# SearchLites

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# The Date Equation

## by David Grinspoon

***Editor's Note:*** *This delightful analogy on the Drake Equation is excerpted from Dr. Grinspoon's new book Lonely Planets, ISBN 0-06-018540-6, © 2003, Harper Collins Publishers, New York.*

Say you are a single person going to a large dance party, and you would like to come away with a date for the following weekend. Arriving in front of the house, you can hear the music pumping and feel the bass rattling your gut. You are excited, but nervous as hell, so you decide to calm yourself with some math. Before going inside, you try to calculate your chances of getting lucky. You start by guessing the total number of people at the party. You notice that people are arriving at a rate of three per minute. We'll call this rate of arrival R. People are leaving at roughly the same rate, but you realize that you can estimate the number of people inside if you know how long they are staying. Let's call this length of stay L. The number of people inside will be roughly R times L. So, if people on average are staying for, say, one hundred minutes, there will be about three hundred inside.

But they are not all potential dates. After all, you have standards and preferences, and some may not be available. So you multiply the total number at the party by several factors, each expressing the probability that the average partygoer will meet one of your requirements. Each of these probability factors will have a value between zero and one. Zero means that nobody measures up to a particular requirement. One means that anyone will do. If half of them are okay, the probability is one-half, or 0.5, and so on.

For instance, you might want to rule out potential dates because they don't fit your sexual *p*reference. We will call this factor $f_p$ (pronounced "f-sub-p") and assume that this is roughly 0.5, meaning that it rules out half of the people there. Then you are going to multiply that by the fraction that you find yourself *at*tracted to. If you are being picky, we'll say that $f_{at}$=0.1. In other words, one in ten, meet this criterion. Again, it cannot be higher than 1, even if you are drunk or desperate. Now, some people are not going to be *av*ailable because they are already hooked up and not interested in multiple partners. Let's say optimistically that a quarter of the people (or 25 percent) you are interested in are free. So $f_{av}$=0.25.

You also have to factor in your own behavior. Some are just so hot, you can't get up the *n*erve to talk to or dance with them. But all this math is making you feel pretty confident, so we'll say you can deal with approaching three-quarters of them: $f_n$=0.75. Then we have to multiply again by the fraction who turn out to actually be *i*nterested in you. Because you are fascinating and fun to dance with, and because you can talk knowingly and winningly of probability (chicks and cats dig that), no one can refuse you, so $f_i$=1. Assuming you have not forgotten any important factors, you can now estimate your chances of scoring at the party. The total number of likely candidates, N, will follow the formula

$$N = R \times f_p \times f_{at} \times f_{av} \times f_n \times f_i \times L$$

This is the "date equation." Given the numbers we've estimated, N = 3 x .5 x .1 x .25 x .75 x 1 x 100. So, N = 2.8. 2.8 people at the party will go out with you next weekend. Jackpot! Although, this is just a rough estimate, since we had to estimate the various factors, your best guesses lead to an N greater than one, so you figure your chances for success are pretty good. Thus emboldened, you check your hair one last time and enter the party....

The Drake Equation is parallel to the date equation, but the party we wish to crash is much larger, more frightening, and more enticing. ❖

*Book Review:*

# If The Universe Is Teeming With Aliens... Where Is Everybody?

## Fifty Solutions to the Fermi Paradox and the Problem of Extraterrestrial Life

**by Stephen Webb**
**Copernicus Books, New York, 2002**
**ISBN: 0387955011, 304pp., $27.50 hardcover**
Reviewed by Milan M. Cirkovi (carioch@eunet.yu)
Astronomical Observatory Belgrade

The simplest estimate tells us that the characteristic time-scale for touring the Milky Way is about 10^7 years for using the technologically acceptable velocity of 1% of the speed of light. This is more than three orders of magnitude smaller than the age of the Galaxy (12-14 Gyr). Assuming there are other technological civilizations out there and that we are an average one, some will be more advanced and others less so. So the question arises: where are those that are more advanced? This is Fermi's paradox in a nutshell. An urban legend (corroborated by historical research!) says that the great physicist Enrico Fermi (1901-1954) at a dinner asked "Where is everybody?" aiming his remark at the obvious absence of extraterrestrial civilizations (henceforth ETCs) or their manifestations.

