The Role of the Social Sciences in SETI

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OVERVIEW

Since its inception, the scientific search for extraterrestrial intelligence (SETI) has been recognized as an interdisciplinary effort. It has attracted people not only from the physical and biological sciences, but also from the behavioral and social sciences. There are many areas where anthropologists, economists, futurists, historians, philosophers, psychologists, political scientists, and sociologists can assist with SETI. Salient interdisciplinary topics include public beliefs in extraterrestrial intelligence and support for SETI; the conduct of the search; signal detection, decryption, and interpretation; news dissemination and rumor control; and both short- and long-term impact of detection on societies, institutions, and individuals.

Factors that militate against greater participation of social scientists include unfamiliarity with SETI, disciplinary biases that tend to focus research on a limited range of research topics, and the lack of a suitable infrastructure such as an extensive literature base, dedicated conferences and journals, and adequate funding. This essay suggests various ways to publicize SETI and various techniques for strengthening the infrastructure, such as increasing funding, sponsoring conferences, publishing in disciplinary-based refereed journals, developing new publication outlets, and building a high-profile peer group. Furthermore, we can involve social scientists as consultants, train graduate students whose interests encompass SETI, encourage piggyback projects that serve both mainstream disciplinary and SETI interests, and provide both role models and social support for newcomers.

SETI

Successive discoveries that the Earth circles the Sun, that the Sun is but one of many billions of stars in our galaxy, and that there are billions of galaxies, coupled with a growing understanding of the origin and evolution of life, have led to widespread abandonment of the once-prevalent view of humankind as central and unique in the universe (Dick, 1996; Shklovskii and Sagan, 1966; Shostak, 1998). Over the past four centuries, physical scientists have established that the laws of physics and chemistry are universal in the sense that they apply at all times in all places. Over the past century, biological scientists have followed a similar path and it now appears that the laws of biology also hold for all places and all times (Dick, 1996). If the laws of physics and biology are universal, and if there are many solar systems with habitable planets, then we would expect life, including intelligent life, to evolve again and again. Recent discoveries of planets in other solar systems and of reliable self-organizing physical processes that may initiate life add to the plausibility of the "many inhabited worlds" hypothesis.

Whereas we have long since refuted the view that humankind occupies a central place in the physical universe, we have yet to disprove the hypothesis that humankind is the only intelligent (or technologically advanced) form of life. SETI, the scientific search for extraterrestrial intelligence, involves observational procedures that can disprove human uniqueness by uncovering evidence of equal or superior intelligence.

There are five particularly promising strategies for finding extraterrestrial intelligence, according to Tough (1999b). The most common strategy has been the microwave search, that is, the use of radio tele-

scopes to identify patterns of electromagnetic radiation that are of extraterrestrial and intelligent origin. In 1998, several optical SETI (OSETI) projects were added in order to search for pulsed laser messages or other optical signals from many light-years away. A second strategy is to search for astroengineering projects, such as Dyson spheres. Another strategy, which has gained plausibility as we ourselves have developed small and efficient technology, is to search for robot probes within our solar system. These probes could still be monitoring us, or they could have lost their capability to function millions of years ago. If these probes are intelligent enough to monitor our telecommunications, we might establish contact by issuing an invitation or by demonstrating our readiness.

What all SETI searches share, and what distinguishes SETI from other attempts to find extraterrestrial intelligence, is a steadfast insistence on remaining within the assumptions and methods of science. The bedrock is SETI's insistence on (a) skepticism, verification, peer review, and the scientific method, (b) strict safeguards against hoaxes, self-delusion, and erroneous data, and (c) protocols to avoid premature and immodest claims.

Beliefs in extraterrestrial intelligence have waxed and waned over the centuries, but seem to have attained new heights in recent decades (Dick, 1996). Many factors have strengthened this belief within popular culture (Dick, 1996; McCurdy, 1997). People attend to the source, as well as the content, of ideas, and one of the distinguishing features of SETI is the strong scientific qualifications and prestigious institutions of many of its adherents. Over the years these have included scholars affiliated with major academic institutions such as the University of Alabama, the University of California (Berkeley, Davis, and Santa Cruz), Cornell University, Harvard University, and the Universities of Hawaii, Paris, and Toronto. SETI researchers have also included affiliates of the United States Naval Observatory, Jet Propulsion Laboratories, the National Aeronautics and Space Administration, and the RAND Corporation.

SOCIAL SCIENCE INVOLVEMENT IN SETI

For approximately 20 years, beginning with Project Cyclops in 1971, NASA–Ames Research Center was the site of workshops in support of SETI. A role for social science was set forth in Philip Morrison, John Billingham, and John Wolfe's *The Search for Extraterrestrial Intelligence* (1977). Mary M. Connors' unpublished papers, "The Role of the Social Scientist in the Search for Extraterrestrial Intelligence" (1976) and "The Consequences of Detecting Extraterrestrial Intelligence for Telecommunications Policy" (1977), illustrated some of the ways that social sciences could contribute to the effort. The "Interdisciplinary Aspects of SETI" panels at the annual congresses of the International Astronautical Federation provide a venue for ongoing discussions of social science issues, and additional opportunities have been provided by the conferences that led to the *Third Decennial US–USSR Conference on SETI* (Shostak, 1993); the *1993 Bioastronomy Symposium* (Shostak, 1995); and the 1992 NASA workshop that generated *Social Implications of the Detection of an Extraterrestrial Civilization: A Report on the Workshops on the Cultural Aspects of SETI* (Billingham et al., 1999).

In his discussion of SETI, Harrison (1997) points out that our experiences as humans have conditioned our expectations about intelligent life in the universe and have channeled the search process. If "contact" occurs—we will use this term loosely to refer to the acquisition of incontrovertible evidence of one or more technologically advanced civilizations elsewhere—social scientists may help us decode and interpret information and even help us understand extraterrestrial civilizations. If interactive communication is possible, social scientists may help inform the decision whether or not to send a communication, and, if the decision is affirmative, help frame a reply. Contact, we expect, could have a broad and profound impact on individuals, societies, and humanity as a whole. Social scientists could be useful for forecasting and advising how to manage this impact.

