is that the very brief transmissions sent only once are probably too short to be detected, and any case impossible for recipients to confirm with a second observation.

Long-lived civilizations will be patient civilizations. They will expect searchers to be patient as well. A patient search is not one constantly changing targets. It is choosing your direction of search and settling in to listen constantly until you hear something. Until we do that, it is premature to speak of any "silence in the Heavens."

Guest Editorial:

A Big Waste of Mass

by Nicholas J. Szabo

According to an article in *New Scientist* this past October, light pollution from cities and the presence of CFCs and other artificial compounds in the atmosphere (indicated by absorption at characteristic wavelengths) could be signs of intelligent life on alien planets. It has been suggested that we could construct orbiting observatories to detect just such biosignatures. I think otherwise.

Humans building large space structures to detect aliens emitting CFCs, which humans have already rendered obsolete after extremely brief use, strikes me as oddly backwards. It is the aliens, most likely hundreds of millions of years more advanced than us, who will have the astronomically sized structures, not ourselves in the near future.

Still, looking for CFCs does hint at the strategy which I have proposed -- look for artificial surfaces with very optically improbable properties, including chemicals that are highly unlikely or rare in natural dust clouds. For example, the surfaces of human satellites and many skyscraper windows have improbably very high concentrations of gold due to its good optical and thermal properties.

Paint contains many artificial molecules. The result is that artificial surfaces have very artificial-looking optical properties and spectra. Given that ETI of the most probable ages (i.e. hundreds of millions of years older than us) could have already spread across its galaxy and converted most of its visible surfaces into artificial surfaces, this search strategy should work for ETI in other galaxies, and indeed given the statistics is more likely to work than looking at star systems within our own galaxy. And, it can be done with normal-sized telescopes and standard spectroscopy. ETI will be far more advanced than we, and should be as easy or easier to detect than planets.

Looking for artificial radiation sources is also a good strategy. They will be too small or too faint or too relatively bright or faint in certain spectra to be stars; indeed they will probably have very artificial-looking spectra. These artificial lights will be parts of astrostructures, rather than strung out on the surface of a planet as in our current brief stage of human development.

The very existence of a planet around a star is strong evidence *against* the existence of ETI there. Dandridge Cole and Gerard O'Neill long ago showed that planets are a very poor way to house a technologically advanced civilization -- they are a big waste of mass.

Ask Dr. SETI ®

Locating my Project Argus Dish

Dear Dr. SETI:

I need some guidance regarding where to site my new dish. There are some public utility electric service lines coming in on one side of my property. The other side has trees to the S & SW. I have a clear shot to the N & NW, however. The back side of the house (where you couldn't see the dish at all) is surrounded by tall trees. Any suggestions?

Rich, Georgia

The Doctor Responds:

Rich, remember that the Earth rotates on a west-to-east path. In drift-scan, that becomes your azimuth rotor. So, to maximize sky coverage over time, your dish should move in elevation on a north-south arm.

This will require some creativity with the mount, because TVRO dishes are generally set fixed in elevation (to coincide with the Clarke Belt), and rotate in azimuth (to track across it). So the mount needs to be varied vertically 90 degrees from the normal configuration. Siting then involves finding a location where, with respect to pointing straight up, you can get the maximum sky view in a north-south arc.

If you want the dish in the back yard, among the tall trees, then find a place where you can point it straight up (bird-bath mode) between the trees, with minimal blockage -- hopefully, nothing within a cone of 20 degrees or so with respect to the vertical.

Hope this helps.

Lagrangian Points for SETI

Dear Dr. SETI:

Do you know of any attempt to look for microwave ET probes that may be at L5/L4 points? I think I might put my system there for a look.

I was thinking - If ET were to send Bracewell type probes to its nearby stars they would park them around each planet at its L5 point. They would be low power because they would be powered by sunlight alone, but could have large antennas that unfurl and point at each planet.

I think that I would just have to point at a location off the moon by ±60 degrees and track it, but I'm not sure. Do you know where I can come up with the calculation of these points?