There are scientific problems which are so difficult that literally dozens of solutions are proposed in the research literature. Origin of life on Earth in biology or the nature of narrow absorption lines in quasars in astronomy are examples of such problems. The origin of gamma-ray bursts was such a problem in astronomy until recently, when it was triumphantly solved by tremendous advances in both observations and theory. However, no such "big" problem is more challenging and fascinating than the problem of extraterrestrial intelligent life, and especially the aspect dealing with Fermi's paradox. *If The Universe Is Teeming With Aliens…Where Is Everybody?* by the UK physicist Stephen Webb (Hereafter referred to as "Where is Everybody? "), thus sets out to perform an ambitious task of investigating all relevant solutions to the problem. The aim of this book is to expound Fermi's paradox in all details and to offer a comprehensive list of solutions proposed in the literature so far. Thus, the book will be useful to the specialist and layman alike, though probably for different reasons. To researchers in biology, astronomy, and cognitive sciences, it will be useful as both a compendium of ideas and a wealth of research challenges for making precise quantitative models. On the other hand, Webb's book has a tremendous potential for public outreach, and communication of modern scientific ideas to the general public in the best manner of two great, unfortunately late, astrobiologists, Carl Sagan (1934-1996) and Sir Fred Hoyle (1915-2001).

The very concept of this book is an excellent antidote to scientific dogmatism which easily arises in fields with so little empirical knowledge and so many conflicting theoretical ideas; it is this dogmatism which, unfortunately, makes synthetic reviews, such as Webb's, so rare, in spite of the explosive development of astrobiology. This book is best to read in tandem with Ward's and Brownlee's recent astrobiological treatise Rare Earth. There are many points of contact, and ideas are obviously complementary, especially since Webb devotes the largest part of the discourse to scenarios which in one way or another imply rarity or uniqueness of the terrestrial-type conditions. Rare Earth certainly makes understanding of some of Webb's points significantly easier, especially in the last two Chapters. There is no special background knowledge required, although some understanding of modern astronomy and biochemistry will be immensely useful to a prospective reader.

Introductory parts (Chapters 1 and 2) contain a wealth of historical and anecdotal material about Fermi and his dinner party paradox (as well as some other paradoxes in the history of science), making for refreshing and instructive reading. The book's substance comes in three large chapters, corresponding to what Webb perceives as the main watershed in attempts to address Fermi's paradox: Chapter 2 considers solutions of the paradox which deny the main premiss by claiming that ETCs are here (#1 through #8); Chapter 3 deals with the replies contending that they exist, but have not yet communicated (#9 through #30); Chapter 4 is comprised by those solutions accepting the conclusion that, in some sense to be further specified, we are alone (#31 through #49). A final Chapter, very brief, deals with the single solution (#50), which the author finds the most convincing (more on it below).

Webb's book appears almost exactly two decades after arguably the finest review article on the topic, David Brin's "The 'Great Silence': the Controversy Concerning Extraterrestrial Intelligence" (Brin, G. D. Q. Jl. R. astr. Soc. 24, 283 (1983)). In the meantime, there have been very important advances, especially in extrasolar planet detection and biochemistry of early life. Other relevant developments concern the role of catastrophic occurrences in the history of terrestrial life, our improved understanding of Galactic chemical evolution, as well as planetary formation and evolution, and discoveries of a number of extremophile lifeforms potentially having their extraterrestrial counterparts.

Where Is Everybody? contains a wealth of information on these topics, masterfully weaved into a colorful tapestry of an engaging intellectual quest. Most of the hypotheses Webb reviews are attractive proposals in their own right; but he takes into account several distinguishing parameters and motivations, some of them of quite recent origin. Notably, Webb's insistence on favoring "non-sociological" explanations of the paradox (i.e., excepting those which assert that ETCs for some reason do not wish to contact us) is highly commendable, being perfectly in tune with the general tone of modern astrobiological discussions.

Among many merits of this book, the most obvious one is its relaxed style which enables easy digesting of occasional portions of complex material. There are such portions present, in spite of the book being occasionally marketed in the "Popular Science" sections. One of its very best features is quite explicit emphasis on the multidisciplinary nature of the task. As such, it delights with many side issues, some of them making the book worth in themselves. Agreeable digressions include such gems as Smolin's self-reproducing evolutionary Universe theory (pp. 56-59), the puzzling Voynich manuscript (pp. 119-120), or Chomskyan neurolinguistics (pp. 224-226). In addition, there is a lot of material scattered throughout the book which can serve as a neat introduction to astrobiology at the undergraduate level.

