

The Inadequacy and Impracticality
of the
Search for Extraterrestrial Intelligence

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For centuries, both astronomers and non-astronomers have been interested in aliens and in the search for extraterrestrial intelligence, or SETI as it is more commonly known. Long before the scientific tools and technology became available for such a search, science fiction writers and others wondered about the existence of extraterrestrial civilizations far more advanced than our own. In 1960, Frank Drake made the first realistic attempt to locate such a civilization with Project Ozma. Although Drake's search for unearthly intelligence was unsuccessful, it sparked off a multitude of SETI projects worldwide that continue to this day. Certainly, there is enormous potential for gains in knowledge and technology from extraterrestrial civilizations, but are these attempts at finding extraterrestrials worthwhile, or are they only fruitless fantasies with no chance of success? Some have argued against the existence of extraterrestrial civilizations, calling SETI a waste of time and resources. This, though, is not the real problem underlying SETI, as no one has proven the non-existence of extraterrestrials. A more important issue is the practicality of the search, as our currently limited capabilities may not be able to detect alien civilizations even if they exist. There are too many unknown variables that must be adjusted correctly for a successful search, such as searching at the exact location in the sky, searching at the right time, and searching at a specific frequency. With a long history of failures already, it is unlikely that we are capable of an immense project like SETI at this time. As the ineffectiveness of SETI may be unsolvable even with a massive increase in allotted resources, perhaps it would be best to leave our dreams about extraterrestrial contact to the future. The answers that we seek in space can wait until we have the answers we need on Earth.

Finding extraterrestrial life is the basic goal of SETI. Imaginative science fiction writers can invent elaborate tales about Martians and technologically advanced aliens, but the scientific questions regarding such a civilization remain unsolved. Many researchers and astronomers have attempted to resolve the problem by proposing hypotheses about the existence of extraterrestrial life. To estimate the number of extraterrestrial civilizations that are in our galaxy, researchers use the Drake equation. Formally, the Drake equation says that $N = R^* \times f_p \times n_e \times f_l \times f_i \times f_c \times L$, where N would be an estimate of the number of civilizations in our galaxy (Schwarzman). Unfortunately, none of the terms in the equation are known with much certainty, especially the last term, L , which is the lifetime of a civilization that can broadcast detectable signals into space. Extrapolating a value for L from our own experiences is extremely difficult, considering the relatively short time that we have had sufficiently advanced technology. Pessimists say L is relatively small, and consequently N is extremely small, because civilizations destroy themselves soon after reaching a certain technological stage with such things as nuclear weapons (Davidson). Even with the Cold War over and the possibility of a nuclear war diminished slightly, we are still in a poor position to predict how long our civilization will last and how long an average civilization would last.

Besides this pessimistic view of a civilization's self-destruction, other arguments exist for small values of N . Some assume that if there were an alien civilization, it would be motivated to colonize other worlds, which seems likely given our own desires to expand into space. Since there have also been billions of years in which a civilization could have spread throughout the galaxy, some ask, why have we not seen any evidence of another civilization? Some researchers have come to the conclusion that aliens should

be everywhere by now. Martyn Fogg believes that there has been enough time for intelligent beings to spread throughout the entire universe (Harrison 189). If there has been even one successful intelligent civilization in the past, we should have already detected some sign of alien life. Thus, some argue that we are alone in the universe.

But there are also arguments for the existence of extraterrestrial life. According to some hypotheses, we have not detected any alien civilization because other civilizations are purposely hiding themselves from us. The “zoo hypothesis” draws an analogy between our role in the universe and a zoo (Schwarzman). This hypothesis says that aliens are quietly watching us, similar to animals in a zoo. Another hypothesis, the “embargo hypothesis,” states that civilizations have an ethical code of not interfering with underdeveloped worlds like ours (Harrison 190). On the other hand, maybe civilizations are not purposely hiding themselves, but have no desire for communication right now. Astronomer Ned Durrice presents the idea of a “cognitive mismatch,” that it is improbable for two civilizations, at the same time, to have the capability for communication and to also have a desire to communicate (Hoffman).