Many of these issues have already been discussed within SETI, typically by astronomers, physicists, and astrobiologists. However, the social sciences are distinct fields with their own literature bases, methods, and traditions. It is time for social scientists, with their broad knowledge of the relevant background literature and their in-depth understanding of social science method and practice, to provide greater leadership in these discussions. Given that there are probably fewer than 100 scientists worldwide and from all fields who are immersed in SETI, it is not necessary to recruit large numbers of social scientists. Instead, we need to increase modestly the number of social scientists to ensure ongoing representation, expand the range of disciplines that are

involved, seek greater international involvement, and recruit scholars who are still in the early stages of their careers. We also need to recruit some senior social scientists whose involvement will send a strong and important message to other members of their disciplines.

OPPORTUNITIES

Potential opportunities for social science contributions to SETI range from understanding the nature of extraterrestrial organisms and cultures, which could radically affect the conduct of the search, to forecasting the human response to confirmation of extraterrestrial life. In this report, we present ten areas where SETI can benefit from social science: (1) attitudes and public support; (2) conduct and expansion of the search; (3) composing a model reply from Earth; (4) decryption and interpretation; (5) news dissemination and rumor control; (6) other preparations and readiness for contact; (7) short-term impact and (8) long-term impact on societies, institutions, and people. Under some conditions, social scientists may be helpful for (9) the analysis of extraterrestrial organisms and civilizations; and (10) the initiation and conduct of relations with extraterrestrial civilizations.

Public Attitudes and Support

Social scientists can identify and help us understand people's attitudes towards extraterrestrial intelligence and towards SETI itself. A comprehensive research program would include social scientists who are interested in popular culture, public opinion polling and survey research, attitude formation and change, persuasive communications, and the media. This research could have an action component intended to help people understand SETI as a scientific enterprise, help reduce the confusion of SETI and UFOlogy, and allay fears based on naive misconceptions about such things as the ease of interstellar travel.

Conduct and Expansion of the Search

Detection (along with rigorous confirmation) is the core task of the SETI enterprise. It is therefore extremely important for social scientists to contribute to search strategies to the best of their ability. Each SETI search strategy rests upon certain assumptions about the deeply unknown phenomenon that it is trying to detect. We know so little about the technology, goals, values, and distribution of extraterrestrial intelligence. In order to search intelligently, the SETI community must devote plenty of thought to whom and what it is trying to detect. Social scientists can contribute to a fresh examination of the current assumptions underlying the choice of search strategies (Tough, 1999b). The search procedures rest upon our understanding of the physical universe, and our assumptions about "the other" and their likely level of technological development. Radio SETI, for instance, is based on the assumption that they, like us, will use radio for communicating.

Disciplined thinking by futurists about the long-term future of human technology and goals can help us anticipate the technology and goals of extraterrestrials, since their civilization is likely thousands of years more advanced than ours. Thoughtful exploration of possible alien psychology and sociology (discussed below) can also help us get a better sense of the phenomenon we are trying to detect. In addition, social scientists may help the SETI field understand the cultural, intellectual, and emotional factors that shape the search, and may help move us beyond unnecessarily limiting mind-sets about search strategies. Thus, an important potential role for social scientists is to help the scientists who conduct the search to expand their efforts into new and potentially fruitful areas. Indeed, one major search strategy is itself primarily a social science strategy even though it relies on the elaborate technical infrastructure provided by the World Wide Web (Tough, 1999a).

Composing a Model Reply from Earth

Social scientists can play a key role in developing a model reply message for use someday when some official international body decides to send a reply from Earth. In the urgency and confusion that may follow confirmed contact, the United Nations or the appropriate global scientific organization should welcome a draft reply. They may not use it word-for-word, of course, because the content of the incoming message may influence what we decide to send. But having a draft in place, especially if the process of drafting it has solicited suggestions from around the world, could have a very strong influence on the actual message that is eventually sent. And if the idea of humans actively sending messages to the stars ever gains widespread support, as one way to encourage a message from afar, a model message could be very useful if it reflected widespread consultation.

Decryption and Interpretation

Whereas it is easier to grapple with the possibility of an information-poor detection—that is, the mere identification of something as of extraterrestrial and intelligent origin—we should be prepared for the possibility of an information-rich detection. Unless the "message" is devised in such a way as to be easily deciphered by neophytes in interstellar affairs, it could be very difficult (if not impossible) for us to understand. Thus far, most of the efforts directed at understanding interstellar communications have been undertaken by mathematicians and physical scientists. Here we should welcome the efforts of people trained in such fields as animal communication, archaeology, cryptoanalysis, cultural anthropology, education, linguistics, psychology, and all other fields that impinge upon language and communication. Such scholars can add breadth of perspective by drawing on their knowledge of diverse species, cultures, and languages in their efforts to decrypt and interpret messages. Among the most directly comparable past efforts are attempts to decipher long-dead languages, but even here we have had the advantage of artifacts and our knowledge of human life forms and cultures.

News Dissemination and Rumor Control

Social scientists can help keep politicians, administrators, and other decision-makers accurately informed on the progress of the search and help facilitate the orderly dissemination of news to the public. Here we can benefit from historical precedent and our understanding of the media and mass communications, organizational functioning, social and psychological influences on attitude formation and change, rumor and rumor control, and many related topics.

Other Preparations and Readiness for Contact

In addition to the areas already discussed, there may be other ways in which the social sciences can contribute to humanity's readiness for contact. Interest in this topic is rapidly becoming much stronger. In 1999 alone, a three-day seminar on contact planning was held in Denver; the final session of the two-day Foundation For the Future seminar in Hawaii was devoted to "What next?"; and a one-hour SETI panel discussion at the International Astronautical Congress in Amsterdam explored the major challenges during the 28 days after confirmed contact. In addition, in November 1999, NASA-Ames Research Center sponsored a symposium on "The Societal Implications of Astrobiology," the philosophical, religious, political, sociological, and psychological implications of the discovery of extraterrestrial life. The Denver meeting was noteworthy for its disciplined futures thinking (eight scenarios) and its use of simulation and role-playing. As social scientists direct their minds and their skills to the question of how to prepare for contact, they will no doubt come up with additional needs and solutions. Acting on some of these solutions soon could pay off in reduced confusion and conflict after contact.