The book contains a wealth of references to popular culture, notably SF publications and movies, which is legitimate

and commendable, since the same cultural aspects motivated a large number of researchers in astrobiology. After all, a large part of the discourse about extraterrestrial life and intelligence that people encounter is in form of fiction and other recreational contexts. What is a bit less commendable is Webb's cultural bias, since all his references in this domain are to books (and movies) of Anglo-American science-fiction. This is a pity, since some of the best relevant SF appeared outside of that cultural milieu; shining examples that come immediately to mind are Stanislaw Lem's His Master's Voice and Fiasco, as well as Strugatsky's Roadside Picnic (and the brilliant 1979 movie Stalker made by Andrei Tarkovsky using this novel as its basis). The omission is even more serious, since some of these books offer a detailed hypotheses, elaborated as much as some of Webb's solutions; see, for instance, the chapter on neutrino-encoded alien message in His Master's Voice.

On the technical side, Where Is Everybody? passes with flying colors. The volume is robustly made, as well as aesthetically pleasing. Graphical design of the book is attractive, though somewhat unconventional. Some of the illustrations are truly splendid (e.g., the tearing of the Berlin wall, p. 132, or the atmospheric ozone depletion, p. 168), and the book is a rarity in being almost entirely free of typographical errors. It has a large bibliography, including some important WWW addresses, which is generally satisfactory, with some exceptions listed below.

On the other hand, the book as it stands has several demerits. The division of proposed solutions into three large groups is certainly satisfactory. What I really desired, however, was a succint comparative analysis at the end of each major Chapter (3, 4, and 5) giving main pros and cons of the solutions presented, possibly in tabular form. Even if these assessments were subjective, they would still be useful since they would highlight the most important points in sometimes intrinsically confusing hypotheses. In addition, such summaries would motivate reasonable polemics and comparative analysis of the issues involved. However, after reading each major Chapter of Where Is Everybody? one is left with a feeling that similar credability can be assigned to many of the hypotheses presented, which clearly is not the case. Also, it is a bit strange that in a book devoted to search for extraterrestrial intelligence the question "What is intelligence?" is not tackled until page 218! While it is clear that these fundamental issues are usually not part of the concern of a practicing astrobiologist, still it seems that a comprehensive review must delve deeper into foundational topics than Webb undertakes.

Some solutions of Fermi's paradox offered by Webb are not very serious, and that does not apply only to the jocular #1. For instance, #24 (ETCs developing different mathematics) is not only incorrectly formulated, but rather incredible as the solution of the very real problem. The same applies to #29 (cloudy skies prevent development of science everywhere else) and #30 (particle horizons limit detectivity of ETCs). The latter is essentially non sequitur, since Fermi's question applies to our Galaxy, as the fundamental unit of the cosmological distribution of matter. To claim that ETCs are beyond our cosmological horizon is the same as to claim that we are alone; it actually begs the question. To this, one is tempted to add another problematic feature: solutions which are made non-serious by poor presentation. The treatment of the "Berserker" solution (#22) is an example. Its main idea is that the self-replicating extraterrestrial probes will act destructively against other civilizations (or simply advanced lifeforms), instead of colonizing or peacefully exploring. The idea has been suggested several times both in SF literature and in SETI discussions at conferences or in newsgroups, but Webb quotes perhaps the least appealing source, Fred Saberhagen's "Berserker" novels. We read that it "has been criticized on several grounds," but we do not learn by whom. On the contrary, in the best review predating Webb's book (Brin's article), it is selected as one of only two entirely satisfactory solutions to the problem. In addition, this solution has been seriously misrepresented; when one uses the version of Brin (or, for SF fans, Gregory Benford in his "Galactic Center" novels) most of the "problems" dissolve; they are artifacts of Webb's presentation.

There are two basic types of problems in detailed presentations of individual solutions in the book. One, more of the annoyance type, is the lack of exact references and original sources at many places. For instance, if we read about the fascinating (though, of course, completely ludicrous) idea of a serious chemist that the Martian moons are artificial satellites launched in 19th century (p. 39), than we would like to know the exact source of such a hilarious claim – and we don't get it. The other, more serious problem, is the lack of some important pieces of the story for quite a few of those 50 solutions. For example, in discussing the possibility of an alien presence in the Solar System, Webb does not mention the well-known case of near-Earth object 1991VG, whose unlikely orbit prompted serious inquiry into whether it might be of alien origin. Limits on the detectability of astroengineering with present technology would be very useful at several points in the book, but this important issue has not been considered at all! Similarly, solution #39 (The Galaxy is a dangerous place) mentions in passing the idea of deadly neutrinos originating in terminal collapses of massive stars, but fails to attribute it properly to Juan Collar who first suggested it in (the highly visible) Physical Review Letters article in 1996.6 Solution #34 ("We are the first") fails to reference arguably the most important recent work in this respect, the paper by Charles Lineweaver,7 which is the first attempt to give a quantitative treatment of the ages of terrestrial planets throughout the Milky Way. Lineweaver's result that, on the average, Galactic Earth-like planets are 6.4 (± 0.9) Gyr old certainly impacts more than one hypothesis proposed to account for Fermi's paradox.

