SPEAKING OUT TO OUTER SPACE – AN ANALYSIS OF HUMANITY'S MESSAGES TO EXTRATERRESTRIAL INTELLIGENT LIFE, 1962–2018

Mike Zapp

University of Luxembourg;
Porte des Sciences, Esch-sur-Alzette, Luxembourg

Various messages have been sent out to potentially existing intelligent extraterrestrial life since the 1960s. Considering the significance of such messages as a medium of first contact and representation of humankind, it is surprising that they have received no attention from sociology. What is their purpose? Who speaks for earth? What is their content and has it changed over time? This work seeks to answer these questions by analyzing all relevant messages (N = 14) sent to outer space as well as related press coverage and official statements from the period 1962–2018. Analyses find a striking shift in purpose, authorship, and content, from political and scientific elites celebrating nation, science and (high) culture to, more recently, for-profits and science facilitating commercial exploitation but also individual agency and planetary awareness. However, such plurality makes global consensus and oversight on whether and what kind of messages should be sent even more difficult.

Keywords: *active search for extraterrestrial intelligence; planetary awareness; individual agency; organized irresponsibility.*

1. Introduction

Issues of astronomy, outer space or extraterrestrial life are certainly on the fringes of mainstream sociology. Dismissed as science fiction or visionary hogwash or simply deemed irrelevant, it is rarely asked how human thinking about the universe and the possible singularity or multiplicity of life therein shape human behavior and reflect particular self-images of humanity.

In this paper, I argue that the way modern societies deal with the question of the ontology of life in the universe reveals important cultural fundamentals and reflects processes of wider social change. To do so, I focus on a specific aspect of the earth-space-nexus, namely interstellar or interplanetary communication or active search for extraterrestrial intelligence (SETI). I posit that speaking to space tells more about the speakers than about what these think about potential cosmic neighbors. As a 'cultural signature of humanity' (Quast 2017), space messages reflect (on) who we are as a species and, as these messages now span almost six decades, mirrors sending societies' cultural, social, economic and political changes. This analytical thrust and the immense consequences of such first contact (however, remote the chances) makes these messages a highly relevant object of sociological analysis.

Journal of Globalization Studies, Vol. 14 No. 1, May 2023 170–186
DOI: 10.30884/jogs/2023.01.10

Since 1962, N = 14 systematic messages have been sent out in various forms by diverse 'authors' and containing shifting content. I draw on official ETI message sources as well as related statements and press coverage and analyze these using grounded theory techniques with a specific focus on the purpose, authorship and the content of these messages.

Analyses find a striking shift in outer space transmissions over time. In the early period of active SETI (1962–1995), messages were designed by political and scientific elites to demonstrate technological superiority and contained nationalist expressions and abstract depictions of life as well as generic representations of culture and 'high' culture in particular.

By contrast, messages from the more recent period (1999–2018) have a more diverse authorship ranging from for-profits to civil society and their objectives now also include raising awareness about ecological vulnerability and a united humanity. While scientific symbols have not disappeared, content now routinely includes popular culture, even in its most profane form.

Drawing on arguments from the risk society and world society theories, I argue that the role of science is explained by the profound ontological function assigned to science in modern societies (Meyer *et al.* 1997). The recent rise of individual agency in SETI supports arguments that emphasize individuals' entitlement to planetary representation in space communication. Concomitant with such democratization, more recent messages also show that aggressive nation-statehood and national supremacy lose legitimacy yet also indicate the 'privatization of outer space' as wealthy entrepreneurs take control of telescopes and extend the industrial sphere to space (Beck 1998). Both the democratization and privatization of space communication will intensify the debate about who sends what for what purpose and whether Earth should seek contact at all.

2. Where is Everybody? The Active Search for Extraterrestrial Intelligence

The possibility (even of the most remote sort) of extraterrestrial intelligence has always evoked the most mixed of human feelings, from fear and fascination to religious awe and artistic inspiration (Dick 1982, 2013). While topics related to ETI and the universe in general remain a fringe section in the social sciences, they do reflect common sentiments in societies around the world (Lampert and Papadongonas 2018). Given the importance of ETI for human imagination and cosmology, it is surprising that sociology, including the nascent astrosociology niche, has shown so little interest in space communication (Dator 2012; Harrison 2011; Quast 2017).