Short-Term Impact

Social scientists can help us forecast, understand, and guide human reaction to contact. As Mary Connors was the first to point out, very different issues are likely to come to the fore right after detection and then later on (Connors, 1976). Short-term impact begins as soon as news is released. It is measured in minutes, hours, and days. Short-term impact includes initial reactions to the news, first impressions of the extraterrestrials, attitude perseverance and change, rumor, and collective behavior, including possible panic. Here, expertise on demographic and cultural differences, human information processing, social influence processes, and collective behavior will help.

Long-Term Impact

Long-term impact can range from a rethinking of our own place in the universe based upon the sheer confirmation of the "other inhabited worlds" hypothesis to profound changes in human culture and institutions. It is possible to rate the potential impact in terms of the amount of information that is available and in terms of the potential for interactive communication.

At *Force 1*, impact will involve the assimilation of knowledge that we are not alone in the universe. This, by itself, will affect our philosophy, our science worldview, our religion, and our culture.

At *Force 2*, we may gain scientific, technical, or other information from the extraterrestrial culture that will affect our own science and technology, with far-reaching implications for our economy, our political institutions, and our international affairs.

At *Force 3*, we will communicate and interact with the extraterrestrial culture, trading information, and perhaps even developing a long-term dialogue (Michaud, 1979, 1990, 1998).

Assessing and guiding the long-term impact will require expertise from essentially all fields. Obvious areas of concern include social change, cultural diffusion, technology diffusion, international relations, metalaw, sociology of knowledge, sociology of law, sociology of occupations, social welfare, the history of science and technology, the psychology of intergroup relations, and so on. There will be no shortage of expert involvement *after* contact, and the main difficulty will be separating meritorious ideas from the noise. What we can do now is establish a group of social scientists who will have given advance thought to these matters and who are in a position to help other scientists—and the public—think productively about contact and its aftermath. In particular, this group might develop a conceptual framework and a research agenda that form a solid base for recommended actions.

Analysis of Extraterrestrial Organisms and Civilizations

The riskiest or most dubious opportunities for social scientists are in the analysis of extraterrestrial organisms and societies. Opinion is divided on the value of undertaking this effort. On the one hand, detection may involve a civilization that is so different from ours and so remote in time or space that any attempts at understanding are a waste of time. This claim may be accurate, or a mere convenience that allows the search to continue apace without serious consideration of the aftermath. On the other hand, even as there are universal laws in the physical and biological sciences, there may be universal laws in anthropology, political science, psychology, and sociology, that is, basic functional relationships that apply at all times in all cultures (Harrison, 1997). If so, then it is possible that "they" will be recognizable to us, and advance preparation may help.

One of the challenges that people will face after receipt of a signal is in understanding an alien worldview. We might gain insights into how we could better understand extraterrestrial perspectives by drawing parallels with ways that diverse groups of humans can overcome differences in conceptualizations of reality. One analogue of this is found in comparative psychotherapy research, specifically in attempts to understand how psychotherapists with different theoretical orientations interpret the same clinical phenomena. It has been found that the implicit assumptions that psychotherapists have about human nature and the process of human change can directly affect how these therapists understand their patients (e.g., Vakoch & Goldfried, *in press*). Unless these differences are made explicit, they can be obstacles to communication between therapists with different backgrounds. Research such as this may yield insights into the basic processes of understanding alternative worldviews.

Relations with Extraterrestrial Civilizations

Social science research and disciplined thought could provide an excellent foundation for preparing for the initiation and conduct of relations with extraterrestrial civilizations. Someday that will be a very important topic. Why not begin studying and preparing now? Insights could come from recent and fresh research into negotiations, diplomatic relations, love and altruism, human relations, and other fields. Work by Michael Michaud (1972-1998) and Ernst Fasan (1990) illustrate some of the opportunities here.

CURRENT INVOLVEMENT OF SOCIAL SCIENTISTS IN SETI

Thus far, social scientists have had only modest involvement in SETI, and there is very uneven coverage in different areas. At present, efforts appear to be dominated by Americans who are either retired or at a relatively late stage in their professional careers, suggesting that in the absence of prompt, concerted effort, soon social scientists will have less, rather than greater impact on SETI. Social scientists have tended to focus on individual reactions, neglecting serious treatment of organizations, societies, and interstate political systems. Even representatives from anthropology and sociology have shown a strong psychological bias, meaning that many subfields of anthropology and sociology have yet to be tapped. We find no clear involvement on the part of economists and only modest involvement on the part of historians, who have tended to focus on the intellectual and social histories of the search. There is even more modest involvement on the part of political scientists.

Anthropology

Anthropology, "the study of man," with its emphasis on evolution and culture, is eminently well suited to contribute to the SETI effort. One of the earliest books on the cultural aspects of SETI, Maruyama and Harkins' *Cultures beyond Earth: The Role of*

Anthropology in Outer Space (1975) provides useful insights into early social science thinking on the topic. Written during the Apollo Applications Programs, this volume was based on the assumption that contact would occur when astronauts encountered extraterrestrials in the course of exploring the solar system. Today, the chances of such an encounter seem remote relative to more distal forms of contact, such as through microwave observation, but we should be open to many possibilities. Still relevant is Finney and Jones' anthology *Interstellar Migration and the Human Experience* (1984). Although only a limited number of chapters are focused specifically on SETI, the other chapters in this volume are pertinent in that they give us some models for advanced spacefaring civilizations.

Economics

Economics studies the creation, distribution, and use of wealth. There are two major focal points: microeconomics, which studies economic activity on the part of individuals, small groups, and organizations, and macroeconomics which studies economic activity at the level of the state or beyond. Economics research strategies include mathematical models, empirical studies of economic behavior, and historical precedents. Quantitative procedures predominate. Given the demonstrated volatility of the stock market, word of contact could affect economic activity. It could, for example, affect confidence in investments or investment institutions and stimulate or retard certain kinds of investments (for example, stimulate investments in search equipment and search-related activities and in mass-marketed items related to the search or to the detected culture).