In such an ambitious project, some redundancy is unavoidable. However, one would expect redundancies to be of a subtler nature than simply rephrasing an entire solution, depending on the emphasis of the original authors. The most blatant example is distinguishing between #8 (God exists) and #31 (the Universe is here for us), which are even located in different Chapters, although they both distill to the same simplistic anthropocentric idea. Also, the rather well-known "Zoo Hypothesis" of John Ball (#5) is just a special case of the general "Interdict Hypothesis" (#6). As if that wasn't enough, both of these solutions are in fact special cases of an even more general suggestion, #23 ("The have no desire to communicate")! If Webb's approach were historical, this would have some justification (if one can argue that the ideas developed independently, or were differently motivated), but this is obviously not the case.

In general, the treatment of the "catastrophist" solutions (e.g., #22, #27, #39, #40) is rather incomplete and biased; this

is seen even in the distribution of the material between the Chapters. Annis' ingenious hypothesis that gamma-ray bursts can regulate the development of complex life on the Galactic scale is put into Chapter 5 ("We are alone") instead of Chapter 4 ("They exist unnoticed"), although the author himself admits that according to this hypothesis "there is nothing special about Earth or humanity; there may be tens of thousands of ETCs in our Galaxy at or near the same stage of development" (p. 172). In addition, the whole idea of "Galaxy as a dangerous place" is mispresented by asserting that we should search for an explanation of our own existence if the risks are high ceteris paribus. That is not so, since any risks (say, supernovae explosions) are stochastical, and we need to use Bayesian probabilistic formalism to determine whether some occurrence is likely or unlikely. In this context, the observation selection effects are all-important, since we cannot, obviously, observe complete lack of life in the Galaxy. Webb's treatment of "luck" shows his "optimistic" bias in an amusing way: talking about the danger of overpopulation, he writes that "if we are lucky, the world's population will... reach a steady state" (p. 125), but when it comes to the danger to life from nearby supernovae "luck is a poor sort of explanation" (p. 169).

As for the preferred solution of the author (#50), it is a bit of an anticlimax; as if in a murder mystery novel or film, after lots of suspense, masterful psychology, ingenious deductions, and unexpected plot twists, you discover that the killer is the butler who found the body, since all other persons involved turn out to have unshakeable alibis. This is not to say that the solution is itself flawed; after all, there are some exciting detective novels (e.g, some of George Simenon's best) with exactly this kind of structure. Still, without disclosing too much, it seems that two natural tendencies of any author of review texts, namely to give a satisfactory conclusion to the whole project and to express a personal expert opinion on it, conflicted in this case. As a result, we receive a patchwork quilt solution into which too much is subsumed (and assumed!) and too little explicated and interpreted. Personally, I do not find the concluding solution persuasive, but that is not a serious misgiving as far as the book is concerned, since little space is actually devoted to it.

This brings us to probably the most obvious attraction of Where is Everybody. The solutions Webb offers are many, and everybody will find at last a couple to her/his own taste. As noted by Jorge Luis Borges, from Homer onward we know that making long lists is a matter of style, apart from often being a necessary endevour. One of the "secret" pleasures of reading Webb's book is that everybody can choose his/her favorites out of 50 or so candidates (even with the redundancies mentioned above) candidates. My personal "top five" picks are, #32/#39 (Life can have emerged only recently/The Galaxy is a dangerous place), #11 (Percolation theory), #22 ("Berserkers"), and #7 ("Planetarium hypothesis"/Simulation argument). Enjoy making your own list!

All in all, Webb's book is a worthy addition to the rather small library of serious monographs on extraterrestrial life and intelligence. It is far from being perfect, and some of its flaws are really hard to excuse. One should not take it at face value without at least some acquaintance with other important review literature in the field, notably Brin's seminal article. But it is still a valuable contribution to the field in which, paradoxically enough, this sort of synthetic study is sorely lacking at exactly the time when it is most needed. As mentioned above, it is very difficult to find a book even similar to it, and it certainly is more than worth its (rather low) price. Its rereading potential is great, and it will be interesting to follow how many new and exciting astrobiological studies currently planned or on the way will influence the solutions Webb lists – or add new ones. Even if you take large chunks of it with a grain of salt, Where is Everybody? deserves a place on the bookshelf of any person curious about the Universe and life in it, in both professional and lay domains. ❖

## Scientists Gamble on SETI Success

For decades, proponents and critics of the scientific Search for Extra-Terrestrial Intelligence (SETI) have debated whether intelligent life even exists beyond Earth, let alone whether our technology can ever detect it. As our knowledge of the cosmos has increased, and the existence of extraterrestrial intelligence as become generally accepted as a given, SETI enthusiasts have begun to debate the specific form that the first confirmed detection might take. Now three ardent SETI supporters have formalized a wager over that question.