It has gone almost unnoticed in sociology and related disciplines that, since the 1960s, humankind has gradually established an infrastructure for actively searching for extraterrestrial intelligence (active SETI). Active SETI or METI (Messaging to Extraterrestrial Intelligence) seeks to send purposefully-designed messages, mostly via radio signals but also in physical forms such as plaques or capsules, to more or less precisely-targeted planets and star systems (Zaitsev 2006). Active SETI wants to break the 'Great Silence' and solve the long-standing Fermi Paradox. In the 1950s, physicist Enrico Fermi asked why – considering the sheer size and potential habitability of the universe – intelligent lifeforms have not contacted Earth. Over the years, hypotheses as to why have multiplied including, amongst others, the simple non-existence of ETI, the zoo hypothesis (with Earth being the zoo) and mutual fear scenarios (Circovic 2018; Vakoch 2009).

Fermi's question of 'Where is everybody?' has become more perplexing in the past two decades as a new generation of telescopes has fundamentally altered human understanding of the scope of the (observable) universe. Astrophysics currently estimates the number of galaxies to be at 10 trillion implying a virtually uncountable number of planets, most of these much older than Earth. How many of these offer Earth-like conditions is being debated yet recent estimates propose a figure of 40 billion, with at least a few dozen of these being located in our own galaxy (Westby and Conselince 2020).

SETI research constitutes a controversial field revolving around the fundamental question of whether Earth should send out messages at all (see Brin 2014; Gertz 2016 for reviews). Those defending active SETI hold that it is the humankind's responsibility to seek peaceful contact and to learn from an advanced (and presumably much older) civilization. Some even believe that if no intelligent life will be detected within the next three decades, it might imply that these civilizations might have already gone extinct – a finding which humanity should take as a warning (de Magalhaes 2015; Zaitsev 2008).

Opponents, on the other hand, object that any message will reveal the Earth's location in space and attract life of whose intentions cannot be known or, reversely, invite human colonialization or commercial exploitation pointing to a long list of hapless intercultural encounters in human history. Another objection refers to the lack of communication oversight. As a matter of fact, authorship and content have vastly diversified since the 1990s and there is no representative or official body, let alone a thorough public discourse, that would legitimize and regulate the content of these messages. In this vein, during a convention of the American Association for the Advancement of Science in 2015, prominent scientists discussed the dangers of active SETI and signed a statement that recommends a 'worldwide scientific, political and humanitarian discussion […] before any message is sent.'[1]

These discussions are not limited to the scientific community. Since the late 1990s, nation-states, international organizations and professional associations have begun to develop frameworks and guidelines for how to deal with space communication and potential contact. In analogy to the Torino Scale (which measures the impact hazard of comets and asteroids), the Rio Scale seeks to quantify the impact of potential extraterrestrial contact (Almar and Tarter 2011). Similarly, the novel San Marino Scale assesses risks associated with sending messages based on intensity and character of the transmission on a scale from 1 to 10 (Almar and Schuch 2007). In addition, the Post-Detection Protocol wants to set standards for governments in case of detecting artificial space signals emphasizing justice, respect for cultural diversity, honesty, and respect for property and territory. The Protocol also sees the United Nations Security Council as the key body to authorize communication (SETI Institute 2018). Though not yet adopted by governments, it would be the first attempt to formalize a space law that explicitly deals with intelligent life as opposed to the existing law that regulates commercial and military use of near or low-orbit space (Bilder 2020; Parker 2009).

Against the backdrop of these discussions, this study seeks to fill a research gap by conceptualizing space messages as carriers of meaning reflecting the humanity's cultural signature and as a mirror of long-term social change. The following section presents sociological perspectives that help explain the shifts in purposes, authors and content of active SETI.

3. Theorizing the Humanity's Search for Extraterrestrial Intelligence

Most social theories only indirectly refer to the cosmos as an extension of the human sphere. Among these, I highlight environmental sociology, particularly in its risk society variant and with its focus on industrialization-induced risks, and world society theory with its focus on science as an ontological system and individual agency as the most legitimate form of agency in modern societies. I elaborate on these two approaches.

