



Responsibility, capability, and Active SETI: Policy, law, ethics, and communication with extraterrestrial intelligence

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ABSTRACT

With recently growing interest in the Active Search for Extraterrestrial Intelligence (SETI), in which humankind would send intentional signals to extraterrestrial civilizations, there have been increased concerns about appropriate policy, as well as the role of space law and ethics in guiding such activities. Implicit in these discussions are notions of responsibility and capability that affect judgments about whether humans or other civilizations should initiate transmissions. Existing protocols that guide SETI research address transmissions from Earth, but there is debate over whether these guidelines should inform *de novo* transmissions as well. Relevant responsibilities to address include (1) looking out for the interests of humankind as a whole, (2) being truthful in interstellar messages, and (3) benefiting extraterrestrial civilizations. Our capabilities as a species and a civilization affect how well we can fulfill responsibilities, as seen when we consider whether we will be able to reach consensus about message contents (and whether that would be desirable), and whether we have the capacity to decode messages from beings that rely on different sensory modalities. The interplay of these responsibilities and capabilities suggests that humankind should place increased emphasis on Active SETI.

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1. Introduction

Recently there has been increased discussion within the international community of scientists engaged in the Search for Extraterrestrial Intelligence (SETI) about Active SETI, in which intentional signals would be sent from Earth prior to the detection of intelligence on other worlds. Perhaps the most well-known such effort to make our presence known to other civilizations was the radio transmission from the Arecibo Observatory in November 1974, directed toward the globular cluster Messier 13 (M13), located some 25,000

light-years from Earth in the constellation Hercules [1]. Although occasionally messages to extraterrestrial intelligence have been proposed for [2,3] or actually included on space probes — most notably the messages borne on several Pioneer [4] and Voyager spacecraft [5] — in this paper we will focus on scenarios favored by the international SETI community, in which contact is attempted across interstellar distances using electromagnetic radiation.

Throughout this paper, we will examine some of the responsibilities that humankind has when considering transmissions to other worlds, as well as ways that our capabilities as a species and a civilization affect our responsibilities. After reviewing the status of existing SETI protocols and their stance toward Active SETI, we will explore the relevance of diplomacy, law, and ethics for informing Active SETI. While the goal of representing the best interests of humankind is uncontroversial as an abstract principle, implementation becomes challenging

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when we attempt to represent the diversity of human perspectives in messages that reflect consensus. Moreover, we will examine the implications of shifting toward a more cosmocentric ethic that considers the welfare of extraterrestrial intelligence, and not only the best interests of humanity. As we reflect on our capacity to engage in interstellar communication, whether by passively listening or actively transmitting, we must remain mindful of the tremendous challenges we face when attempting to comprehend forms of intelligence that evolved independently in potentially quite different environments from our own, and with whom we are constrained to communicate through electromagnetic radiation at interstellar distances, and not by direct contact. To preview one of the main conclusions of this paper, given the many uncertainties about the responsibility and willingness of extraterrestrial civilizations to transmit signals for our benefit, an increased reliance on Active SETI to complement traditional Passive SETI programs is advocated.

2. Responsible policies: protocols and Active SETI

In response to the advances in SETI programs and the prospect in the near future that we may be faced with the detection of evidence that we are not alone in the universe, since the 1980s, under the auspices of the International Academy of Astronautics (IAA) and the International Institute of Space Law (IISL), legal experts, scientists, and technologists have devoted significant attention to legal and policy issues relevant to SETI [6]. This discussion has drawn upon precedents from space law and other legal principles to provide guidance about the transmission of messages from Earth to any extraterrestrial intelligence that might be detected in the course of SETI research, summarized as so-called “post-detection protocols.”

Some have argued that essentially the same legal and policy considerations apply whether one is replying to a signal from an already detected civilization, or whether one is transmitting without prior knowledge that an extraterrestrial civilization exists. Others suggest that decisions about whether to transmit from Earth *de novo*, prior to detecting extraterrestrial intelligence, may require a different deliberative process than traditional, Passive SETI. Guillermo Lemarchand and Donald Tarter, for example, have analyzed the protocol called the “Declaration of Principles Concerning Activities Following the Detection of Extraterrestrial Intelligence” [7]. Some have observed that, based on this document, there should be no transmissions of any sort prior to broad-based international consultation. Specifically, they highlight Article 8, which reads “No response to a signal or other evidence of extraterrestrial intelligence should be sent until appropriate international consultations have taken place.” In contrast, Lemarchand and Tarter argue that “the existing SETI protocol does not specifically prohibit active predetection search strategies. It is, after all, a ‘post-detection’ protocol.” (p. 140).