We may never know which of the above hypotheses are correct. Carl Sagan, a noted authority in the field, used the Drake equation to estimate that there might be around a million civilizations in our galaxy (Sagan). But Sagan also realized the inherent uncertainty in his claim:

We must recognize the possibility that even with as many as 10^{22} planets in the accessible universe, the probability that one of them possesses a technical civilization may be 10^{-22} or less. We may feel that the probability must be higher, but we do not *know*. Indeed, the determination of such probabilities is one of the major motivations of a search for intelligent extraterrestrial life. (Shklovskii and Sagan 358)

In any case, we only have conjectures and no solid evidence, leaving this question of our uniqueness and place in the universe open to debate. This planet that we live on may or may not contain the only sentient beings in the universe. However, for the purposes of SETI, it seems reasonable to assume that we are not alone and that other intelligent life exists or did exist at some time. It is difficult to defend those who do not support SETI, based solely on the belief that extraterrestrial life does not exist. Considering the billions of stars and planets in our Milky Way galaxy, and given billions of years for life to evolve, we cannot hope to claim or reasonably establish that our blue planet is an abnormality among many. It is at least plausible that there is life somewhere out there waiting to be found.

The goal of SETI is to find such life. Due to the vastness of space, space probes could take tens of thousands of years to reach any destination at all, and humanity may be long gone by the time a response finally reaches Earth. Therefore, ever since Drake, astronomers and SETI enthusiasts have developed other ways to detect unnatural signals that could only be signs of another civilization. One common method, also known as radio SETI, examines electromagnetic radiation, specifically in the microwave region ranging in frequencies from 1000 to 100,000 MHz, since these can best penetrate the haze and dust of the universe. Perhaps it is based on a very human-centric belief, but scientists hope that civilizations will develop like our own and use radio as a means of communication. However, even for radio, which travels at the speed of light, the distances of space are still enormous. The closest star is more than 4 light years away, meaning that it would take at least 8 years roundtrip for us to send a message and to wait for a response. But the closest civilization is almost certainly much farther from us. Sagan

has estimated that it would take around 1000 years for one message to be sent to the nearest civilization (Shklovskii and Sagan 439). Obviously, the short-term goals of SETI could not include communication with aliens. For the same reasons, it is also absurd to worry about alien invasions or other civilizations finding and conquering us, as a direct result of SETI. By the time an alien spaceship could reach Earth, either all aliens aboard would have died or we would have had a couple thousand years to improve our technology. We are currently much more in danger of destroying ourselves and should not worry about SETI starting extraterrestrial wars.

An argument against SETI, commonly used by governments, points to the costs needed to run a SETI project. However, this is also a weak argument, as most radio SETI projects require relatively few resources. The most recent federally funded SETI project, based on a radio search of the skies, was the \$100 million, 10-year NASA program beginning in 1992 called the High Resolution Microwave Survey. It lasted for one year. Before Congress cut the funding in 1993, SETI cost taxpayers about a nickel per person per year (SETI Institute). Currently, the “world’s most sensitive and comprehensive search for extraterrestrial intelligence” is Project Phoenix, running on a \$4 million a year budget funded mostly by millionaires and corporations (SETI Institute).

SETI seems to be a good investment, but realistically, what can we expect from the search? There are basically two different scenarios that could occur. One, nothing happens, and we will continue to unsuccessfully search the skies. However, we could never prove that we were alone in the universe, and so would continue an endless search. A second possibility is that we will receive an unquestionably intelligent signal. What would humanity’s response be? The movie *Contact* (1997), based on Sagan’s novel