The risk society describes 'a phase of development of modern society in which the social, political, ecological and individual risks created by the momentum of innovation increasingly elude the control and protective institutions of industrial society' (Beck 1998). The concept brings to the fore the various externalities of nuclear, chemical and genetic technology and industrial progress in general. Importantly, as environmental degradation, nuclear catastrophes and pandemics such as HIV/ Aids or the current COVID-19 virus do not stop at national borders, the risk society is an inherently global society. However, with risk mitigation still reflecting the inherited logics of national planning, the border-transcending nature of risks causes a situation of 'organized irresponsibility' (Beck 1998) where each contributes to risks while none takes responsibility.

While science played an important part in producing the risks during early modernization, in the risk society of the second or reflexive modernity, science also represents a key source of reflexivity where causes and effects are analyzed in their impact on the wider societal and ecological context (Beck *et al.* 2003). In the second modernity, reflexive communication and discourse about risks are to be held in 'global public spheres' (Beck 2009: 81; also Volkmer 2014). These spaces are made of scientists, international organizations (intergovernmental and non-governmental alike), media and the wider civil society to counter the hazardous forces of markets and profit-seeking. Many cases of risk-related spheres have been empirically explored in cross-national studies, notably in relation to environmental issues (*e.g.*, Ivanova *et al.* 2014) but also genetics, health and conflict (see Mythen 2020 for a review). In many of these analyses, the risk society theory calls for a strong cosmopolitanism and planetary consciousness in science and public action.

Extending these arguments to the specific role of outer space and ETI, Beck (1998: 144) himself argued that 'the industrial way of life […] is spatially and temporally open and tends to extend […] to the stratosphere and the universe.' Building on these theoretical cues, some argue that SETI constitutes such a modern risk whose consequences are difficult to ascertain and to insure against (Billingham and Benford 2011; Dickens and Ormrod 2007). As space transmissions intensify, senders multiply and the regulative void persists, this would represent an almost ideal-typical example of 'organized irresponsibility'.

At the same time, the possibility of extraterrestrial 'out-groups' and the attempt to contact these would increase the humanity's in-group bonds or at least raise planetary awareness (see contributions in Vakoch 2018). Such a global public sphere would also matter in countering the nascent commercial exploitation of space, its largely unregulated legal status and, importantly, would provide democratic legitimacy to active SETI (Parker 2009). These arguments also echo theories that stress that world integration is also based on technological advances (Grinin 2017; Grinin and Grinin 2013; Grinin, Grinin and Korotayev 2020). In these accounts, accelerated technological progress, no-

tably the Scientific–Information Revolution, ushers in a planetary period in which the control of technological production and social order is yet to be determined.

While science remains, in a very instrumental way, the paradoxical cause and cure of risk in reflexive modernity, world society theory adds an ontological and meaning-generating role to science. Scientific knowledge immerses phenomena into a universal collective reality, and legitimates specialized personnel and indeed entire social sectors within a rationalized cosmological frame (Frank and Meyer 2007). In this perspective, science has acquired a quasi-religious status in modern societies replacing God, the Church and the State as the ultimate source of authority (Meyer *et al.* 1987). We will see that science indeed provides a universal language in SETI messages describing life as a highly rationalized phenomenon.

World society theory also shares with arguments of reflexive modernity an emphasis on individual agency. Yet, whereas Beck analyses individualism as a microsociological phenomenon, world society theory takes a macrosociological perspective revolving around the expansion of the educated, rights-bearing and empowered individual as a cultural construction since the Enlightenment and with great momentum since World War II (author). Most prominently reflected in the expansive human rights regime, individual agency has become a protected good in the institutional panoply of world culture (Cole 2016; Elliott 2007). Such individual empowerment should also hold for the entitlement to communicate on behalf of humanity in SETI messages.

In sum, these analytical categories help embed SETI activities into the wider sociological literature by raising questions about space communication as a risk, the specific role of science and individual agency therein, yet also the possibility of seeing space exploration as an extension of Earth's industrial sphere. These useful heuristics are used to analyze SETI, its changing agenda and problematic implications. The following section introduces the sample and methodology.

4. Data and Methodology

This study draws on N = 14 active SETI messages from the period 1962–2018. All these messages score high on the San Marino Scale (above 5; see above). Selection is based on Zaitsev (2012), Dumas (2015), Quast (2018) as well as earlier reviews by the SETI Institute (*e.g.*, Tarter *et al.* 2015). The messages selected have been transmitted with the explicit purpose to be received by ETI. They have been designed to convey intelligible information and intend to represent Earth's populace and, ideally, to establish diplomatic relations with ETI.