By time of the 2006 International Astronautical Congress, held in Valencia, Spain, the international SETI community had moved to a point at which there was widespread support for the view that the existing SETI protocols should not be construed to apply to *de novo* transmissions. An editorial in *Nature* [8] maintained that “the Valencia meeting voted against trying to set up any processes for deliberating over the style or content of any spontaneous outgoing messages,” (p. 606) though it would be more accurate to say that the group that met in Spain simply proposed that the current SETI protocols remain silent on the issue of Active SETI, given the different circumstances of replying to a signal from another civilization and of transmitting without prior knowledge that the hoped recipient actually exists. At that same congress, though independent of these discussions of the IAA’s SETI Permanent Study Group, Ricky Lee’s [9] review of legal and policy issues related to SETI included the recommendation that the existing protocols should be modified to distinguish “between a communication sent by the Earth that is directed at a known alien civilisation and a general attempt at creating communications with such unknown alien civilisations...” (p. 5).

3. Not science, but diplomacy

Some have argued that Active SETI goes well beyond the realm of science, and is instead a move toward formalized relations with other civilizations. As Michael Michaud [10] summarizes this position, “In effect, sending deliberate communications to another intelligent species would mean conducting relations with that species. It would be a form of diplomacy.” (p. 554). A similar sentiment is expressed in the SETI Institute’s report [11] on its strategic planning workshops charged with identifying research priorities for the first two decades of the twenty-first century: “Transmission is a diplomatic act...” (p. 244). This report, called *SETI 2020: A Roadmap for the Search for Extraterrestrial Intelligence*, recommended *against* initiating Active SETI projects.

Elsewhere Michaud [12] writes that “Despite its name, Active SETI is not scientific research. Sending deliberate communications to another civilization is a political act.” (p. 25). In the next sentence in the same paper, Michaud explains the primary concern of those who oppose Active SETI, or who are at least cautious about it: it could be dangerous. “Given our lack of evidence, we might best adopt a precautionary principle: Don’t call attention to ourselves until we learn more about alien capabilities and intentions,” he reasons. “In practical terms,” he concludes, “this means not increasing the electromagnetic signature of the Earth beyond its present level” (p. 25).

4. The limits of law

Although at times Active SETI has been described as a form of diplomacy, more often scientists have turned to the legal profession for guidance on principles by which to regulate Active SETI. But there are several challenges to relying on legal guidelines. Francis Lyall [13] has argued

that such documents as the Outer Space Treaty and the Moon Treaty of 1979 have limited applicability to questions raised by SETI, and that the desire to seek legal guidance may in part be based on the desires for scientists to make sure they are doing the right thing, rather than an obvious relevance of legal principles for guiding SETI. In Lyall's view, "we are scratching about among the Space Treaties, when we seek to base SETI legalities on their terms. The fact is that SETI was not in the minds of those drafting, signing or ratifying these agreements." Moreover, he contends, "the search for legality based on the treaties is, to an extent, unnecessary. At least within the Anglo-American view, what is not prohibited is permitted. That is also the case in International Law.... However, I find among scientists a desire to know that what they are doing is authorised by law." (p. 662).

One of the challenges of adopting legal precedents as a foundation for exchanges with extraterrestrial intelligence is that law is most informative when there is already a *well-established relationship* between the actors whose relationship is in question. That is, before we know what the appropriate *legal* relationship between two entities should be, we typically know that both entities actually exist, and we have an existing relationship of *some sort* between those two entities. Simply acquiring a signal from another civilization, or sending a signal to another civilization, is insufficient to establish a legal relationship. Instead, both parties must be doing something to make contact with the other before they can be said to have a legal relationship. As Patricia Sterns [14] articulates this point, "the *transmission* of a response will formally engage the Earth and the extraterrestrial beings in a form of legal relationship." (p. 4).

