

Anticipatory Science Diplomacy as a Governance And Cooperation Mechanism for the Search for Extraterrestrial Life

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Executive Summary: The scientific search for extraterrestrial life mainly consists of looking for evidence of current and past microbial life and intelligent, technology-capable life. The space industry appears to have entered an era of “NewSpace” activities that are no longer conducted exclusively by the traditional state space powers. Instead, emerging space actors, both public and private, have commenced searches for extraterrestrial life. The likelihood of successfully discovering extraterrestrial life only increases when considering an unintentional discovery resulting from the various other space-related activities pursued by NewSpace actors. Unfortunately, the relevant policy landscape is plagued with significant gaps. Anticipatory diplomacy, that is, a model for diplomacy that seeks to act today to address the challenges of the future, might be appropriate for governing those science-related global activities and for encouraging cooperation among varying actors. This policy memo offers the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) suggestions on how to practically implement anticipatory diplomacy in the scientific endeavor of the search for extraterrestrial life by means of four proactive policies: harmonization of pre-discovery measures in national space laws, encouragement of international R&D partnerships among public and private actors, a public registry of activities with the potential to detect extraterrestrial life, and an appropriate interdisciplinary UNCOPUOS Working Group. The overall recommendation is to start with establishing the proposed UNCOPUOS Working Group and then to task it with evaluating if and how to implement the other three proactive policies.

I. Key policy challenges in the scientific search for extraterrestrial life

We are currently witnessing a reinvigoration of humanity’s interest in the exploration and use of outer space. In this “NewSpace” era of space activities that are no longer exclusively the domain of major states, private space activities are pushing the boundaries of the space industry (Vernile 2018). Emerging space activities, like other cases that involve novel technologies, are accelerating at a pace that exceeds the capacity of regulatory regimes. A particular space activity that faces multiple policy gaps, especially concerning the involvement of private actors, is the search for extraterrestrial life.

The extended process of the search for extraterrestrial life consists of three phases: pre-discovery, discovery, and post-discovery (Dick 2018). At the moment, this scientific endeavor is still in the pre-discovery phase; future scientific evidence might advance the search beyond this phase. The necessary evidence sought during such scientific investigations comprises two kinds of indicators (Lingam and Loeb 2021). Biological indicators (“biosignatures”) are sought as proxies for extant or extinct microbial life. Technological ones (“technosignatures”), i.e., communicative signals or artifacts in the broad sense (Wright 2021), are

sought as proxies for extant or extinct intelligent, technology-capable life. Currently, both the search for microbial life (Profitiliotis 2021a) and the search for intelligent, technology-capable life (Profitiliotis 2021b) suffer from similar policy challenges, particularly related to independent private space activities: problems of jurisdiction and enforceability of corresponding measures.

Currently, the search for microbial life by government space agencies is proceeding under the “planetary protection policy”. This policy is a set of guidelines that aims to prevent the biological cross-contamination of extraterrestrial and terrestrial environments that could jeopardize the integrity of the Earth’s biosphere and the process of the search (Frick et al. 2014). The guidelines are inspired by the provisions of Article IX of the United Nations “Outer Space Treaty” (UNOOSA 1967). However, the Outer Space Treaty is only binding for member-states, not independent private actors. Alongside the search for microbial life, scientific research is also advancing the search for intelligent, technology-capable life. The latter is not proceeding under any legally binding international agreements (Bilder 2020). The International Academy of Astronautics has adopted the “Declaration of Principles Concerning the Conduct of the Search for Extraterrestrial Intelligence” (SETI Institute 2018) to foster transparency in the search for communicative signals, including self-initiated transmissions from Earth to putative extraterrestrial receivers (Gertz 2016). Moreover, planetary protection policies might be applicable to any investigations of candidate extraterrestrial artifacts in our solar system (McGee 2010). However, these approaches are non-binding, cannot effectively regulate the operations of independent private actors, and cannot offer any guidance for the global governance of the potential discovery and post-discovery phases.

This neglect of the search for extraterrestrial life in space diplomacy, policy, and governance might originate in the presumably low probability of a successful discovery. Nevertheless, the probability of an event’s occurrence is not the only dimension of importance in assessing the need for preparing to manage it. The expected impact should also be taken into consideration. “Wild card” events have been defined as events that are assumed to have a low probability of occurrence but can have high impact if

they do occur, i.e., extraordinary and surprising events with radical and sweeping consequences (Hiltunen 2006). In this vein, the discovery of alien life can be framed as a wild card event, and has already even been recognized by the World Economic Forum as an “X Factor,” an emerging global risk of possible future importance with unknown consequences (World Economic Forum 2013).

