Pursuing Five Strategies for Achieving Contact

[Abridged Version]

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If highly intelligent life has evolved elsewhere, how might scientists detect it? Five strategies are especially promising. Because of all the positive consequences that contact will likely produce, as noted throughout the seminar, humankind should put major thought and resources into all five strategies.

Because a highly advanced civilization, thousands of years beyond our technology, could readily send small but extremely smart probes to monitor our society and telecommunications, we should try to detect such probes:

1. Pursue a variety of means for searching the solar system and our planet for physical evidence of an extraterrestrial object or its effects.

2. Invite contact through invitations to ETI on the World Wide Web.

3. Encourage contact by becoming sufficiently prepared.

In the search for extraterrestrial intelligence or technology, there is also a good chance of detecting evidence from many light-years away:

4. Search for evidence of astroengineering projects and their by-products.

5. Use radio and optical SETI to detect artificial signals.

Additional discussion of all five strategies, and the reasons for widening the array of strategies, can be found at http://members.aol.com/AllenTough/strategies.html.

The SETI field is united by its common aim of detecting irrefutable scientific evidence of genuine extraterrestrial intelligence. To maximize the chances of success, the wisest approach is to encourage and support all five strategies. The benefits to humankind could be extraordinary.

[The full paper is available in Section V of this volume, pages 115–125.]

What Can We Do Now?

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The long-term impact of dialogue with an extraterrestrial civilization may be determined to a significant extent by our initial response. This first impression may set the tone for subsequent dialogue, and in fact, may determine whether or not there will even *be* further communication with ETI. For example, even a reply message with completely benevolent intentions might be misinterpreted. Some people, for instance, might want ETI to help us overcome some of our greatest threats to survival as a species, such as nuclear war. But how can we make sure that another civilization understands that we are seeking friendly guidance and not being threatening (by showing that we have nuclear weapons)? Given the high stakes, we would do well to ponder these issues in very concrete terms long before we have the opportunity to reply.

One of the standard premises of SETI policy is that decisions following confirmation of the existence of ETI should be made on behalf of humankind, with decisions not being made by a single nation or other small group. It is often assumed that access to a signal will lead to access to the message. However, given the linguistic challenges we may encounter in attempting to understand a message from another species, even having the full "text" of a message may not guarantee that it could be comprehended by all interested parties.

Contact via information-rich signals may be particularly likely to lead to discrepancies between what different groups of people know about the message: some may know much, while others know little. To cite an example from fiction, in the movie *Contact* the initial "layers" of the message were relatively easy to understand, but the more complex parts took considerable effort. Ultimately the code was broken, not by a UN task force, a group of academics, or a government intelligence agency, but by a giant corporation with significant resources. It is conceivable that even if the contents of a message were made public, only large groups with significant power and resources could understand them. One benefit of increased attention to message-making prior to signal detection is that we may be better prepared for informed, open discussion and analysis of messages that we may receive in the future.

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We should also become more open about the range of forms that a reply message might take. Most people who have considered the matter seriously enough to draft messages themselves have backgrounds in mathematics, the physical sciences, or engineering. It is only natural that the content of their messages has reflected the same disciplines. There has been some speculation that messages from another civilization may contain information about their cultures, philosophies, and arts. But there have been no attempts to construct such messages ourselves. We might, for example, construct messages that are intended not merely to convey information about our existing forms of art, but instead send messages that are *themselves* works of art. If some day we decide to focus on math and science in reply messages, we should do so with the conscious recognition that this would provide a very truncated view of human concerns.

Spreading the Word

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…the recruitment of eminent and respected thinkers in all the fields relevant to the topic, and the involvement of specialists in decision theory…

Two areas are selected below from the many that could be discussed. They are the recruitment of eminent and respected thinkers in all the fields relevant to the topic, and the involvement of specialists in decision theory and related fields in the challenges we face. It should be noted that Al Harrison has written a thoughtful paper, covering all aspects of the "What Next?" question, which should be required reading for us and for these two groups as they emerge.

At the moment, serious issues of the cultural impact of contact have been discussed by only a handful of key people who, to their credit, have come to recognize the significance of the questions that are being raised. It is important that we seek to include additional thinkers in the years to come. One group is especially important. This is composed of the people who are recognized by their peers as being at the top of their own disciplines, especially in the academic world. They are those who are sought after, worldwide, to be prominent advisors to many organizations, whose publications are the finest, whose original contributions are notable, and who have received honors and awards for their work. A good example is the late Roger Heyns, one-time Chancellor of UC Berkeley and an eminent social psychologist. Exciting the interest of such leaders could be viewed as elitist. This could be good, because of their enormous importance in our own cultural evolution. But it should not prevent us from growing, or harnessing, in parallel, great communicators like Carl Sagan, who can spread knowledge and discussion to people from all walks of life.

In many universities there are departments or divisions focused on decision theory, decision analysis, game theory, and utility theory. These techniques are seldom used in the real world, yet they offer approaches that can offer clearer insights into the complexity of the issues we face.

Speculations on the First Contact

[Abridged Version]

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The existence of very advanced technological civilizations is highly conditioned by very large societal lifetimes.