Presumably, any information of a scientific or technical nature that is received from an extraterrestrial culture could have profound effects on terrestrial technology, with the potential of causing major disruptions in large sectors of the economy (for example, utilities, information processing, and health care), perhaps rendering some occupations obsolete while opening up new opportunities in other areas. Social scientists from economics and many other disciplines could also address efforts by institutions and interest groups to control, manage, and even suppress information from ETI because it might affect their economic interests.

Futures Studies

The SETI enterprise is trying to detect a technology that is likely thousands of years more advanced than our technology. In order to make good choices regarding just what to search for, it is valuable to look ahead to our own future technology. This gives us a glimpse of what advanced alien technology might be like. Although the field of futures studies often focuses on the next five or ten years instead of the next 10,000, it nonetheless can offer some useful insights for SETI strategies. Disciplined science-based thinking about the potential future of space travel, computing and artificial intelligence, robotics, and nanotechnology can also provide useful insights into the likely capacities of extraterrestrial technology. One effort to relate such thinking to SETI strategies is provided by Tough (1999b).

History

History has a long-recognized role in SETI. First, intellectual history is useful for putting the search in perspective, both within the framework of science and within the framework of popular culture. Historians have produced several works on the extraterrestrial life debate back to antiquity, but particularly pertinent here is Steven Dick's more recent effort, *The Biological Universe* (1996), which stressed developments during the 20th century. Historians can help us identify precedents that can serve as analogues for contact under varying scenarios. The age of discovery and the age of empire may be of use, for during these eras Chinese, Dutch, English, Portuguese, Spanish, and others sailed forth to encounter new worlds in Africa and the Americas. To the extent that we are more likely to encounter extraterrestrial ideas rather than organisms, the diffusion of ideas across the face of the Earth may provide the best analogues. Here, an analysis of the Dead Sea scrolls, including people's reactions to confirmed and disconfirmed prophecies, would be relevant. History, like political science, can help us analyze how the introduction of a powerful and technologically advanced "third party" affects the relationship among nations.

Philosophy of Science

Philosophy of science can play a central role as we attempt to expand our own science to encompass extraterrestrial life forms and intelligences. Additionally, given that search procedures frequently push our observational powers and our technology

to the limit (Dick, 1996), philosophy of science can help us understand criteria for evidence. That is, given an information-poor detection scenario, what constitutes "incontrovertible" evidence of extraterrestrial intelligence? Finally, philosophers of science can help us understand the perhaps rapid and profound changes in our own science and technology that may result from interacting with extraterrestrial intelligences.

Political Science

Political science is of high relevance but low visibility within SETI. Political scientists who, like economists, draw on mathematical models, empirical observation, and historical analysis, could aid our understanding of public support for the search and ways to organize the search at the national and international levels. Additionally, if the search is successful, we may expect political repercussions that political scientists could both predict and help shape. Under some scenarios, a positive search outcome could alter the balance of power, and conceivably, extraterrestrial societies could become "players," of sorts, in human political affairs. Political science can also analyze how governments might react to a confirmed detection, including motivations for secrecy. This could be particularly relevant if the first detection were made accidentally by a government installation designed for other purposes. SETI enthusiasts from many fields have raised questions of security, international coordination, and the like, but these questions have received only minimal attention (Michaud, 1972-1998).

Psychology

Psychology *is* a broad-based discipline. The leading professional organization, the American Psychological Association, has 159,000 members and affiliates. Despite its historical focus on "the individual," psychology has many different subfields ranging from comparative and physiological psychology (which overlap with biology) to social and organizational psychology (which overlap with sociology).

Simply because of the sheer number of psychologists we would expect significant representation in SETI. The first major work by a psychologist on SETI was John Baird's *Inner Limits of Outer Space* (1987). Baird, an experimental psychologist with a strong emphasis on cognitive psychology, presents a useful discussion of the role of human information processing in the search for extraterrestrial intelligence and the problems of interspecies communication. This work urges caution on the topic of extraterrestrial intelligence and stresses the limitations of SETI. A slightly later book that is heavily psychological was published by management consultant Frank White. His work, *The SETI Factor* (1990), is based largely on interviews and dwells on potential human reactions. Of particular interest are his semi-formal propositions regarding preparing humankind for contact. A more recent work with a strong psychological flavor is Harrison's *After Contact: The Human Response to Extraterrestrial Life* (1997). Harrison, a social psychologist whose graduate education involved both psychology and sociology, addresses the psychology of the search, the nature of extraterrestrials, and predicted human reactions to various search outcomes.

Although at least three psychologists have been involved in recent International Astronautical Federation Congresses, there is very little representation given the large number of psychologists in this world. In recent years, as UFO claims expanded to encompass alien abductions, a growing number of psychologists have turned their attention to abduction reports. Almost without exception these investigators have adopted a critical stance and have found evidence supporting mundane interpretations of unusual experiences. Whereas their research is useful if it dispels misconceptions, it is of little direct benefit to SETI.

Sociology

Sociology focuses on abstract social relations and large social entities. With the exception of sociological social psychologists, sociologists tend to discount the role of the individual and direct attention to the impact of expectations and other situational forces on behavior. So far, it is social psychologists who have tended to represent sociology in SETI. Sociologist David Swift's *SETI Pioneers* (1990), represents a major contribution from sociology to SETI. In this partly psychobiographic work, Swift examines the various forces that led scientists to SETI and also their ideas about extraterrestrial intelligence. Other participants include William Bainbridge (1983), who has done work on people's attitudes towards extraterrestrial intelligence, and Donald E. Tarter (1992), who has written extensively on reply policy among many other topics.

FACTORS LIMITING INVOLVEMENT

Many forces limit involvement of social scientists in SETI. Some social scientists have not heard of SETI, or confuse it with UFOlogy. Disciplinary biases that favor a limited subset of topics work against SETI. Social scientists who choose to work in SETI will not find a strong infrastructure or an established peer group, and may risk ridicule or professional censure. There is little funding to support social science involvement and few quality publication outlets.