If we detect extraterrestrial intelligence in passive searches for signals from other planets, then we would indeed know that the other intelligence exists. If their signal is in response to unintentional leakage of electromagnetic radiation from Earth, or other evidence of developing civilization on Earth, such as atmospheric changes in the nineteenth century due to industrialization, then the extraterrestrial civilization would also know about our existence. Thus, there are at least some cases of traditional passive search scenarios in which legal precedents would seem to provide at least initial guidance for defining our relationship. A more perplexing case holds for Active SETI, in which we would transmit a message to beings whose existence we posit, but without direct evidence.

5. Responsible for truth

While we may not be in a formal legal relationship with extraterrestrial intelligence for some time, we may still benefit from "metalegal" guidelines for appropriate interstellar communication [15]. For example, Aldo Armando Cocca [16] identifies a dozen principles "rich in legal content in a brief code" to guide the actions of SETI researchers. Among these is the "principle of truthfulness," which states that "The addressee of messages or signals must never be intentionally deceived."

(p. 129). Cocca extends this emphasis on truthfulness to other terrestrial researchers as well in a separate principle, also identified as the "principle of truthfulness," which states that "Researchers must always observe due loyalty vis-à-vis all other researchers." (p. 129).

Ernst Fasan [17] conveys a similar emphasis on truthfulness, at least about our intentions to act in certain ways toward extraterrestrials, when he suggests the following as an important concept to communicate to extraterrestrial intelligence: "If we promise something, we shall keep our word; if you promise something, please do the same." (p. 134). However much we might agree that we have a responsibility to be truthfulness in interstellar messages, following through on that intent may be difficult. As Goldsmith [18] notes after approvingly recalling Fasan's call for truthfulness, "In view of the notorious difficulty of separating truth from falsity, even this simple rule may prove difficult to apply. Does exaggeration count as untruthfulness, as when Thomas suggested that we broadcast nothing but Bach...?" (p. 150).

6. Responsibilities to humankind: reflecting diversity in interstellar messages

An equally important principle that has been espoused to guide SETI activities is to ensure that decisions about whether to transmit, and if so, what to say, be made on behalf of humankind as a whole. Indeed, one of the reasons the participants of the *SETI 2020* workshops [11] recommended *against* beginning Active SETI projects was their observation that transmission is "an activity that should be undertaken on behalf of all humans. We lack the cultural maturity to accomplish such a cohesive action." (p.244). Indeed, even the team responsible for the 1974 transmission to the globular cluster M13 from the Arecibo Observatory called for broad-based discussions prior to any follow-up transmissions [1]: "More extensive attempts at the transmission of radio messages from the Earth to extraterrestrial civilizations should be made only after international scientific consultations as recommended by the first Soviet-American conference on communication with extraterrestrial intelligence...." (pp. 465–466).

While there are certainly benefits of sending a message about which there is broad-based consensus, achieving absolute unanimity about message form and content could also be constraining and inhibiting to a fruitful exchange between human and extraterrestrial civilizations. Instead, a message that emphasizes differences of opinion — both about the appropriate content domains and the specific accounts that are given in each of these domains — could enrich and actually better reflect the nature of human understanding at this point in our development as a civilization.

To be clear, the *intention* of those who encourage sending a response from Earth in a single voice is laudable. Proponents of a unified response argue that no small group should take it upon itself to speak for planet Earth. Rather, a process that ensures widespread input

and agreement on message contents would better represent Earth than would a message composed by a group from one nation.

Douglas Vakoch [19] calls for a markedly different approach in his “Dialogic Model,” which advocates transmitting messages that highlight wide-ranging and at times even conflicting perspectives. By doing so, he attempts to reflect the reality of the current human situation in which there are significant differences of viewpoint between groups and even between individuals within relatively homogeneous groups. Vakoch argues that to minimize such differences would neglect some of the most important information that humankind could convey: the diversity of our views.

At the same time that a message reflecting human diversity would provide a more *accurate* portrayal of ourselves, it may also be a quality that extraterrestrial intelligence will find inherently worthwhile. “[D]iversity may be a value in its own right, an end unto itself—worth pursuing for its own sake,” suggests Mark Lupisella [20]. “Given the potential for quite diverse life forms throughout the universe,” he continues, “diversity may have broad cosmic significance beyond our own aesthetic appreciation” (p. 339).