Based on a hypothetical distribution of advanced technological civilizations in the galaxy, Sebastian von Hoerner (1961) estimated that the civilizations we will find will probably be much older than we are, and they will be more advanced. He considered that our chance of learning from them might be the most important incentive for our search. According to these ideas and due to the large interstellar distances, the extraterrestrial contacting signals would already contain high-information messages (including an introduction to a language). There might be some *speaking* and *listening*, but *mutual exchange* of knowledge would be rather limited because of the long time scale involved.

Shklovskii and Sagan (1966) and Sagan (1973, 1980) took all these original ideas and extended them into the concept of *Encyclopedia Galactica*. They imagined that a hypothetical network of civilizations in the galaxy compiled all the accumulated knowledge from each independent evolutionary history and put it at the disposal of the emerging technological societies. After the detection of an extraterrestrial message, they foresaw big technological gains, hints, and leads of extraordinary value. They speculated about all sorts of scientific and technological results, ranging from a valid picture of the past and future of the universe through theories of fundamental particles to whole new biologies. They also made conjectures that we might learn from the views of distant and venerable thinkers of the deepest values of conscious beings and their societies. Finally, the most speculative and seductive argument to pursue in the search for extraterrestrial signals is that we can obtain information that may help us to solve our political, social, or environmental global crises and thereby pass through our *technological adolescence*.

These dreams have dominated the scientific and popular literature over the last 40 years, including most of the presentations made in this workshop. Very little discussion took place around the basic hypotheses behind these ideas.

The purpose of this essay is twofold: The first purpose is the introduction of restrictions to some of the original hypotheses about the technological characteristics and intentions of the extraterrestrial civilizations. The second is the construction of different communication scenarios, based on the inclusion of ethical and artistic *universal* principles. To do that, we will analyze the proposed characteristics of the extraterrestrial supercivilizations that would have the hypothetical capability to send interstellar messages with high-information content. We will present a series of theoretical and empirical arguments to reject the concept of advanced civilizations transmitting omnidirectional signals in a full-time mode. In this way, we will place a limit on the detectability of these high-information messages. Then we will comment on the life expectancy of our contemporary terrestrial civilization, with special emphasis on the consequences generated during the last 50 years of the nuclear era. The present state of planet Earth and its long violent human history create an urgent need for a deep and strong ethical, societal mutation. Otherwise, our species will become extinct.

All technological civilizations that already have passed through their technological adolescence and have avoided their self-destruction (by misuse of advanced technologies or by environmental degradation of their home planet) must have developed ethical rules to extend their societal life expectancy. In

doing so, they must have learned how to respect the natural evolutionary times of other beings in the universe. To build this scenario, we will introduce the concept of *Lex Galactica*, based in Kantian ethical principles, as hypothetical guidelines for advanced civilizations in how to contact emerging societies. If the advanced galactic civilizations are unable to check the level of technical and ethical evolution of the possible recipients of their signals, they will be unable to send high-information-content messages due to *Lex Galactica*. Using these alternative boundary conditions, we will discuss different contact scenarios and their possible message characteristics. We will consider the possibility that the first message from an advanced technological society would include some extraterrestrial artistic manifestation.

The existence of very advanced technological civilizations is highly conditioned by very large societal lifetimes. Analysis of the history of our incipient technological human society shows that we are facing the dangerous technological adolescent era, when our civilization can became extinct in the following 30 to a thousand years. Probably, most technological civilizations have to pass through a similar adolescent era. In any case, the only possibility to avoid self-destruction is a deep and strong societal mutation, based in some sort of Kantian ethics. The implementation of these ethical guidelines would prohibit placing potentially destructive knowledge at the disposal of any ethically underdeveloped society. This knowledge could be a threat to the survival of the recipient civilization.

Only beacon, low-information signals should be sent, in an intermittent and target mode, to those stars that have planets suitable for life.

From these assumptions, we can derive the following observational predictions:

1. No omnidirectional electromagnetic transmissions with high-information content will be observed.

2. Only beacon, low-information signals should be sent, in an intermittent and target mode, to those stars that have planets suitable for life. For detecting terrestrial-type planets, extraterrestrials can use advanced space interferometry techniques (Beichman et al., 1999). We should expect this type of signals from all advanced technological civilizations at distances over $[35 + (t_f\text{-}2000)/2]$ light-years, where t_f is the observing date in years and $t_f \geq 2000$.

3. An alternative transmission strategy could be the addition of some extraterrestrial artistic creations to the beacon signals. Extraterrestrial art contemplation would help us to expand our perceptive horizons.

4. Those nearby advanced societies that have already received our initial radio transmissions, with the technical capability to detect and decode our weakest signals, will have some idea about our technological and moral level of development. These civilizations may be transmitting to us high-information messages or those chapters from their *Encyclopedia Galactica* that our civilization is in a position to understand—but only those stars at distances $R_t < [35 + [(t_f\text{-}2000)/2] + \tau]$ light-years, where R_t is the distance at the observing date t_f and τ is the time that the extraterrestrial society needs to analyze and evaluate our technological and ethical stage.

5. We may also be able to detect some radiation leakage from nearby civilizations, but this will probably be with very low-information content. The same thing would happen with any serendipitous detection of evidences of technological extraterrestrial activities (Dyson, 1959; Lemarchand, 1994 and 1997).

[The full paper is available in Section V of this volume, pages 153–164.]