Allen Tough, longtime proponent of the search for autonomous robotic probes in our Solar System, threw down the gauntlet last year by predicting that the first confirmed and accepted evidence of extraterrestrial intelligence would be found within our Solar System, rather than across the interstellar gulf. He invited his colleagues to post odds in support of the alternative hypothesis, and two SETI supporters have taken up the challenge. H. Paul Shuch and Louis Scheffer have gone on record as predicting that an interstellar detection will occur first, and have put up money on the question.

At stake in the pooled bet is the modest sum of $1000 US. In the event that Tough's prediction proves true, that amount will accrue to the nonprofit SETI League. Should Scheffer's and Shuch's prediction pan out, a like sum will be donated to -- the nonprofit SETI League! "This is a no-lose bet as far as our grassroots effort is concerned," states Shuch, who serves as The SETI League's executive director. "We all agree that ETI will ultimately be discovered. The only open question is where it might first rear its lovely head."

The SETI bet is being brokered by LongBets.org, a nonprofit organization which deals solely with long-range questions having societal significance and measurable outcomes. All funds collected by LongBets ultimately benefit recognized charities, though it might take some time to conclusively answer the questions they raise. This is the first time that parties to a LongBet have all selected the same beneficiary, win or lose.

"If it is at least a hundred years ahead of us," argues Prof. Tough, "a civilization will have the capacity to explore the galaxy with small super-smart interstellar probes. It will be motivated by the desire for an up-close look at other civilizations and by the benefits of rapid two-way communication between the super-smart probe and each civilization. Surely it will be easier for us to make contact with a near-Earth probe than to find a distant needle-in-a-haystack signal!"

"It's all a matter of instrumentation," counters Dr. Shuch. "Right now, we know how to detect radio emissions from the stars, and have developed some powerful instruments for doing so. Although I don't dispute the probable existence of interstellar probes, the fact is we don't yet have the technology to reliably detect them. So I'm betting on interstellar radio contact, the traditional technology of contemporary SETI."

# European Astronomers Honor SETI League Founder

**Heppenheim, Germany.., September 2003** -- At its triennial Congress, the European Radio Astronomy Club has awarded its highest honor to Richard Factor, the American industrialist who nine years ago founded the nonprofit international SETI League, Inc. Factor, who has served as The SETI League's president since the group's inception, was honored with the European group's DSP-FFT Award for his global vision and leadership in the scientific Search for Extra-Terrestrial Intelligence.

DSP-FFT stands for Digital Signal Processing (the analysis of scientific data by computers) and Fast Fourier Transform (the primary mathematical tool used by scientists to perform DSP). The award is presented every three years to a person or persons making significant contributions to radio astronomical research. In his professional life, Factor is president of Eventide Inc., an American electronics company that manufactures high-quality DSP equipment for the broadcast industry. One of Eventide's products appeared onscreen as a prop in the Hollywood film "Contact" a few years back.

The European Radio Astronomy Club (ERAC) is a society of over two hundred professional and amateur experimenters, students, teachers and scholars from all over Europe, and beyond, engaged in astronomical research in the radio spectrum. The group has its own radio telescope in Mannheim, Germany, in addition to private observatories built by its members around Europe. ERAC is a SETI League affiliate society, many of its members also belong to The SETI League, and its president, Peter Wright, serves as a SETI League volunteer Regional Coordinator.

SETI League executive director Dr. H. Paul Shuch accepted the award in Factor's behalf at the third triennial European Radio Astronomy Congress, held recently at Heppenheim's Starkenburg Observatory. The award consists of a certificate, and a trophy fashioned out of a Campbell's Tomato Soup tin. "The soup can," explains Shuch, "is evocative of a landmark experiment conducted here in Germany, in which noted digital signal processing experts analyzed computer files corresponding to various acoustical phenomena. They mistook the electronic signature of a boiling kettle of tomato soup for human speech, underscoring the difficulties faced daily by SETI scientists -- difficulties which Richard Factor is helping us to overcome." ❖

## SETI League Strengthens European Ties

**Heppenheim, Germany.., October 2003** -- Although registered as a United States nonprofit corporation with headquarters in New Jersey, the grassroots SETI League has always enjoyed an international flavor, with its 1400 members hailing from 64 different countries on six continents. With a recent significant increase in SETI interest and activities throughout Europe, the educational and scientific organization has begun to allocate an increasing percentage of its resources toward supporting its members on that continent. Plans are now being laid for The SETI League to host its first scientific meeting in Europe, in March of 2004.