From this perspective, one might argue that if a message is restricted to only the content about which there is universal consensus, the resulting message would provide a very impoverished — and perhaps brief — representation of human concerns. Indeed, we might view Jean Heidmann’s [21] proposal to send extraterrestrials an encyclopedia as a way to convey a diversity of views—though he originally stated the value of his approach as providing a ready-made *consensus* about content, noting that encyclopedias’ “vast diffusion ... insure their recognition by a large portion of the Earth society and the best chance for a wide consensus.” (p. 234). By recognizing that the content of encyclopedias always reflects editorial perspectives — for example, through decisions about which topics are worth including and how much attention each deserves — we might turn this inherent partial bias into a virtue. By identifying a panoply of encyclopedias representing a range of ideologies and approaches, we might convey diverse perspectives through works that might receive widespread endorsement from a range of communities. And although the particular form of the encyclopedia is only one of a range of possible forms we might wish to use, with its own set of challenges for encoding and decoding, the ideal behind the encyclopedia — to represent a range of perspectives — is appropriate for attempting to convey the complexity of human views and values.

7. Capable of consensus?

Even if we were to achieve widespread consensus about any messages we transmit, it is by no means certain that an extraterrestrial interlocutor would automatically assume that a message from Earth was sent on behalf of all of humankind. Indeed, the claim that any particular message is representative of Earth as a whole, while also describing the conflicts and lack of coordination of many

aspects of our civilization, could make a claim of broad representativeness questionable, and rightly so.

Freeman Dyson has argued that the multiplicity of transmissions that might follow detection of extraterrestrial intelligence, while not in accord with the ideals of existing SETI protocols, is nevertheless the likely response given the challenges of regulating transmissions from Earth. However, Dyson sees this cacophony of responses as representing humankind well, insofar as it represents our lack of agreement on many fundamental issues.

Some have intentionally encouraged such diverse messages, compiling samplings for actual transmissions. Alexander Zaitsev, Charles Chafer, and Richard Braastad [22], for example, have collected messages from around the world and transmitted them from the Eupatoria Planetary Radar facility in the Ukraine. They contend that by gathering input from people from all walks of life, and not merely those closely associated with the SETI community, they have increased the diversity represented in interstellar messages: “we strongly believe in a truly democratic approach to METI [Messaging to Extraterrestrial Intelligence]: that the people themselves, not just a handful of elites, should speak for Earth through their direct participation in METI.”

Representing our diversity may give a true picture of the current state of our civilization, as Michaud points out, but we should be cautious in how we might convey this [23]. “Having humankind speak with many voices may be representative of diversity,” he notes, “but it may also be bad policy. Imagine yourself in the place of an ETI [extraterrestrial intelligence] that receives a barrage of messages from the Earth. How could you conduct a rational dialogue with such mixed signals? Who would you believe, those humans who seek an exchange of scientific information, those who desire to convert you to the true faith, or those who announce their intent to exterminate you?” (p. 133). If instead of transmitting an unregulated “barrage” of messages that contradict one another, however, we were able to send a coherent collection of messages that explicitly and respectfully articulated differences of perspective, that could provide extraterrestrials — and ourselves — with an important indication of our increasing maturity as a species.

Although we commonly imagine that an advanced extraterrestrial intelligence will have a unified civilization, perhaps they would be familiar with diverse cultures because such are represented on their own worlds. This point is summarized well by Michaud [24] when he observes “It is also possible that the aliens would be not unified politically, any more than the human race is. The extraterrestrials might also have competing states, and it would be important to know if the communications we receive represent a unified planetary body politic, or only one state, alliance, faction, or other sub-group (it is even possible that there could be more than one advanced species on a planet.)” (p. 14).

8. Galactic protocols and interstellar responsibilities

While the benefits of representing human diversity in interstellar messages may be clear, there still remains the

question of whether we should contemplate sending such messages only in *response* to the detection of a signal from an extraterrestrial civilization, or whether we should begin transmitting intentional signals even prior to knowing which, if any, stars systems are inhabited.