Disciplinary Biases

Although many sciences are defined in a very broad way, our sense is that within each field maybe 5 percent of the topics occupy 95 percent of the researchers. This reflects history, politics, and cultural influences as well as intellectual significance. For example, despite its self-proclaimed interest in a broad range of phenomena, the field of social psychology was dominated by cognitive dissonance theory in the 1950s and 1960s, social problems in the 1960s and 1970s, and attribution theory ever since. Other areas that had long been considered fundamental, such as group dynamics, have received a fraction of the attention that they had received until about 1960. Gender-related issues seem to predominate in sociology and may be gaining ascendance in some areas of anthropology. Whether or not similar examples can be developed in each and every social science, the point is that professional organizations, funding agencies, and journal editors dictate fashion and thereby draw disproportionately large numbers towards mainstream areas, leaving relatively few people to work on "avant garde" (or, if you prefer, "fringe") topics. This tendency towards mainstreaming is self-amplifying, in that it has a heavy influence on choices for dissertation topics and on hiring and tenure practices.

By some measures SETI appears to have gained mainstream status in the physical sciences—witness coverage of SETI in astronomy texts—but is unknown or misunderstood in the social sciences. Indeed, it may be that SETI is less well known in the social sciences than among the public because social scientists' interests divert them from the interests that prevail in popular culture.

Social science has modeled itself on the physical sciences. Perhaps nowhere is the influence of logical positivism as strong as in the field of psychology. In the early decades of the 20th century, psychology had both an experimental tradition (based on research continuous with biology) and a psychoanalytic tradition (based on an emphasis on early childhood experiences and inferred mental constructs). By the 1920s the "school" of behaviorism became dominant. Behaviorism focused on the antecedents of behavior and on behavior itself, making no assumptions about possible mental events that mediated between the antecedent stimulus and the consequent response. By focusing on observables and eschewing "ghosts and social glue," psychology hoped to become respectable through emulating physics. Early requirements for membership in the American Psychological Association included three research publications to ensure high professional qualifications. The founder of behaviorism, John B. Watson, is reputed to have said, "If you can't see it, it doesn't exist, and if it doesn't move, you can't study it." The situation has eased today with strong interest in "cognition" (mental states and information processing) and the (numerical) domination of the field by clinical psychologists. However, the "spirit" of behaviorism still influences the field and the hypothetical nature of extraterrestrial intelligence may make it difficult to enlist psychologists.

For some psychologists, there is a thin line between hypothetical beings and imaginary beings. In mental health work, imaginary beings are associated with weak intellect or mental illness. Because of this, there is a debilitating ridicule factor and a good chance that one's work will be dismissed as "parascience." One of us, who published an article in a respected journal, was dismayed to discover that the abstracting service classified this article as parapsychology, thereby lumping it with clairvoyance, telekinesis, past life regressions, and the like.

Limited Funding

For the most part, social science research is not very expensive, at least, in comparison to research in the physical and biological sciences. This is fortunate because governmental funding for the social sciences has decreased dramatically over the past few decades. This poses two problems. First, even though some work on the "cultural aspects of SETI" can be done on the proverbial shoestring, funding is useful for basic equipment, research assistants, travel for inspecting archives, attending conventions, and so forth. The lack of travel funds is a particular problem, since the major SETI meetings take place at international locations and have registration fees geared to the salaries of aerospace executives and

engineers. Social scientists who might be interested in SETI find their energies drawn to more conventional areas where they can get funds to cover research expenses, course releases, and summer salaries. The lack of funding in the social sciences has drawn many social scientists away from research and to summer teaching, consulting, and other income-generating activities.

Weak Literature Base

Science includes assumptions, methods, and a set of data that are accessible through that field's literature base. With two or three exceptions, books that address the cultural aspects of SETI appear as popular science literature or in the physical science literature, not within the social science literature. For example, many bookstores classify Harrison's (1997) *After Contact* as astronomy, astrophysics and space science, or as UFOlogy. Similarly, we find very few relevant articles in the social science databases. For example, although *Psychological Abstracts* publishes tens of thousands of abstracts each year, there are very few abstracts related to extraterrestrial intelligence (as of April 2000, 48 books and articles) and fewer yet when we subtract from the total those that address UFO abductions. When we search for SETI in the mammoth *PsychInfo* database, we find not one article under SETI. Thus, social scientists who might want to get involved in SETI have had to go beyond their fields to learn about the search and its cultural implications. There is a chicken-egg problem here: The lack of a literature base means that few social scientists are drawn to the area; the lack of involvement prevents development of the literature base.

Limited Publication Outlets

Leading scholarly journals seem to have a conservative bias. Usually they are edited by senior members of the field who have an understandable fondness for the topics and procedures that allowed them to achieve fame. Even if the conservative editorial establishment does not consider articles on SETI to be "at the fringe," manuscripts on this topic are likely to fall outside of these editors' past experiences. There is no established literature base to set a baseline for evaluating new articles, and it may be difficult if not impossible to find qualified peer reviewers within the discipline. Some of us have had difficulties publishing social scientific research in discipline-based journals. At the worst, social science editors define SETI as a "fringe area" of dubious intellectual merit and of no interest to a scientific audience.

Minimal Peer Support

The primary reference group for academics consists of the peers who share their specific research interests. This community of scholars is not necessarily found on one's home campus, but at other campuses and research institutions, both nationally and internationally. Through attendance at meetings, mail, telephone, and now email, this community provides members with encouragement, feedback, and emotional support. For many academics, it is the accolades of this peer group—not the praise of campus administrators or of the public—that serves as the most powerful motivator. For all intents and purposes, there is no established peer group to support social scientists' interests in SETI. This means that researchers in this area have to operate without peer support, or else develop a peer group on some other basis (for example, a shared interest in unusual topics).