(1985), shows one plausible side effect of alien detection. In the movie, the global community becomes unified, as the world realizes that differences between the aliens and humans are much greater than differences among countries. Both decoding the alien message and building the large alien transport machine require the “economic equivalent of going to war” and require the combined resources of many nations. Besides the unification of countries for a common purpose, another possible benefit from communication with aliens is advanced knowledge. Shklovskii and Sagan estimate that the average age of a civilization that we detect would be 10,000 years or more (418). If, as in *Contact*, we were able to send someone to meet the aliens or were able to communicate with them, we could gain much knowledge from this advanced civilization. But even if we could not immediately communicate, as is most likely, we would have gained some very important knowledge about the universe and our place in it. We would know that it was possible to survive with technology and that technology does not necessarily imply destruction from such horrors as weapons of mass destruction. We would know that those who argued for small values of L were being too pessimistic, and using this knowledge, we could more accurately calculate the number of civilizations in the galaxy. And, most satisfying of all, we would finally know that we were not alone in the universe.

It sounds too good to be true, and it probably is. Unquestionably, the benefits to be gained from success would be enormous. But what are the chances of success? Since Drake’s Project Ozma about 40 years ago, there have been more than 50 different SETI attempts, none of which has found any signs of extraterrestrial intelligence. Perhaps it has only been bad luck that we have not found any sign of extraterrestrials, and tomorrow

may bring an exciting new discovery. But it is difficult to argue away our failures as bad luck. The chances of our hitting the right star at the right time are dismally poor. Even with Sagan's estimate of a million advanced civilizations in our galaxy, we would still need to examine a huge number of stars, with on average about 1 in every 1000 stars having a planet with an advanced civilization (Sagan; Shklovskii and Sagan 413).

Perhaps we can attribute this disturbing lack of success to our limited technology. Even in the short time that we have had the capabilities to scan the skies, our technology has grown amazingly fast. While Drake could only observe two stars with his meager equipment, Project Phoenix is literally millions of times more powerful than Drake's search. But even with our more advanced technology, what are the chances of finding another civilization in the vast regions of space? Kerr contends that "unless some other civilization is already beaming powerful signals our way, current capabilities would probably miss even abundant intelligent life." There are so many different "coincidences" that must occur for us to be successful.

We can see how limited the most powerful search, Project Phoenix, is by observing how much room there is for a miss of even a powerful signal coming in our direction. First, the radio telescopes must be observing the right location in space. Project Phoenix has designated as their targets 1000 stars, all within 200 light years. 1000 stars out of the 200 billion stars in our galaxy is an extremely small set. Even though scientists have carefully picked 1000 stars that they have deemed most likely to have life, what makes us, with absolutely no experience with life off the planet, think that we can have any idea of what other life or their environment would be like? If these 1000 stars happen

to be the wrong stars, then the chance for this SETI search to achieve results is effectively zero.

Timing is also important, since observing the right star when there are no signals being transmitted will lead us nowhere. It is impractical to monitor every star simultaneously, but selectively observing stars is clearly inadequate. What if an intelligent signal comes in right after we conclude that a star system is lifeless? What if the signal stops right before the telescope is aimed in its direction? It is like aiming in the dark and hoping to hit a target that may or may not exist.

The last and most important requirement for a successful search is a correct frequency. Although scientists have tried to “guess” what frequencies a civilization would broadcast on, we have no idea which frequencies to listen to. On Earth we disagree about a standard frequency for communication, and it seems even more likely that there would be different opinions on frequencies throughout the galaxy (Shklovskii and Sagan 439). The frequencies most likely to be used for communication range from 1 to 10 GHz. With narrow radio bands as a sign of intelligence and with 0.1 Hz being theoretically the smallest possible transmission width, there are a hundred billion possible channels to listen for greetings from other civilizations (Heidmann 79-81).

In terms of frequency range, Project Phoenix searches for signals between 1000 and 3000 MHz, broken into narrow 1 Hz channels. Computers scan these 2 billion channels per star for patterns indicative of a non-natural origin (Davidson). But even this is quite ineffective. According to Harrison, we have only explored a slice of the sky: 99.99 percent of the skies remain unexplored (193). There is also no hope of trying to second-guess or understand what frequencies another civilization would choose based on

our current knowledge. As Sagan says, “No matter how obvious this choice of wavelength is to us, there still remains the question of whether earthly clarity may be extraterrestrial nonsense” (Shklovskii and Sagan 388).