The traditional line of reasoning in opposition to Active SETI is summarized well by Jill Tarter, as she reviews the reasoning of one of the participants of the SETI Institute's strategic planning workshops to determine priorities for the next two decades of research. As Tarter [25] describes this meeting, the results of which were published as *SETI 2020: A Roadmap for the Search for Extraterrestrial Intelligence*, she notes:

At the workshops Paul Horowitz (a physicist from Harvard University) summarized things very well, [when] he said: 'If it happens at all, there always has to be a first contact between two technological civilizations. Statistically, it is extremely unlikely that our first contact with an ETI civilization will also be its first contact with an ETI civilization. Thus the advanced technology we detect will have experienced this type of encounter many times before. It already may have established a galactic protocol for information exchange, to which *ab initio* transmissions by Earth will have no chance of adhering. Thus we justify our asymmetrical listen-only strategy by recognizing our asymmetrical position amongst galactic civilizations. We are among the very youngest!' (p. 18).

One assumption in the above quote is especially noteworthy. This assumption is that the standard "galactic protocol" necessarily involves the more advanced civilizations transmitting and the less advanced civilizations listening. The difficulty with this claim is that if indeed humans have no way to anticipate what a "galactic protocol" involves, then how can we be so sure that it requires the more advanced civilization to take the initiative? It would, to be sure, be beneficial to humans if this asymmetry of responsibility actually holds. As Tarter [25] notes, "Transmitting is a harder job than listening, and so we put the burden of transmitting on the older technologies." (p. 19).

What is not so clear, however, is whether the advanced civilizations will feel the responsibility to take on this burden. After all, we see cases on our own planet of cultures that provide benefits for individuals within their *own* culture, but they do not place much emphasis on providing for the well-being for individuals in *other* cultures. Perhaps this assumption really reflects our ethical assumption that if a civilization has the resources to transmit messages for our benefit, it *should* transmit messages.

Fasan indirectly addresses the question of the obligation to transmit when he examines how metalegal principles may affect the actions of extraterrestrial civilizations [26]. He provides the following hypothetical scenario, which is quite close to the standard SETI paradigm in which we, the younger civilization, attempt to detect electromagnetic signals from other worlds, with the hope that simply knowing that it is possible for a

civilization to live for an extended time may provide encouragement to humankind during our own technological adolescence. "[W]hat should be the law when some epidemic breaks out among the members of another race, which can be cured by [electromagnetic] waves?," Fasan asks. "Are we then legally obligated to deliver such waves to the suffering aliens? As long as we remain within the limits of strict legality we have to answer this question in the negative. For no race may damage another one. No race has therefore the right to demand from the other that it harm itself. But every enlargement of entropy is by definition damage to a certain degree. Were we to provide the other race with certain electromagnetic waves, we would use up energy. But using up energy increases entropy and is self-damaging. Therefore our negative answer is correct." (p. 65).

Thus, Fasan [26] concludes that there is no *legal* obligation for one civilization to transmit electromagnetic signals for the benefit of another—even under circumstances that call for greater compassion (an epidemic that can be cured with intervention) than does humankind's current situation. Nevertheless, he quickly adds that at least according to human ethical standards, the civilization that *can* help *should* help: "This solution is, as we have said, a purely legalistic one. The highest principles of human ethics would, of course, demand that we should, and very quickly, help the other race and provide the necessary energy." (pp. 65–66). Indeed, elsewhere Fasan [17] argues that among the appropriate ideas to communicate in messages to extraterrestrial intelligence is the following: "If we can help you in any way, please tell us. It is an ethical principle for us to extend help to you." (p. 134).

The challenge we face in attempting to anticipate whether extraterrestrials will feel themselves bound by comparable ethical guidelines is that we have no direct knowledge of such putative beings. From the perspective of an extraterrestrial's ethical system, perhaps it is the younger civilization, which arguably has the most to gain from an interstellar exchange, that should be expected to take on the burden of transmitting. Rather than benevolently transmitting, more advanced civilizations may instead be selective in deciding to whom they will reply. A young civilization may not have a galactic *right* to intercept transmissions from other civilizations simply by virtue of its youth; young civilizations may need to *earn* the knowledge that other civilizations exist by first showing that they are willing to transmit messages of their own.