II. Anticipatory science diplomacy: A governance and cooperation mechanism for the future of the search for extraterrestrial life

An increasing diversity of state and non-state space actors seek to contribute to the overall endeavor of the search for extraterrestrial life. These activities are neither unified nor coordinated, leaving an opening for potential conflict. Specifically, China has already stated plans for its first independent Mars mission that will search for evidence of microbial life (CNSA 2022), while its FAST telescope has recently performed its first observations to identify potential extraterrestrial communicative signals (Zhang et al. 2020). In parallel, a private mission to search for signs of microbial life in Venusian clouds is being planned (NBC News 2022), while privately-funded searches for extraterrestrial communicative signals (Breakthrough Initiatives 2022) and physical artifacts are also underway (The Galileo Project 2022). Additionally, scientific discoveries can occur unintentionally or accidentally (Arfini, Bertolotti and Magnani 2020), which means that the various activities that do not search for extraterrestrial life could also catalyze the transition to the discovery and post-discovery phases. The global nature of this serious issue calls for proactive science diplomacy interventions to anticipate future scenarios involving diverse actors and settings.

Such science diplomacy interventions can leverage anticipatory diplomacy practices to encourage coordination and cooperation among actors and prevent conflict. Indeed, the past success of the precautionary Montreal Protocol of 1987 in managing the stratospheric ozone hole over Antarctica has shown that anticipatory diplomacy measures can be effective in navigating wild card events. Ambassador (ret.) W. Robert Pearson, the U.S. ambassador to Turkey from 2000 to 2003, recently made the case for anticipatory diplomacy as a new model for diplomacy that is better suited to the changing nature of the challenges we expect to

face in the future. Anticipatory diplomacy has been described as an approach to diplomacy that focuses more on multilateral diplomacy, recognizes the importance of multidisciplinary scientific subject-matter expertise, emphasizes inclusive and collaborative multi-stakeholder processes, and commits to looking into the future to evaluate and prepare for potential developments (Pearson 2022).

Such an anticipatory diplomatic approach appears to be appropriate for governing the diverse global landscape of the scientific search for extraterrestrial life and for encouraging cooperation among varying actors. Ambassador Jacques Pitteloud, the current Swiss ambassador to the U.S., has specifically brought anticipatory science diplomacy to attention, stressing the importance of “trying to anticipate the potential benefits and risks of scientific advancements so that the international community can ensure that all countries can benefit from scientific innovations while developing any legal international frameworks that may be necessary to protect or regulate the new technologies” (Science & Diplomacy 2021). It’s worth noting that the necessity of engaging in anticipatory science diplomacy has already been acknowledged by multiple international organizations that need to proactively act upon the rapid pace of scientific advancements and their impacts to fulfill their missions (GESDA 2022).

III. Policy options for guiding the implementation of anticipatory science diplomacy

The recommendation of this policy memo is to implement anticipatory science diplomacy through UNCOPUOS, the prime international diplomatic platform exclusively focused on space, to facilitate cooperation for the global governance of the search for extraterrestrial life. The memo outlines policy options to offer comprehensive guidance across the pre-discovery, discovery, and post-discovery phases.

i. Option 1: Promote the global harmonization of explicit measures related to the current pre-discovery phase of the search for extraterrestrial life in national space laws.

The UNCOPUOS could commence diplomatic discussions on the global harmonization of explicit measures related to the current pre-discovery phase of the search for extraterrestrial life in the national space laws of its member-states. The provisions of

Article IX of the United Nations “Outer Space Treaty” could be the basis for the discussions, together with the more detailed, voluntary planetary protection guidelines maintained by the Committee on Space Research (COSPAR 2021). Such harmonization should start with encouraging states to enshrine in national law planetary protection guidelines for microbial life, in order to operationalize them. The UNCOPUOS should also seek subject-matter experts to promote the forward-looking development of analogous guidelines for intelligent, technology-capable life to be enshrined in national law. These guidelines should, at the minimum, protect the search for technosignatures from interfering human space activities and the Earth’s biosphere and technosphere from harmful contact with technosignatures.

Advantages

UN member-states are bound by the “Outer Space Treaty” to prevent harmful cross-contamination and to bear international responsibility for the activities of all their actors, including private. The enshrinement of pre-discovery measures into national space laws can ensure the states’ compliance with this Treaty and enable enforcement to private actors through domestic mechanisms. The domestic enforcement and global harmonization of these matters can benefit countries and private actors by enabling fair competition on the national and international levels and preventing a regulatory “race to the bottom.” Unregulated toxic competition could harm countries and private actors by generating multiple negative externalities that would interfere with the search for extraterrestrial life, such as contaminating solar system bodies with terrestrial microorganisms.

Disadvantages

Global harmonization of pre-discovery measures might be challenging, as current international space law has not foreseen these matters clearly enough to offer explicit provisions. Out of necessity, the harmonization can be based on COSPAR’s planetary protection policy which is not a legal instrument. Enforcing pre-discovery measures to private actors may incur additional costs to private space exploration activities. The challenge of harmonization may be exacerbated by countries willing to risk their compliance with the Outer Space Treaty by enforcing lenient to no national measures

to private actors in an effort to increase their domestic industrial growth.

ii. Option 2: Encourage international R&D partnerships in the search for extraterrestrial life among public and private actors and ensure benefit sharing for all nations, including non-spacefaring ones.