INCREASING SOCIAL SCIENCE INVOLVEMENT

Social science is crucial for the SETI endeavor and there are many points at which scholars from anthropology, economics, history, political science, and sociology can make positive contributions. Indeed, if we can increase involvement, the social scientists that we involve will identify many new analogues and fruitful topics. SETI as an empirical endeavor is rapidly approaching its 40th birthday. Almost all of the evidence that has been accrued in recent years boosts many of the estimates that enter into the Drake Equation. This, coupled with massive advances in search technology, augurs well for a positive outcome. We are way beyond that point where the cultural aspects of SETI can be treated as a side issue, and we are rapidly moving beyond that point where we can advance based on the ideas of popular writers or of well-intended physical or biological scientists who, by treating sociocultural issues, operate beyond their area of training.

Powerful forces tend to complicate the task of involving social scientists in SETI. As already noted, many social scientists have not heard of SETI or confuse it with nonscientific interests. Social scientists, whose tools currently lack the precision of those used in the physical sciences, and who sometimes smart following invidious comparisons with the "hard" scientists, may be leery of people with strong technical backgrounds.

Such factors as the lack of funding and limited publication outlets discourage all of us, but may

make SETI particularly unattractive to academics who have yet to earn tenure or who are interested in rapid advancement. The ability to attract funds and publish in refereed journals are two of the most important indicators of scholarly achievement and are essential for advancement in many research universities. This is particularly discouraging for junior faculty members who could make long-term contributions to the SETI effort. These dissuaders feed upon and amplify one another, and make it both difficult, and potentially unrewarding, for social scientists to get involved in SETI. Steps must be taken to remedy this situation.

High-Profile Leadership

We need a visible, full-time leader to serve as a role model, to rally social scientists, and to facilitate good social scientific research in behalf of SETI. For decades such leadership was provided by John Billingham, a physician by training who became very attuned to the interdisciplinary aspects of SETI. At first, Dr. Billingham provided leadership for biological and social sciences at NASA-Ames, and, following the loss of government funding for SETI, at the SETI Institute.

There are many reasons for establishing a high-profile position at the SETI Institute, the SETI Australia Centre, or comparable location. First, SETI is a complex endeavor, which requires a broad understanding of SETI as well as a firm foundation within one's own social science discipline. A scholar who is located at a SETI research institute will have a much better understanding of SETI than one who is trying to do similar work in an isolated academic setting. Second, too many social scientists have had to do SETI-related research "on the side" while working on other, more conventional projects. The opportunity to focus on SETI itself will accelerate this person's research progress. Third, a full-time position with a stable SETI organization will help legitimize the role of social science within the SETI community and increase acceptance of SETI in the social science community.

This person's work will have a salutary effect on the work of other social scientists who may be drawn to SETI. Through lectures and writings, he or she will engage the interests of other social scientists. He or she can mentor newcomers, help them locate relevant books and articles, and develop professional networks. He or she will serve the larger interdisciplinary community, for example, by organizing conferences and workshops, providing editorial services, and identifying funding sources and other opportunities.

At the same time, a resident social scientist will offer certain benefits to the host institution. Even as the social scientist serves as a spokesperson who informs the social science community about SETI, he or she will keep the physical scientists at the institute informed about pertinent developments in fields outside their disciplines. If and when contact occurs, the resident social scientist will help the institute make the transition from pre-contact to post-contact activities. Adding social science to the institute's repertoire represents a form of diversification, which may help the host institute survive if contact is made by a competing organization or in a manner that departs from current expectations.

A few months after this section was written for discussion at the Melbourne meeting, the SETI Institute displayed outstanding vision and leadership by creating a new position to promote research into cultural issues. The Institute appointed Dr. Douglas Vakoch as resident Social Scientist in February 1999. This is an excellent start toward the goals discussed in the previous three paragraphs, and may stimulate similar appointments of social scientists around the world.

Looking to the future, our model should be nothing less than a permanently endowed position. We should seek funding from organizations and individuals who are not interested in providing additional support for the technical aspects of the search, but who have interest in the cultural aspects. Separate funding sources are essential to prevent in-house competition for funds between the physical scientists and the social scientists. The reason we should seek a permanent endowment is to ensure that the position survives during periods of low financial support for the technical side of SETI. If the social scientist's position were funded from a central source, the position would be too tempting a target if budget cuts became necessary. It is therefore incumbent upon social scientists to take the lead role in developing an endowment for this position. Although we should not lose sight of the greater goal, temporary funding would permit a quick start, and the position's first incumbent could help raise permanent funding.

Publicizing SETI

We need to inform social scientists about the rationale behind SETI, the search procedures, and the

potential role for social scientists. One strategy would be to reach different disciplines, or clusters of disciplines, through their disciplinary or interdisciplinary academic journals. Because of the biases discussed earlier, our manuscripts must be clear, compelling, scholarly, and targeted toward specialized audiences. When people are uncertain about the content of a message, they look to the qualifications of the source. Thus, it would be helpful to have the materials drafted by recognized scholars or people associated with highly regarded institutions. We might consider having large numbers of coauthors, including astronomers with prestigious affiliations. This would signal the respectability of SETI in the physical sciences and reassure readers that SETI has the support of a scientific community.

Another step is to identify select groups of scholars within a discipline and organize paper sessions or symposia at a regional, national, or international meeting. This will be very difficult because, at present, no individual discipline has a strong nucleus of social scientists who are already interested. In our attempts to organize such a meeting we will have to establish SETI's reputability and relevance for the discipline.

Funding

Although funding is limited, we need to ensure that social science receives a "share of the pie." To qualify for this, social scientists will have to work with other SETI scientists to "enlarge the pie." This will require casting SETI-related social science in ways that are attractive to governmental agencies and finding all new sources of funds. To these ends, we must work with philanthropic organizations and individual philanthropists, and our success may depend upon creative new partnerships.

Some universities still provide funds to offset travel costs, for example, airfare for one international trip per year. The rub is that such funds may be limited to those who will present "original research," which in the sciences may mean new empirical data, thus limiting funding opportunities to only a subset of the many topics that need to be addressed for SETI. Additionally, such funds may be administered by committees whose members have disciplinary or other biases against SETI. Because there are no obvious existing funding mechanisms for social scientific research in SETI, social scientists are often not willing to search out possible funding sources, but instead take the safer route of seeking funding for more conventional lines of research.