Based on these criteria, various other types of communication and transmission are excluded (see Quast 2018 for a detailed review). We, here, find external memory initiatives or 'space mini-museums' meant to be accessible for future human space farers and carrying, for example, the human genome (N = 10). Also excluded are (often short-range) commercial transmissions such as those by the tortilla chips producer Doritos or the National Geographic Channel (N > 45) as well as 'send your name into space' initiatives (N > 20). I also did not include space mission outreach and publicity messages celebrating, for example, Mars Exploration Rovers (N = 7) as well as artistic items inserted in Earth's orbit such as sculptures mounted to orbiting probes (N = 15) and 'space art' (N = 9). The latter category, while revealing some insights into the human-space nexus, does not represent an explicit attempt to establish communication (*e.g.*, the Klingon

Opera; Quast 2018). Finally, there is a group of educational and symbolic messages that lack criteria required for successful communication (*e.g.*, relevant target, modulation technique, encoding).

Table 1 shows the distribution of messages across types and decades. SETI has been the earliest type of communication signal, while commercial transmissions have become the most frequent type in the more recent period.

Table 1

Number of messages sent to space, by type, 1970–2020 (Dumas 2012; Quast 2018; Zaitsev 2012)

	Active SETI	Symbolic/ educational	Space art	Time capsules	Send your name into space'	Commercial
1970	1					
1980	3			1	1	
1990	1		2			
2000	2			1	5	
2010	3	3	4	5	9	38
2020	4	4	3	3	7	5

Note: It is difficult to quantify and demarcate messages for a numerical value. For example, Lone Signal could be counted as one long 2.5 month-transmission or a series of 12^{hr} transmissions over a 2.5 month-period = ~76 signals. Either way skews the result, I opted for a more conservative counting.

In order to better contextualize these messages, related press coverage and participants' statements are partially drawn upon in the analysis whenever deemed instructive. Analysis was based on three key categories as standard elements of linear communication models including source/sender, receiver/ destination as well as the message information or content transmitted in various forms (written, recorded and visual forms in this case) (Schulz and Cobley 2013). As opposed to interactive models, the linear model assumes no direct feedback, which best describes the current situation of active SETI.

The three key categories were refined and bolstered applying the main grounded theory tools of constant comparison (open, axial, selective) coding, memo writing, and integration of concepts and categories, supported by the software MAXQDA (Bryant and Charmaz 2007; Corbin and Strauss 2008). The following section presents the results.

5. Results: Six Decades of Interstellar Communication

The presentation of results is divided into two phases representing two distinct sets of objectives, authorship and content: an early phase ranging from 1962 to 1995 and a more recent phase starting in 1999. The following section presents these messages with a focus on their main purposes, authorship and content.

1962–1995: National Pride, Science and Human (High) Culture

Morse Message (1962)

The first interstellar radio message in the history of humankind was sent on November 19, 1962 by the Soviet Union to Venus and transmitted via Morse code. It contained the words *MIR*, (meaning both *peace* and *world* in Russian) and, a few days later, *Lenin* and *SSR* (the Russian acronym for the Soviet Union). Sent from the Evpatoria Planetary Radar in Crimea in order to test (and demonstrate) its potency, the message was cele-

brated as 'another victory for Soviet science and technology' by the Soviet press (The Red Star, Dec 30 1962).[2] The message was reflected from Venus approximately four minutes after transmission and is now flying near the star HD131336 in the Libra constellation, the destination of other more recent messages (Kutuza and Rzhiga 2012).

Pioneer Plaque (1972–1973)

The *Pioneer Plaque* was the first human-built object to leave earth attached to the Pioneer 10 and Pioneer 11 spacecrafts. Pioneer 10 was launched in March 1972 and Pioneer 11 in April 1973 and transmitted signals back to NASA until 2003 and 1995 respectively. Both messages are now at approximately 12 billion kilometers from Earth in the direction of the Taurus constellation. During a three-week preparation phase, Carl Sagan, the then-director of Cornell University's Laboratory for Planetary Studies, his wife Linda Salzman and Frank Drake (also Cornell University) were responsible for message design and content.

The *Plaque* contains a series of symbols designed to be easily decodable upon receipt by ETI. At the top is a schematic representation of hydrogen as the most abundant element in the Universe. At the bottom is a diagram of the Solar System and a small picture showing the trajectory of the space craft. The left side of the Plaque shows a radial pattern of 15 lines emanating from the same origins which represent periods of pulsars and the Sun's relative distance to the center of the galaxy.