The UNCOPUOS, by means of its secretariat, the United Nations Office for Outer Space Affairs (UNOOSA), could secure funding via sponsors and donors to provide seed financing to international R&D partnerships of public and private actors. Partnering actors would need to agree to operate under a pre-competitive collaboration arrangement to search for extraterrestrial life for the benefit of all nations. An example of such an arrangement in the current pre-discovery phase could focus on decreasing the costs of planetary protection technologies (Profitiliotis 2020). UNOOSA's other successful programs and initiatives can provide best practices to this end.

Advantages

Financial support can stimulate international cooperation in R&D as a practical incentive for interested actors. Pre-competitive collaboration can benefit the whole field of the search for extraterrestrial life, because it allows competing actors to pool their resources to overcome common problems, develop enabling technologies, and set standards. The collaboration of public and private actors has the main advantages of access to diverse sources of capital for scaling up promising initiatives, access to complementary infrastructures and expertise, cultivation of innovative solutions to meet cost and efficiency performance requirements, and appropriate identification and allocation of risks in advance. UNOOSA is already involved in collaborations of public and private actors since its inception and has successfully used fundraising to support its various activities, such as the United Nations Platform for Space-based Information for Disaster Management and Emergency Response and the Regional Centres for Space Science and Technology Education. UNOOSA's fundraising efforts focus on obtaining voluntary contributions through its established Multi-Donor Trust Fund (A/RES/62/217), which can become the vehicle for the proposed financing. Benefit sharing for all

nations can be ensured early on by explicit statements in the relevant funding agreements.

Disadvantages

Significant justification and promotion of the value of collaboration in the endeavor of searching for extraterrestrial life might be needed to convince potential sponsors and donors to allocate enough funding to support the appropriate financing of R&D activities. Similarly, significant promulgation of the pertinence of pre-competitive collaboration might be needed to convince international private and public actors to accept such agreements, particularly those with advanced space exploration programs. Insufficient international standardization might make international collaborations more difficult. The likelihood of convincing the aforementioned stakeholder groups may increase by communicating clearly that financing pre-competitive collaborations is highly impactful, because it can help the sharing and diffusion of niche methods and technologies as building blocks for overall innovative solutions to problems faced even by advanced actors, which in turn can promote standard-setting.

iii. Option 3: Create a public registry of activities with the potential of detecting extraterrestrial life.

The UNCOPUOS, by means of UNOOSA, could create and maintain a public registry of Earth-based and space-based activities with the potential of detecting extraterrestrial life. This registry could further promote international collaborations, especially among public and private actors, and contribute to legitimacy, transparency, and accountability. Alongside the benefits to the scientific community, preregistration of such an activity could allow actors to take formal credit for their predicted or accidental discovery, in case it occurs.

Advantages

Registering in advance activities with the potential of detecting extraterrestrial life can be used to retrospectively flag alleged discoveries that would be unregistered. This could offer a clear control point that allows for the appropriate international governance of a discovery event on the basis of the discoverer's intentions.

Disadvantages

Taking credit for a predicted or accidental discovery may not be a strong enough incentive to convince

public and private space actors to commit to the proposed registry. Thus, the preregistration might need to develop into a mandatory prerequisite for actors looking to assert any legitimate claims related to future discoveries.

iv. Option 4: Establish an interdisciplinary UNCOPUOS Working Group on the Search for Extraterrestrial Life.

Several Working Groups have conducted productive work in UNCOPUOS and its Subcommittees. The proposed interdisciplinary Working Group on the Search for Extraterrestrial Life, operating across the Subcommittees, could be tasked with identifying areas of concern regarding the pre-discovery, discovery, and post-discovery phases of the search for extraterrestrial life, propose measures that could facilitate its governance, and produce voluntary guidelines to prevent potential harms. To promote a proactive and forward-looking attitude in this Working Group, strategic foresight exercises could be conducted during its operation, thereby augmenting the anticipatory element of the science diplomacy efforts.

Advantages

UNCOPUOS Working Groups are agile and proven structures that have been established multiple times in the past to address intricate issues of great importance, such as the “Long-term Sustainability of Outer Space Activities” issue.

Disadvantages

The output of such a Working Group cannot be enforceable, unless further actions are taken, which may include the amendment of an existing treaty or the negotiation of a new treaty.

III. Policy recommendations for charting a path forward

The first three policy options are expected to require extensive deliberations to secure the support of UN member-states. Additionally, the potential strategic commitment of member-states will need to be followed by several operational actions on the UN side, requiring allocation of human and other resources. Therefore, the recommendation is to start with the establishment of the interdisciplinary UNCOPUOS Working Group on the Search for Extraterrestrial Life, which will first undertake the work of centrally coordinating deliberations among member-states on areas of concern regarding the search to foster buy-in. The Working Group should then be tasked with an independent evaluation of the merits of the first three policy options and should decide on their implementation, particularly from a forward-looking perspective. The UNCOPUOS should make an effort to promulgate in-depth diplomatic dialogue on the creation of the proposed Working Group, especially in the context of the UN 2023 Summit of the Future (United Nations 2021). As the search for extraterrestrial life is an endeavor of global reach that can impact both spacefaring and non-spacefaring nations, forward-looking science diplomacy is needed to safeguard humanity’s interests against the harms of any future unilateral actions.

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