Even if we were able to pick the right wavelengths to listen for signals, another problem is the gas and dust in the galaxy that distorts transmissions through space. Taking into account blind areas, which distort signals so much that we cannot hope to perform radio observations, Duric says the observable area of the galaxy is only about 1000 light years, which is less than a fiftieth of the size of the galaxy (Hoffman). The number of civilizations in the entire galaxy may be large, but the number that we have any chance of detecting could be extremely small.

Another problem with SETI is not that it may never succeed, but that it could continue forever without conclusive results. NASA’s Dr. Bernard M. Oliver commented, “I really don’t expect success soon...If we don’t [succeed] it might be taken as a sign that there is not extraterrestrial intelligence. That would be a mistake” (qtd. in Kerr). We should not judge anything about extraterrestrial intelligence from our lack of results, since the “absence of evidence is not evidence of absence” (SETI Institute). As Harrison explains, “There is no real way to prove that ET does *not* exist. There will always be hope that different search strategies, better equipment, and greater determination will produce a favorable outcome” (317). In this lies a problem with SETI, which is based on the unscientific and non-falsifiable hypothesis that extraterrestrial life exists. As Popper says, “a theory which is not refutable by any conceivable event is non-scientific. Irrefutability is not a virtue of a theory...but a vice” (36). Since no event can possibly refute SETI or its underlying assumptions about extraterrestrial life, we cannot take SETI

too seriously. If it is successful, then we will benefit greatly, but if it is unsuccessful, as it has been, we will have gained nothing at all.

Some may think that any attempt, however inadequate or insufficient, to find extraterrestrials is worth the effort, due to the enormous possibilities that could come from success. The comparably modest resources needed for SETI seem quite justifiable when one thinks about the absolutely enormous, and unthinkable, good that could come as a result of success. It is true that there is potential for gain. But the complete ineffectiveness of current SETI makes me wonder if we could allocate our resources to something more worthwhile. Harrison remarks, “Even optimists have to admit that the search could be unsuccessful, at least in the sense that it fails to establish contact with extraterrestrials. Consequently, it is unwise to attempt to justify the search solely on the basis of benefits that might accrue from discovering ET” (22). In fact, other important benefits have been cited in support of SETI.

Harrison divides reasons for supporting SETI into two broad categories: “outcome-dependent” and “outcome-independent” benefits. Outcome-dependent benefits are those arising from contact, and as discussed previously, cannot be used to justify SETI, given the low chance of achieving successful contact. Outcome-independent benefits do not depend on our finding intelligent life but may be considered as a side benefit of SETI. Harrison includes in this category “an improved self-understanding, and enhanced knowledge of the universe, technological spin-offs, a useful venue for science education, and better international relations” (22). But none of these are very unique to SETI and may not be great motives for supporting it. Some outcome-independent reasons to continue SETI include a general increase in knowledge and technological

advancements. Certainly our technology has improved, giving us better radio telescopes and better observation methods, and from this advancement of technology, our general knowledge about stars and space has increased. But it seems ridiculous to attribute these gains to SETI. Technology is advancing more or less independently of whatever SETI programs that are going on. Similarly, advances in other areas cannot be solely attributed to SETI. For example, better international relations is one outcome-independent benefit that Harrison states. But SETI has not helped in relieving any unpleasant problems among nations, especially since almost no governments are currently involved with SETI anymore. Perhaps it would require the detection of a signal for nations to be unified as in *Contact*. In that case, it would become an outcome-dependent benefit and could not be used to justify SETI.