On the right, the *Plaque* shows the silhouette of the spacecraft and two nude human figures, a man and a woman of approximately 168 cm in height. The man raises the hand as a gesture of good will and a demonstration of how the thumb and limbs can be moved. Sagan (2000), in retrospective, explained that the figures were based on DaVinci's drawings and Greek sculptures and that he refrained from showing the women's pudendal cleft as this may have met resistance at NASA. Unsurprisingly, it was this depiction of humans that sparked most of the criticism at the time. Some felt that the active male part denigrated the female person to a passive bystander implying sexist bias (Achenbach 1999). Others took issue with the seemingly 'Caucasian' appearance of the figures (Geppert 2012; Wolverton 2004). Carl and Linda Sagan regretted such appearance as initial drawings were intended to be more pan-racial, which turned out to be technically impossible (*e.g.,* outlines rather than shades) (Achenbach 1999).

Arecibo Message (1974)

Shortly after the launch of the *Voyager* and *the Pioneer Plaque*, Carl Sagan and Frank Drake designed another message, the so-called *Arecibo Message*, named after the Arecibo radio telescope in Puerto Rico, aimed at the star cluster M13 approximately 25,000 light years away. In addition to pictures reminiscent of those on the Pioneer Plaque, the *Arecibo Message* consisted of binary digits. These digits were meant to provide a universal and logical form of information transmission. The message contained the numbers one through ten, the atomic numbers of the elements found in DNA, a DNA helix, a diagram of the Solar system, a sketch of the Arecibo telescope, and, in the center just above Earth, a human figure as well as a count of the human population.

Voyager Golden Record (1977)

Had the *Pioneer Plaque* been rather simplistic and the *Arecibo Message* a complex code book, the *Voyager Golden Record* might represent a more poetic and artistic outreach to

extraterrestrial lifeforms. The *Record* was placed aboard the Voyager 1 and 2 spacecrafts launched in 1977, which still transmit signals now reaching the so-called interstellar medium, a region of outer space beyond our Solar System, making it the most distant human-made objects in outer space at approximately 1.496^{10} km (NASA 2020).

Preparation of the *Golden Record* was preceded by more careful and wider consultation compared to the previous messages. A committee of scientists and technicians chaired (again) by Carl Sagan spent almost one year to select appropriate content (Sagan 1978). The *Record* is an impressive collection of images, sounds, music, spoken greetings and printed messages by then U.S. President Jimmy Carter and U.N. Secretary General Kurt Waldheim. These latter messages emphasize peace, friendship (Waldheim) and a humanity which is 'still divided into nation states, but […] rapidly becoming a global civilization' (Carter).[3]

The images represent a mixture of mathematical, physical, chemical and anatomical information but also scenes from everyday life around the world (*e.g*. stores, food preparation), architecture, human interactions and nature. Since the nudity in the *Pioneer Plaque* picture was met with criticism, the *Golden Record* only showed a silhouette (Sagan 1978).

Sounds included capture a variety of audio impressions including laughter, footsteps, engines, natural and animal sounds. In addition, spoken greetings were recorded in 55 languages representing 65 per cent of the world's population at that time.

The musical part of the record comprised 27 mostly folk and classical compositions but also jazz and pop pieces from around the world making for almost 90 minutes of music. Sagan (1978) recounts that the musical selection was the most challenging and he chose a decidedly non-ethnocentric approach consulting historians, anthropologists and musicologists before finalizing.

Greetings to Altair (1983)

Designed by Hisashi Hirabayashi and Masaki Morimoto, the *Greetings to Altair* message was transmitted via Stanford's 'Dish' in August 1983 to HD 187642 in the Aquila system and is estimated to have arrived in 1999 (Pink Tentacle, 2008). The message consisted of 13 binary-coded images depicting basic mathematical, astronomical and biochemical information as well as images showing biological evolution on Earth from jellyfish to humans as well as the molecular formula for ethanol along with English and Japanese toasts.

NASDA METI Messages (1995)

The National Science Development Agency of Japan sent mosaic images to stars located in the Libra and Virgo constellation (ETA > 2147) in 1995. Images show families, 'alien' depictions, humans and a rice dumpling and tea (Quast 2018). Unfortunately, no pictures from the content, particularly those of 'aliens,' are available from NASDA.