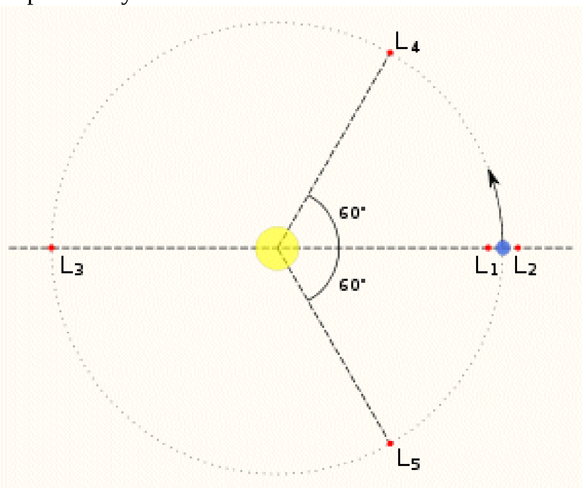
Jim (Argonaut)

The Doctor Responds:

Jim, the idea of parking interstellar probes in Lagrangian points has occurred to many of us on Earth, so the Assumption of Mediocrity suggests that extraterrestrials may have had the same thought! But, before we can decide where to point our antennas, we need to consider *which* set of Lagrangian points we're talking about.

Three-body problems in orbital mechanics are always mathematically challenging, and in many cases intractable. In

1772, Joseph Louis Lagrange figured out an interesting special case. In an orbital system with the proper mass ratio between the primary and secondary objects,* there exist five points where the gravitational attraction of the two bodies upon a third object is in equilibrium. These three points are today called the Lagrangian Points, and are designated L1 through L5. In the case of the Earth and the Sun, for example, they are shown pictorially here:



There exists a similar set of five Lagrangian Points in the Earth-Moon gravitational system. Likewise, there are similar stable points in systems involving other planets and their moons. So, there are a good many L1, L2, L3, L4, and L5 points in our solar system alone.

If an extraterrestrial astronomer can detect a star and its planets, deduce planetary orbits, and estimate stellar and planetary masses, then such a being can compute the existence and location of the resulting Lagrangian Points. Parking an interstellar probe in these gravitationally stable regions is trivial -- at least, to the extent that *anything* involving interstellar travel can be considered trivial!

In the case of Lagrangian Points in a planet-moon orbital system, it gets a little more challenging, because our hypothesized extraterrestrial astronomer has to detect, and analyze the orbits of, moons around exoplanets. I'm not ruling this out, just pointing out the difficulties.

To date, a few searches for gravitationally stable interstellar probes have indeed concentrated on Lagrangian Points in the Earth-Sun system. It is reasoned that a civilization detecting the Earth will know that it is in its star's habitable zone (just as we know this about a few of the exoplanets we have detected from Earth). If you want to search for probes in the Earth-Sun L4 and L5 points, all you need to do is point your antenna in the ecliptic (the plane of the Earth's orbit around the Sun), at points in space leading and lagging the Earth by 60 degrees. In other words, look in space where the Earth was two months ago, and where it will be two months hence. Who knows? You might get lucky!

* Specifically, the ratio of the masses of the primary and the secondary objects must exceed 24.96, for stable Lagrangian points to exist.

Why Not Look Locally?

Dear Dr. SETI:

I just don't understand why we are searching deep space when there are already highly advanced and highly evolved non humans in our airspace doing exactly what they want, and we all know it, but for some reason most people are in denial or blinded by indoctrination.

We must stop thinking things are the way we expect them to be, because, they are not. I believe in the not too distant future, that SETI will be ridiculed for being so backward thinking. I ask you, which is more significant, creatures already in our airspace most people can't even comprehend, or a chance signal from a distant galaxy?

It just does not make sense to me! No offense intended...just frustration.

Peter (UK)

The Doctor Responds:

Peter, I understand your frustration. Let's assume for the sake of argument that you are entirely correct about advanced beings in our airspace. Let's further assume that extraterrestrial civilizations are common and numerous (I see no reason not to start here). If ETI is as diverse as humanity (and again, I see no reason not to assume that), then we have something different to learn from *each* civilization we might encounter.

True, I can learn a lot from my local neighbors here in the US, but should that stop me from also seeking a dialog with other humans in, let us say, the UK (or anywhere else)? Similarly, even assuming there are "highly advanced and highly evolved non humans" here on Earth, why should this stop me from also seeking other ETI elsewhere in the universe?

If you have the expertise to study and communicate with ETI here on Earth, then you should certainly do so. As a radio astronomer, I have (arguably) the expertise to establish contact with other ETI at a greater distance, so I should certainly do so! We each play to our individual strengths. ❖

Dr. SETI ® studies a Small Radio Telescope at the recent International Astronautical Congress in Korea. AF6KD photo. →

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Director (Patron membership plus seat on advisory board)	$100,000
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