Ultimately, regardless of who *should* take the burden of transmitting, perhaps no civilization currently *is* transmitting. In the face of an inherently uncertain state of affairs, a diversified search strategy of both Active and Passive SETI may increase our chances of contacting another civilization.

9. Sensory capabilities

As we consider the potential diversity of forms that extraterrestrial intelligence may take, we find another

reason to engage in Active SETI. To begin exploring the extent of that diversity, Doris Jonas and David Jonas in their book *Other Senses, Other Worlds* [27] suggest we can gain insights into the nature of extraterrestrial intelligence by extrapolating from terrestrial species that rely on senses that less important to humans than our primary senses of vision and hearing. “One thing is certain: we have no reason to assume that evolutionary forces on other planets will produce forms or intelligences that are the same as ours, even though the basic raw materials must be similar,” Jonas and Jonas argue. “Whatever chance factors combine to produce any form of life, infinitely more must combine to produce an advanced form” (p. 9). But we are not left simply to speculate abstractly about the possible natures of extraterrestrials; rather, we can conduct Gedanken experiments based on variations of species we can directly observe on Earth. “How can we gain some remote idea of what kinds of being we may someday encounter in the course of interplanetary and intergalactic exploration?” they ask. “Surely the most logical way is to try to imagine what might be the result of some other chance circumstances that could produce different combinations of those senses and intelligences that exist right here on our own earth” (pp. 9–10).

As an example, Jonas and Jonas consider how intelligent extraterrestrials that rely primarily on a sense of olfaction might differ from humans. Even mathematics, something that many would consider to exist beyond the realm of sensory experience, may be affected by a species’ primary sensory modality, they argue. As they imagine the mathematics of a fictional intelligent species that uses smell as its main means of gathering information about their world, Jonas and Jonas [27] suggest that “with their sense of the diffusion of matter, their numbers represent gradients between each integer. The number 1 represents a field extending from 1 to 2, and so on along the line. As a result, their mathematical calculations are expressed in symbols of probability and utilize the concept of statistical averages far more than the absolutes of our digital form of calculation” (pp. 57–58).

Similarly, because the presence or absence of objects at a specific point in time is more difficult to determine through olfaction than through audition or vision, an olfactory intelligence could have a different sense of time. For such beings, Jonas and Jonas [27] argue, “much of the past flows into the present and coexists with it, so that their thinking patterns and their language are based on different premises from ours, especially in this matter of what is past, what is present, and what is future” (p. 58).

These differences between humans and extraterrestrials in morphology and physiology may be considerable, given the diverse environments in which different forms of intelligence may have evolved. “We and the aliens also might have different frames of physical and temporal reference,” Michaud [24] suggests, “based on differing sizes, shapes, metabolic rates, and perceptions of the physical environment, complicating the development of a mutually comprehensible symbolic language” (p. 13).

As an example of how differences between species can affect communication, Albert Harrison and Alan Elms [28]

consider the impact of varying perceptions of time. “Different species tend to run on different internal clocks,” they note. “On Earth there are fast-paced animals with brief life spans (for example, hummingbirds) and slow-paced species with lengthy life spans (for example, tortoises). Major differences between the internal clocks of humans and ETIS [extraterrestrial intelligent species] could pose significant barriers to communication and understanding” (p. 212). Such cautions become all the more sobering when we take into account that extraterrestrial intelligence may be *artificial* intelligence, having been created by biological forebears, but potentially unconstrained by some of the physical attributes of their creators, such as mortality.

10. Capable of communicating?

The usual assumption in SETI circles is that extraterrestrials we hope to encounter via interstellar communication will have more experience and superior capabilities than we do. On purely statistical grounds, we assume that if extraterrestrials make contact with us, they will also have already made contact with other civilizations. And in the course of multiple such encounters, they should have developed methods for communicating in maximally intelligible ways with whatever kind of rudimentary intelligence receives their electromagnetic signals. Having never made contact with an extraterrestrial intelligence before, we are lacking in this experience. Thus, it seems reasonable to place the communicative burden on the more advanced civilization—in this case, the extraterrestrial.