"I find myself spending more and more time here," noted SETI League executive director H. Paul Shuch during a visit to Germany earlier this month, "in part due to the kind hospitality of my European friends, and partly because Europe is emerging as a real hotbed of SETI science." Dr. Shuch was recently made a member of the Starkenburg-Sternwarte e.V. in Heppenheim, one of the oldest private astronomical observatories in Germany, and host to the last three triennial European Radio Astronomy Congresses, of which The SETI League was co-sponsor. One of his first acts as a member of the Observatory was to secure their Board's approval to schedule there a SETI Science and Technology Workshop.

As a recently inducted member of the International Academy of Astronautics (IAA) and an active participant on their SETI Permanent Study Group, Shuch is seeking official IAA sanction for The SETI League's planned workshop, which has been tentatively scheduled for the weekend of 26 to 28 March, 2004. Academic papers will be presented on a variety of topics related to the scientific Search for Extra-Terrestrial Intelligence, a formal Proceedings will be published, and various social events are planned, to encourage further collaboration between SETI League members throughout Europe.

"Given the success of the three SETICon Technical Symposia we held in the US over the past three years," says Shuch, "it seems most appropriate to begin hosting similar events at various other SETI Centers of Excellence around the world. I am hoping the March meeting will be the first of many, held wherever SETI League members may care to congregate."❖

## Event Horizon

**December 12 - 14, 2003**: *Philcon '03,* Philadelphia PA.
**February 6 – 8, 2004:** *Tropical Hamboree,* Miami FL.
**February 13 – 15, 2004:** *HamCation 2003,* Orlando FL.
**February 13 – 15, 2004:** *Boscone 41,* Boston MA.
**March 12 – 14, 2004:** *Contact 2004 – Mars, Myth and Reality,* Mt. View CA.
**March 26 – 28, 2004:** *EuroSETI04 Science and Technology Workshop,* Heppenheim Germany.
**April 17, 2004:** *Sixth Annual SETI League Ham Radio QSO Party*; 14.204, 21.306, and 28.408 MHz.
**May 28 – 31, 2004:** *Balticon 38,* Baltimore MD.
**June 28 – 30, 2004:** *Society of Amateur Radio Astronomers Annual Meeting,* NRAO Green Bank WV.
**July 12 – 16, 2004:** *BioAstronomy 2004, Search for Habitable Worlds,* Reykjavik Iceland.
**July 22 – 25, 2004:** *Central States VHF Conference*, Toronto Canada.
**August 6 – 8, 2004:** *SETICon 04* SETI League Technical Symposium and Annual Membership Meeting, in conjunction with the *11th International Ham Radio Moonbounce Conference,* The College of New Jersey, Ewing (Trenton area) NJ.
**September 2 – 6, 2004:** *Noreascon Four* World Science Fiction Convention, Boston MA.
**October 4 – 8, 2004:** 55th *International Astronautical Congress,* Vancouver BC Canada.
**August 4 – 8, 2005**: *Interaction* World Science Fiction Convention, Glasgow, Scotland UK.
**October 17 – 21, 2005:** *56th International Astronautical Congress,* Fukuoka Japan.
**August 23 – 27, 2006:** *LA-Con IV* World Science Fiction Convention, Los Angeles CA. ❖

*Guest Editorial:*

# The Silver Lining that is the Space Age



When one contemplates the tragic loss of the Space Shuttle Columbia and its crew of seven astronauts, it is often hard for many of us to separate our emotions from the reasons why we send human beings into space and why those people willingly accept these daring and dangerous missions into a realm that can quickly end life from only a few missteps.

The Space Shuttle Columbia Mission STS-107 was a case in point. Outside of the fact that the first Israeli astronaut was on this flight, the general public knew or cared little of what the mission objectives were. Most media coverage was brief and often buried amidst unrelated news. This Shuttle would not even be docking with the International Space Station (ISS) Alpha. Instead it would "simply" circle our blue globe for sixteen days. The astronauts would conduct over eighty different experiments designed to compliment the work being done on the ISS.

The important fact is that this mission's experiments did relate directly to our daily lives here on Earth. The researchers studied the major functions of the human body in the purer microgravity environment as it affects the brain, heart, lungs, blood vessels, and the nervous and immune systems. They watched how fire works in space. Earth's ozone layer and our planet's climate were examined for clues to how different environments interact with each other.