The endowed position could allow a secure base from which the incumbent social scientist could seek more long-term external funding for his/her own research, as well as facilitate contacts between funding agencies and other social scientists. One of the functions of an endowed position would be analogous to the provision of startup funding to new academics. In research-oriented academic departments in the social sciences, it is recognized that the institution must make an initial investment in its new faculty members in order to increase the likelihood of long-term productivity and eventual outside funding. Thus, it is possible that an endowed position might eventually pay for itself in increased external funding.

It is particularly important to defray the costs of attending International Astronautical Congresses, the triennial International Astronautical Union Bioastronomy Conferences, and other meetings where SETI social science is welcome. Participation in these meetings serves several goals. First, the price of admission is an original paper, which encourages new research on SETI. Second, fellow panelists can offer useful suggestions and feedback. Third, over two or three meetings, the neophyte becomes a part of the research community, adding new friendships to the justifications for continued involvement. Defraying travel costs is particularly important for junior faculty whose salaries are low.

Dedicated Conferences

In the early 1990s, scholars who were interested in the cultural aspects of SETI planned a major weeklong conference, *The 1995 International Conference on SETI and Society*, to be held at the Majestic Congress Center in Chamonix, Mount Blanc, France. This conference, subtitled "Cultural Aspects of the Search for Extraterrestrial Intelligence and the Discovery of Signals from Other Civilizations in the Galaxy" was to be of unprecedented size, scope, and duration, a true watershed for increasing the role of social science in SETI. The Chamonix Conference was to address a full array of issues regarding the cultural aspects of SETI, ranging from philosophical underpinnings through the immediate and long-term effects of contact.

Unfortunately, due to the loss of NASA funding for SETI, the Chamonix Conference did not materialize. Thus, since the mid-1990s, social scientists have largely had to content themselves with subsidiary roles at more general SETI gatherings. (Unique exceptions were the 1992 workshops reported by

Billingham and others [1999], the 1999 Hawaii seminar that provided the foundation for the present volume, and NASA's Societal Implications of Astrobiology Symposium.) Dedicated conferences can be high-profile events that attract the attention of both social science and SETI communities. They can allow us to build a "critical mass" of qualified social scientists who can spend an extended period of time discussing cultural aspects in depth. They also allow us to publish conference proceedings that will at once provide an archival record of our efforts and stimulate further work. Conferences have proven useful for winning the support for SETI of distinguished physical and biological scientists and should prove useful for winning the support of distinguished social scientists also.

There are many conference models ranging from small, transient work groups that meet for a few days to discuss a limited number of issues to large, comprehensive, multistage events that encourage sustained thought and culminate in the publication of comprehensive proceedings.

This latter model holds great promise for involving leading social scientists in SETI. For such a series of conferences, the first stage is to identify outstanding social scientists and then use travel funds, honoraria, and other incentives to make their involvement in a planning conference attractive to them. The second stage is to implement the resulting plans with a series of larger conferences that are held at six- to eight-month intervals and in the aggregate allow for in-depth coverage of a wide range of topics. Each of these conferences builds on the other, and there are "homework" assignments between meetings. The conference organizers assign staff to handle logistics, provide clerical and research support, and make sure that the meetings are successful. The organizers also assume responsibility for final preparation of the proceedings or other documents. This expensive and time-consuming effort would be justified by (1) gaining the interest of top leaders within different social science disciplines; (2) developing superior publications that can then be widely distributed; and (3) the wave of support that will come from other social scientists when they discover that some of their discipline's leaders have an interest in SETI.

Developing a Scholarly Literature Base

Those of us who are already involved in SETI must "bite the bullet" and develop papers that will be publishable within our disciplines. It is no longer good enough to limit ourselves to journals that attract audiences from the physical sciences or that are intended for "space buffs" who are already supporters of SETI. If we have become somewhat lax because we have been targeting audiences from outside of our disciplines, we will have to tighten our standards. Presumably, the best place to start is with the least controversial aspects of SETI.

Some professional societies publish journals that pertain to the field as a whole and are circulated to the entire membership of the association. Examples include the American Psychological Association's *American Psychologist* and the American Psychological Society's *Psychological Science*. A very high-quality article, with multiple authors of demonstrated reputability, may be accepted by this kind of journal. An article submitted to the *American Psychologist* about ten years ago was returned to the authors without having undergone peer review on the basis that "Psychology and the Search for Extraterrestrial Intelligence" would not interest many readers. Changes in SETI and popular culture may make it worth trying this again.

As an interim step, we should try to increase our publishing in reputable sources that already do recognize SETI as a scholarly activity. One possibility would be an expansion of publication in *Acta Astronautica*, which currently devotes a special issue to SETI every four or five years. The current practice, which precludes relatively rapid publication of articles, could be alleviated by more frequent publication of special SETI issues. Another promising outlet is the *Journal of the British Interplanetary Society*. A social scientist in an endowed position could serve as a focal point to encourage such publishing, for example, by acting as guest editor of special issues of journals. Increasing publication of SETI-related social science articles in such sources would help build a literature base for subsequent articles submitted to discipline-based journals in the social sciences. We emphasize that developing a better literature base in journals that are devoted to space exploration, although valuable, is not a substitute for increased publication in social science journals.

Other opportunities for developing the literature base include newsletters and anthologies. Newsletters often feature nonrefereed articles and contain scant detail. Furthermore, while they may inform and enthuse researchers who are already in a field, they are not necessarily suitable for attracting new contributors. Anthologies such as conference pro-

ceedings or books of readings serve a useful purpose because they do become a part of the archives. However, collections of specialized papers may not be very widely distributed and hence suffer some of the problems of newsletters. In addition, proceedings editors sometimes fail to deliver on their promises, or at least fail to do so in a timely manner, and such bad experiences can discourage potential contributors. For example, a NASA-sponsored study of humans in space conducted in San Diego in 1984 did not appear in print for over a decade. A study of the manned Mars mission eventually published by the American Astronautical Society was first drafted in 1988 but not printed until 1996. Many publishers are wary of heavily multiple-authored books such as conference proceedings. These tend not to sell well; hence, publishers are reluctant to produce them.