Other intangible benefits have been given by Sagan, who believed that “in the deepest sense the search for extraterrestrial intelligence is a search for ourselves” (Sagan), and claimed that we can learn a lot from SETI, regardless of the results that come from the search. However, it seems that a better place to search for ourselves is on this planet rather than searching out in space. *Contact* depicts Ellie, the dedicated extraterrestrial hunter, looking towards the stars for answers. But during this time, due to her passion for SETI, she leaves her lover and risks her life. Looking outward for the answers is not a substitute for looking inside ourselves, and may do more harm than good. Imagine how much more we could learn if we concentrated on ourselves instead of extraterrestrials.

The current SETI projects are pitifully inadequate in relation to the colossal goals that they hope to achieve. But I do not necessarily support an increase in government

spending in this area, since “even with a strong commitment and steadily improving technology we may have to search for centuries” (Harrison 50). Instead, I think we might as well discontinue all such programs, until humans are ready for a serious attempt to find our place in the universe. A few individuals with private funding cannot accomplish an enormous project like SETI. It requires a lot more, and perhaps it is more than we have currently available or are willing to give. I am not entirely opposed to the current programs, but even with all the good things that could come from SETI, more attention should be paid to earthly matters. Perhaps the pessimists are correct in saying that civilizations destroy themselves. In that case, our own existence may be in danger, and we should concentrate on staying alive. Another possibility is that we just are not technologically advanced enough for SETI at this time, in which case, we should also wait for a more suitable time. Contacting other civilizations can wait until we know ourselves. Maybe sometime in the future we will be ready to pursue this project as a united human race, but until then, we should just work on getting to that point. The aliens can wait. They have been waiting for billions of years already.

Works Consulted

Contact. Warner Bros. 30 Apr. 1998 <<http://www.contact-themovie.com/>>.

The official web site of the movie. This site contains interviews with many interesting people, including Jodie Foster, Ann Druyan, Frank Drake, and Seth Shostak.

Couper, Heather and Nigel Henbest. "Science: The stars this month." The Independent (London) 30 Mar. 1998: 14. On-line. Lexis-Nexis. 14 Apr. 1998.

Project Phoenix has been privately funded for about five years now, after the previous NASA funded SETI project had lost its support in Congress after one year in 1993. SETI researchers work from the premise that civilizations like ours will use radio waves as a means of communication, so bigger and better receivers are being built.

Davidson, Key. "Scientists employ complex means to attempt to talk with other worlds." San Francisco Examiner 20 Apr. 1998, sooner ed.: A-8. On-line. Lexis-Nexis. 2 May. 1998.

Computers scan a broad range of radio frequencies for patterns or any signs of intelligent civilizations, among the perhaps billions of Earth-like planets in our galaxy. Pessimists say that civilizations destroy themselves (i.e. nuclear wars) soon after reaching the stage of being able to communicate.

Enserink, Martin. "Preventing a Mars Attack." Science 27 Feb. 1998: 1309.

NASA is planning to bring a chunk of rock from Mars back to Earth in 2008, but there are questions as to possible Martian microbes that could be spread on Earth. NASA is planning to quarantine the Martian sample, not just to protect us, but maybe even more important, is to not contaminate the sample. If there are extraterrestrial microbes, it is absolutely necessary to keep the sample uncontaminated with earthly microbes.

Flowers, Nick. "Science: ET, please call Sydney As Australia scans the airwaves, the US is preparing to launch an armada of probes in the search for aliens." The Daily Telegraph 4 Mar. 1998: 16. On-line. Lexis-Nexis. 2 May. 1998.

SETI began in the 1960's with the astronomer Frank Drake, and who came up with an equation to estimate the number of civilizations that are out there. In his equation, "L" represents how long a civilization lasts. Without "L" being a lot bigger than how long the human race has been around, our chances of success are very small. But recent discoveries have made previous estimates actually seem pessimistic. Besides the massive radio wave searches, there is also hope in finding possible signs of life that existed in the past or will exist in the future on the planets and moons in our solar system. Seth Shostak says, "Life is not a miracle, it's a statistic."