Is this the emotional equivalent of landing humans on Mars or discovering extraterrestrial life? Not really, but it is good solid research, the kind that has benefits way beyond some brief public attention.

It is sometimes hard to see what good such things can do for us in our hectic, busy lives, but the space program is full of examples where designing and testing devices for space travel have led to major improvements for our society.

One area we are all familiar with to various degrees is computers. In the early days of these analytical machines, they tended to be the size of large rooms and used hot, expensive vacuum tubes that frequently failed and had to be replaced.

Computers were the logical systems of choice when the Space Age arrived with its complex spacecraft and rockets. However, to build a rocket booster that could lift those room-size monsters was both prohibitive and impractical. Engineers and scientists had to find a way to shrink them down to fit in the very confined places aboard a space vessel. Thanks in large part to this need from the Space Age, we now have sophisticated computers that can be held in the palm of your hand with more power than every computer built before the advent of the first space launches.

Another field advanced by space is what the STS-107 crew largely focused on: Medicine. Many past space developments, some not even related to the medical field, have made major contributions to this science.

One prime example is angioplasty. The Dymer™ 200+ excimer angioplasty laser system was first used for studying atmospheric turbulence from satellites. It was later modified to help remove fatty buildup blocking arteries that could lead to heart attacks.

The miniaturization that worked so well for computers also applies to medicine. Thanks to engineers who created small measuring instruments including tubes, valves, and pumps, these same devices have been used to perform such tasks as assisting weakened hearts in pushing blood through the body. This research is part of NASA's Programmable Implantable Medication System (PIMS).

The technology made to enhance images of the lunar surface during the Apollo program now allows doctors to view inside the human body without needing invasive and potentially dangerous surgeries.

A device made for Apollo astronauts to drive the Lunar Rover with one hand led to a similar technology called the Unistik Controller for helping quadriplegics get around with relative ease in their wheelchairs, certainly making their daily lives easier.

Not all benefits come from manned space missions. Our robot satellites and space probes have greatly contributed to our expanding knowledge since Sputnik 1 entered Earth orbit in October of 1957.

Imagine how limited our weather forecasting would be without meteorology satellites. Thousands of lives have been saved from oncoming hurricanes over the decades because electronic eyes in space monitored the paths of those devastating storms. This vital information allows authorities to warn residents in the way of hurricanes to reach safety in time. Other types of Earth monitoring craft have kept track of plant growth to improve our understanding of the environment and watch foreign military actions to guard against sneak attacks.

Communications satellites have allowed us to talk to anyone anywhere across the globe at the speed of light. Watching television broadcasts and receiving cell phone calls and e-mails from even remote places are routine occurrences, thanks to these tireless machines high above us.

I hope these examples have helped to create a better understanding of why people like the astronauts of the Space Shuttle Columbia and the many thousands of others who work in the aerospace industries have dedicated their lives - in certain instances to the fullest extent - to space exploration and development. They weren't doing it for some esoteric, abstract goal; they were playing truly important parts to improve all of our lives physically, intellectually, and culturally.

The next time you hear about a space mission being launched, know that it is yet another piece of our lives and our future being dedicated by your fellow human beings who see the true value of space exploration for us all. Some information gathered might seem abstract, but it may have significant uses we cannot even comprehend at present. As English physicist Michael Faraday once said when asked of the possible use for one of his inventions, "What use is a newborn baby?" Like a newly born infant, space science is our future.

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## Complementary SETI Research Strategies

**by Scot L. Stride (scot.stride@interstellar-probes.org)**

There is wide agreement that many possible observational manifestations of extraterrestrial technology exist. These manifestations take the form of energy or matter markers. While manifestations of ET mind and consciousness might also be possible, designing observational experiments to search for such exotic markers does not presently fit within the scope of SETI.

Some argue that extraterrestrial consciousness studies are a necessary ingredient, but observational SETI researchers are not ready to go there. I agree. Of the more familiar energy and matter markers there are shared features. Electromagnetic emissions whether microwave or optical are the result of a physical device; these devices are artifacts. In the SETI research an alien transmitter, whether located on a very distant world or on a robotic space probe near our solar system, is an artifact of extraterrestrial technology. In essence, the SETI is an indirect search for artifacts of extraterrestrial technology.

SETV is the Search for Extraterrestrial Visitation. SETV is a new strategy - a hybrid of the SETA (Artifacts) and SETI strategies. Like SETI, SETV is a passive search for artificial emissions from ETI. Unlike traditional SETI, SETV is a local search within our solar system for physical artifacts of ET technology. These artifacts might be robotic probes which emit energies that are detectable on Earth. Being within the solar system it's also possible to directly image these artifacts.