The scenario faced by SETI scientists is all the more challenging because these scientists are constrained by not having direct access to the intelligence they are attempting to understand. Unlike ethological investigations on Earth, SETI scientists are unable to observe extraterrestrial intelligence in its natural environment. Unlike laboratory studies, SETI scientists are unable to manipulate experimental conditions systematically to test ever more refined hypotheses. Instead, if their searches succeed, they will be confronted with a signal from an intelligence that they hope has attempted to be as transparent as possible. The question remains, however, whether humankind will be able to comprehend the best efforts of extraterrestrial intelligence.

If we have sufficient faith in the communicative abilities of such advanced extraterrestrials, then we need do nothing more than wait for their signal to come in. Any message encoded in the signal should be easily decoded, and although the message may not begin with a series of prime numbers or a primer of arithmetic, the intent of the extraterrestrial sending it should be obvious in the form and content of the message. But if there remains any doubt about our ability to understand the message sent by an intelligent species that evolved in a different environment, and with whom we have no possibility of direct contact, then we should also remain open to receiving assistance from extraterrestrials in the opposite direction: their decoding and interpreting of *our* messages.

Even accepting this asymmetry of communicative ability between humans and advanced extraterrestrials, the more fundamental question of which basic search strategy we should use — actively transmitting, passively listening, or both — remains unanswered. In the same way that we would expect an advanced extraterrestrial to be more capable of creating intelligible messages than we are, we should also expect them to be superior at *decoding* and *interpreting* messages from other civilizations than we are.

If it turns out that we are not as skilled at understanding messages from extraterrestrials as we hope to be, in the long run the quickest way to have *mutual comprehension* between humans and extraterrestrials may be for humans to take the initiative. By transmitting messages that we would imagine to most intelligible to other civilizations, along with a sampling of our own natural languages [29,30], we would provide substantial guidance for more advanced civilizations to tailor a primer to our own limited experiences of the universe. The delay of such a round-trip exchange could be considerable — easily extending to centuries or millennia — but if the alternative is to learn that intelligent life exists around other stars, but we cannot understand what they are trying to tell us, then it would be advantageous purely for human self-interest to begin a sustained Active SETI program even now, before detecting other civilizations. Such a proactive strategy would also address the concern that while many of the more advanced civilizations *should* be transmitting for our benefit, none or few actually are.

11. Responsible membership in the Galactic Club

The emphasis on the benefits of interstellar communication for humans, rather than for extraterrestrial intelligence, is reflected in the Draft Declaration of Principles Concerning Sending Communications with Extraterrestrial Intelligence, developed within the IAA SETI Committee. This document notes that if a message is sent to an extraterrestrial civilization, “The content of such a message should reflect a careful concern for the broad interests and wellbeing of Humanity....” No mention is made of the potential benefits of such communication for intelligence on other worlds. Indeed, one of the objections raised to Active SETI in the *SETI 2020* report [11] was that it would provide humans with no benefits for many years, whereas Passive SETI could succeed in the near future: “Transmission will not be rewarded for decades, perhaps centuries, because of the great distances and round-trip travel times for signals. Our resources are constrained, and it is thus prudent to pursue a passive program of exploration that might provide a positive result within years.” (p. 244).

Although many have suggested that humankind might benefit from joining a “Galactic Club” of other civilizations [31], few have suggested that humankind should be expected to pay dues to join, or that we should consider the needs and interests of other members of the club. Given our uncertainty about extraterrestrial motivations and “galactic protocols” for first contact, however, the fact remains that passive searches may be met with silence, even if the galaxy is teeming with intelligent life capable

of communicating at interstellar distances. As Lupisella [32] speculates, “maybe, if we’re not wise to a cosmocentric ethic, we would not be worthy of taking part in a galactic or cosmic dialogue at all” (p. 10).

De novo transmissions from Earth, prior to detection of an extraterrestrial civilization, may also have a salutary impact on future generations of humans. If other civilizations are waiting to reveal their presence until receiving an invitation from humankind, an Active SETI program may be a prerequisite to establishing communication with extraterrestrial intelligence. Thus, search strategies that take seriously human obligations to other civilizations may also increase the chances that future generations of humans will make contact with life beyond Earth.

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