Gibson, Everett K. Jr., David S. McKay, Kathie Thomas-Keprta and Christopher S. Romanek. "The Case for Relic Life on Mars: A meteorite found in Antarctica offers strong evidence that Mars has had--and may still have--microbial life." Scientific American Dec. 1997.

Probes have essentially solved the question of the little green men from Mars: there is no intelligent life or civilization on Mars. However, the discussion continues about whether there once were living microbes on Mars and perhaps still is there today. The discovery of life that once existed on Mars could bring with it many insights in our search for other life in the universe.

Harrison, Albert A. After Contact: The Human Response to Extraterrestrial Life. New York: Plenum, 1997.

Gives a thorough treatment covering the current thoughts in SETI. Optimistic about SETI, in general, but gives both sides of the argument.

Heidmann, Jean. Life in the Universe. Trans. Isabel A. Leonard. New York: McGraw-Hill, 1992.

The International Astronomical Union in 1982 created a special committee on "bioastronomy" to find life around other planets. The possibilities of extraterrestrial life are enormous. We may already be broadcasting our radio signals to other civilizations.

Hoffman, Ian. "Researchers Are Rethinking Communication With Aliens." Albuquerque Journal 18 Apr. 1998: 1. On-line. Lexis-Nexis. 2 May 1998.

Carl Sagan is known to be in the optimist school in the search for extraterrestrial intelligence, with his estimates of millions of civilizations in the galaxy. Pessimists point to the many years of listening to radio signals and getting no positive results. Using radio waves may not be the solution. Many parts of the galaxy distort radio signals, so that we can only effectively search a small fraction of the galaxy. Ned Duric believes that we should consider other options, outside of the radio spectrum, perhaps in other types of radiation.

Kaufmann, William J. III and Neil F. Comins. Discovering the Universe. 4th ed. New York: Freeman, 1996. 381-388.

Stanley Miller and Harold Urey in 1952 conducted an experiment whereby common organic material under certain conditions formed the building material for life, as we know it.

Kerr, Richard A. "SETI faces Uncertainty on Earth and in the Stars." Science 2 Oct. 1992: 27.

A ten-year SETI project is planned that would be funded by NASA and would be a "million times more capable than the feeble attempts that have gone before" (NASA's HRMS). But Kerr is skeptical about the possibility of success even in this big project to find life elsewhere. A big obstacle for the future of SETI is federal funding and a diminishing budget, as many congressmen believe that this project is a waste of federal money.

Klein, Barry. "Is anybody out there?" St. Petersburg Times 25 Mar. 1998: 1D. On-line. Lexis-Nexis. 17 Apr. 1998.

One professional extraterrestrial hunter, Seth Shostak, is convinced that there exists life out there. However, not all scientists share his views, as there has been no clear evidence of any other civilization even with the billions of stars in the galaxy. U.S. taxpayers paid around \$60 million for SETI equipment before Congress stopped funding in 1993. Currently, SETI operates on about a \$4.5 million budget, coming from the private sector.

Loft, Kurt. "Cosmic search for life continues despite skeptics, lack of funding." The Tampa Tribune 20 Mar. 1998: 9. On-line. Lexis-Nexis. 17 Apr. 1998.

Seth Shostak is mentioned in this article also. Shostak notes that among the 400 billion stars in our galaxy, 60 billion resemble our sun. But just as there are those for SETI, there are those against it. In 1993, Congress stopped the funding for what would have been a 10 year NASA project – the \$100 million High Resolution Microwave Survey.

Menon, Vinay. "Alien contact inevitable, researcher says 'I think someday we will have an answer.'" The Toronto Star 10 Mar. 1998: B5. On-line. Lexis-Nexis. 24 Apr. 1998.

Jill Tarter is the director of California's Project Phoenix involved in SETI. Jodie Foster's character in *Contact* was based on her. With the increasing noise being generated by our technology, someday it may be necessary to set up a listening post on the far side of the moon.

Popper, Karl R. *Conjectures and Refutations: The Growth of Scientific Knowledge*. New York: Basic books, 1962.