When people hear the term "visitation" they mainly think of alien beings in ships coming to study Earth. Unfortunately the SETV strategy gets confused with UFOlogy; after all, SETV is a solar system search for ETI, and if ET probes can get here at all they might take an interest in life on Earth. Similarly there are large numbers who indiscriminately lump microwave SETI efforts with UFOlogical efforts; after all, both claim to be looking for ET. The truth is the SETI and SETV strategies complement each other; both are the opposite of UFOlogy.

SETI and SETV follow well established scientific methods handed down from decades of observational astronomy. Both strategies depend on instrument data for their scientific proof. UFOlogy, by the very nature of the available data, follows vastly different methods. UFOlogy methods range from archival and historical document analyses to collecting eyewitness reports and interviews with "abductees." Certain prominent figures in UFOlogy have tried in vain to apply observational methods to their research. Frustrated in their efforts they decided it was cheaper and easier to get their data in other ways (e.g., hypnotic regression, FOIA searches, etc.)

Unlike UFOlogy, which is ridiculed as being "psudoscience", modern SETI/SETV efforts avoid such cynicism by depending exclusively on objective data from electronic instruments. SETV, like SETI, is a passive observational experiment using instruments, sensors and computer technology. SETV is a scientifically based search within the solar system for active robotic spacecraft of presumed ET origin. The SETV search environment is bounded by the volume of space within the orbit of Pluto. There are two components to SETV, the "back porch" search and the "back yard" search. The back porch search, like SETA, endeavors to collect observational data in the space between the Earth's surface and the Moon (cislunar space).

The back yard search, termed Solar System SETI ($S^3$ETI), seeks indirect evidence of ETI artifacts in the solar system. $S^3$ETI is a targeted search for anomalous microwave or laser emissions using existing or future ground-based SETI resources.

In any case these robotic probes are expected to be remarkably advanced and endowed with artificial intelligence. Based on the history of Earth's space programs, it is far more practical and valuable to construct robotic probes to explore the cosmos than to send out biological entities. For example, the cost of the NASA Apollo program alone (~$25B) was significantly more than that spent on all NASA planetary exploration missions to date. However, we have learned more about the solar system from robotic missions than manned ones.

Robotic exploration continues to be a better deal for tax payers than manned exploration. While it's been postulated that advanced ETI could genetically engineer a crew to live and work in interstellar space, their first attempts at interstellar exploration will involve smart spacecraft.

Steven Dick postulates the universe could presently be in a "post-biological" epoch where artificial or machine intelligence dominates biological intelligence. As computer and nano technologies continue to advance at record pace, it's plausible that in the future our interstellar probes will possess artificial intelligence, autonomy, reconfigurability, self-repair and self-replicating capabilities. Many futurists and "big thinkers" predict major changes to society when intelligent self-aware machines come into existence. In fact, some believe biological intelligence is an evolutionary step towards machine intelligence, one that's better adapted to survive the interstellar frontier.

The SETI community generally agree that the first ETI we encounter will be vastly more advanced than us. To me "vastly" means highly evolved machines, not genetically enhanced humanoids. If we detect ETI in deep interstellar space it is likely to be an artificial intelligence. Intelligent machines will possess technological capabilities far beyond our present means. A machine intelligence may be in our solar system right now and detectable using the $S^3$ETI strategy.

The microwave strategy has dominated the SETI field for over forty years, and it's true that no artificial signals have been confirmed. With the impending construction of the Allen Telescope Array (ATA) the dominant strategy will have a new and powerful tool at its disposal. If ETI exist and are broadcasting EM signals, the ATA represents the best resource for detecting them. The ATA could operate for at least 20 years, and if no ETI signals are detected by 2025, then what?

SETI researchers are a patient bunch but they can't afford to pin all their hopes on the ATA. The SETI community must no longer ignore searching our own solar system for signs of ETI. The shared goal of all SETI researchers is to find valid and objective scientific proof that we are not alone in the cosmos. And believe it or not the cosmos includes our solar system! It is time for the SETI community to invest considerable intellectual resources on alternatives.

To foster innovative strategies, a "SETI Strategic Initiatives Workshop" needs to be organized and convened. Robert Bradbury points out that such a workshop may fall under the auspices of the NASA Astrobiology roadmap. While the roadmap goals exclude research into "signatures of intelligent life" a NASA sponsored workshop exploring alternative ways to identify "intelligence signatures" would be very healthy for the SETI. Lets get busy! ❖

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