There are strategies that can reduce the cost of conference proceedings and hence make them more attractive to publishers. One of us has had experience with a volume that had approximately 50 contributors. Each agreed to waive royalties. Also, the proceedings were from a conference that had NASA-NSF funding, and some of the remaining funds were used to purchase and distribute copies to contributors in lieu of royalties. None of this is to be confused with "vanity" publishing. The manuscript went through the same editorial review and production process as any other manuscript. The subsidy restructured the economics of the project and made it possible to print and distribute a professional, hard-covered book instead of a paperback based on camera-ready copy. These two concessions made publication attractive to an otherwise unenthusiastic publisher.

Increasing Visibility as a Peer Group

Social scientists who are already in SETI must form a conspicuous interdisciplinary peer group for anthropologists, economists, historians, psychologists, political scientists, sociologists, and indeed humanists who might contribute to SETI. We need prominent, enthusiastic role models who are willing to actively recruit and serve as mentors. We are in a transitional period when people are learning about SETI and it is a good time to "stand up and be counted."

Some of us have received support from groups of space advocates. These have provided us with the opportunity to try out new ideas and to receive preliminary feedback. Some of us have presented papers at such meetings that have subsequently been revised for presentation at the International Astronautical Congresses or entered into the literature. Because these space advocacy groups tend to be very heterogeneous and enthusiasm sometimes outruns critical thinking, they may be more useful for getting people started than supporting sustained professional contributions.

If it is to be effective, the social science peer group must be well accepted within the broader SETI community. It will not attract new adherents if there is a strong view among astronomers and astrobiologists that social science is a "weak sibling" or somewhat tangential to SETI. We cannot expect to find new recruits if we ourselves are not accepted, or, as in some space advocacy groups, continually overpowered by people who are totally preoccupied with technology.

Piggyback Projects

Another strategy is to *develop piggyback projects*, that is, encourage projects that develop somewhat standard disciplinary themes but at the same time yield valuable insights for SETI. For example, people's beliefs about extraterrestrial intelligence can serve as an arena for testing theories of attitude formation and change, or people's beliefs about government coverup may give us some insights as to the steps that governments might take to improve credibility.

The basic model here is SERENDIP (Search for Extraterrestrial Emissions from Nearby Developed Intelligent Populations), a microwave search that serves the interests of both basic astronomy and SETI. The way that this is done is searching for microwave evidence at the same time that the radio telescope is collecting data of interest to "mainstream" astronomy. As an example from the social sciences, in a study comparing American and Chinese attitudes about ETI (Vakoch and Lee, 1997), the Chinese collaborator administered the questionnaires for the study in the same testing session at which she gathered data for her experiments in cognitive psychology. This required little extra effort for her, because she had already recruited participants for her own research unrelated to SETI. Questions about SETI can examine broader social scientific issues, as when a study of attitudes towards ETI helps build our understanding of basic processes of attitude formation and change.

Other Strategies for Encouraging Involvement

There are many strategies in addition to those set forth above. One additional strategy is to *involve volunteer consultants*. Those of us who are already engaged may be able to identify people who are willing to donate one or two hours of their time to steer us in promising directions or to critique our work. This will broaden our perspectives and also provide additional quality checks without making heavy demands on marginally interested colleagues.

Another opportunity is to *train covert Ph.D.s*. There are some highly qualified students who are interested in space exploration, including both human expansion into space and SETI. A few of these can receive graduate training at the International Space University and then move forward to an uncertain future. As for the rest, because of disciplinary biases, lack of funding for space-related research, the low priority accorded social scientists for the funding that is available, and so forth, there are very few job opportunities, even for the best graduates. One of us will not accept a graduate student unless it is possible for that person to develop dual competence, for example, strength in environmental psychology, as it is generally perceived, as well as interests in life in isolation and confinement. The dissertations of such students can follow the *Piggyback* strategy identified in the preceding section.

Another way to get people involved is to *include coauthors*. That is, invite colleagues and students to help develop a paper that you are working on in behalf of SETI. This will engage their interest, show them that SETI is a responsible endeavor, and (if you choose the right person) make your work easier. It is helpful if the end product is at least a convention paper and preferably publishable. This strategy can be particularly fruitful with students and with junior colleagues.

Most social scientists currently involved in SETI are North American. This is problematic, because reactions to contact may differ from culture to culture, and our goal is to understand world reaction. This lack of diversity, recognized by the IAA SETI Committee, could in part be overcome by encouraging social scientists with interests in SETI to collaborate with colleagues from other cultures. An endowed social scientist at a place like the SETI Institute or the SETI Australia Centre could play a central role in facilitating such collaborations, by virtue of his or her contacts with a range of colleagues both in the social sciences and in the broader SETI community.

Finally, *we can develop professional networks*. Psychology is an immense field and although the other social sciences have nowhere near so many professionals, they are still large. Of these hundreds of thousands of social scientists there must be some who are already interested in SETI but have yet to be identified. Active networking can help us find and cultivate such individuals. We have seen the impact that email groups like the ALLSETI list can have on maintaining periodic contact between members of the SETI community. An endowed social scientist could serve as a "facilitator" or "hub" of such a communication network.

The Quality of Social Science Insights and Ideas

This essay has outlined a wide variety of steps that can help the social sciences increase their visibility, status, and contribution within the SETI field. In all of this, however, it is important to remember that the core factor is the quality of social science insights and ideas. The impact of social scientists will be profound if they contribute fresh ideas about the nature of ETI and how to detect it, bold insights into the variety of human reactions if the search succeeds, and farsighted scenarios of humanity's eventual relations with extraterrestrial intelligence. The quality of their thought, the ingenuity of their research designs, and the depth of their findings will, in the long run, be particularly significant factors in their contribution to the SETI field.

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