This is perhaps the source of the modern philosophy behind science, requiring testable and falsifiable hypotheses to be considered scientific.

Sagan, Carl. "The Quest for Extraterrestrial Intelligence." Cosmic Search 1.2 (1979). 27 Apr. 1998 <<http://www.point-and-click.com/radobs/vol1no2/sagan.htm>>.

Sagan believes that only good things can come from SETI. He describes a method by which we could communicate mathematics as a common language, and is very similar to what was portrayed in *Contact*. Just receiving a message from a superior civilization would let us know that it is possible to survive in a technological era without destroying ourselves. The knowledge that might be gleaned from an extraterrestrial message has the possibility to be enormous. We can learn much from such a search, whether or not it is successfully resolved. We will undoubtedly have increased our technology and knowledge. Not everyone is so optimistic though. The big question is that if intelligent life exists out there, where are they and why haven't we seen any signs of them? Sagan gives many plausible reasons why other civilizations have not contacted us. One possibility is that civilizations destroy themselves. In a study for NASA directed by Phillip Morrison of MIT, they have come to several conclusions, the most important one being that it is important and significant to continue SETI programs, which only need modest resources.

Schwarzman, David and Lee J. Richard. "Being Optimistic about the Search for Extraterrestrial Intelligence." American Scientist July-Aug. 1988: 364-69.

The authors see good things coming out of SETI programs, whether or not signs of extraterrestrial intelligence are ever found. SETI programs have generated a general increase of knowledge and technologies and also have caused people to think about the future of our own civilization. Many people have argued for $N = 1$, that we are alone and unique in the universe. Michael Hart, in 1975, argued that even under pessimistic assumptions, at least one civilization should have spread to a detectable range of our planet within the time that our galaxy has been around. Since we have been searching for so long and no sign of any intelligent life has been found, it is most logical to assume that we are alone. The implications that we are alone can have profound consequences. One possibility is that L , the lifetime of a civilization, in the Drake equation is small. This raises questions as to the future of mankind. At the time of the article, there was a proposed project that would cost the equivalent of a decade of the world's military budget. As the authors pointed out, "An earth willing to make such a transfer of resources would be well on its way to becoming a unified planetary civilization."

SETI Institute. 1998. SETI Institute. 8 May 1998 <<http://www.seti-inst.edu/>>.

Project Phoenix targets 1000 stars within 200 light years. Computers listen to millions of radio channels in the range of 1000 and 3000 MHz. To find a sign of intelligence, it is necessary to find a signal at a very narrow frequency band, of 1 Hz. The search of all 1000 stars is expected to be completed in the year 2000.

Shklovskii, I.S. and Carl Sagan. Intelligent Life in the Universe. New York: Dell, 1966.

One source cited this book as the "bible" of the search for extraterrestrial intelligence. It presents evidence for the existence of life in the universe and on Mars. Much evidence is presented but some may be a bit out of date. But a lot of the comments on SETI and implications are quite insightful and still applicable. Sagan concedes, "On the other hand, if we can only reasonably expect civilizations at about our level of technical advance thousands of light years away, attempts at communication would not seem profitable, at least at the present time" (409)

Smith, Matt. "Heavenly Secrets: How the NASA researchers who inspired the film Contact outfoxed Congress and continued the search for intelligent aliens." SF Weekly 1 Apr. 1998: Features. On-line. Lexis-Nexis. 24 Apr. 1998.

Project Phoenix got its name from how it rose from the ashes, after the funding for the SETI program was cut by Congress. But, from recent reports, it seems that NASA did not completely stop its SETI efforts even after Congress had supposedly terminated the whole program. From a report on NASA cited in the article, \$1.3 million was spent or transferred in some way to the SETI Institute. Currently, NASA is putting billions into the Origins space program, which has the goal of seeking life on other planets using space probes, and not using any of the SETI radio techniques. John Billingham has been behind an international protocol to limit global communications with aliens. The possibility of intelligent life out there is a matter of faith, not unlike religions.