1999–2016: Friendly Faces and Everybody's Space

At the beginning of the twentieth century, a new generation of SETI activities emerged with a different set of funding and design infrastructure. In particular, national, publicly-funded programs became rarer. Reasons for such loss in interest have not been thoroughly discussed yet a sharp cut in NASA funding since the Apollo 11 moon landing in

1969 and a winding down of the U.S.–Soviet space race might be among the primary reasons (Cadbury 2006; Garber 1999).

Moreover, since the late 1990s, a new generation of telescopes (*e.g.*, the Hubble Space telescope) not only enhanced astronomers' understanding of the magnitude of the universe, it also helped to send messages farther and in a more targeted way than ever before.

Cosmic Call 1 and 2 (CC, 1999 and 2003)

'Space entrepreneur' Charles Chafer, known for his company Celestis (specialized in space burials), launched the *Cosmic Calls* initiative. Two messages were sent to a system of stars around 41 light-years away which are assumed to be orbited by a number of extrasolar planets. The *Calls* are estimated to arrive between 2036 and 2069.

Led by prominent Russian astronomer Alexander Zaitsev, Chief Scientist at Russia's Institute of Radio-engineering and Electronics, the *Cosmic Calls* are considered some of the most promising and technically-sound attempts of SETI (Dumas 2007). The message contains the so-called Dutil-Dumas Message, an interstellar 'Rosetta Stone',[4] developed by Canadian physicists Yvan Dutil and Stephane Dumas and based on a bitmap of symbols to introduce scientific concepts as well as an alphabet and graphic pictures of, mostly, people, and nature (Dumas 2007). The second part consists of information on the spacecraft while the third part contained the Arecibo Message from 1974 using the same mathematical language (Braastad and Zaitsev 2003).

In addition to these components, *Cosmic Call 2* contains personal messages of thousands of people from 50 countries. These can partly be accessed (http://www.ieti.org/) and comprise the flags of the world and logos of international organizations, David Bowie's Starman, a resolution of New Mexico's Extraterrestrial Culture Day as well as drawings from school children.

Teen Age Message (TAM, 2001)

While working on the *Cosmic Calls*, Zaitsev secured funding from the Russian Education Department to send another message. The content and target stars were selected by a group of Russian teens and had three parts. The first part was made of a sounding imitating transmission from the Sun's center, while the second part contained seven musical compositions played with a Theremin, an electric instrument producing an almost sinusoidal sound, which would make it easy to identify. The third part, similar to the Arecibo Message, contained binary digital information such as greetings in Russian and English as well as drawings (Zaitsev 2002a, 2002b)

A Message from Earth (AMFE, 2008)

A Message from Earth was the second active SETI to be initiated and funded by private entrepreneurs. Oli Madgett (RDF Media), social networking site Bebo and SETI expert Zaitsev invited 12 million Bebo users, celebrities and politicians in an attempt to send the 'first democratically selected' message and to raise planetary and environmental awareness (Kiss 2008). Half a million Bebo users participated in the vote for the 500 most appropriate messages, which are no longer accessible. Zaitsev describes these as centering on world peace and views on Earth (Zaitsev 2011). *AMFE* was sent to Gliese 581c from the Yevpatoria telescope, Crimea, and is expected to reach its target by 2029.

Hello from Earth (HFE, 2009)

In August 2009, Cosmos, an Australian science magazine published by the Royal Institution of Australia, invited its readers to send in good will messages which would then be transmitted to the potentially habitable exoplanet Gliese 581d. The Cosmos staff selected N = 501 messages (criteria unknown) from Australia, the U.S., China, Italy, Russia and a number of other countries around the world (https://www.hellofromearth.net). A content analysis based on the 501 included messages identifies the following terms as the most frequent (propositions omitted): *you*, *I*, *we*, *planet*, *earth*, *love*.

Lone Signal (2013)

The *Lone Signal* was the first crowd-funded and profit-seeking active SETI transmission. Initiated by businessman Pierre Fabre (who made his fortune in pharmaceutics and cosmetics), the transmission targeted the potentially habitable star system Gliese 526. *Lone Signal* contains two components, a repetitive hailing component made of encoded mathematical language and meant as a Rosetta Stone (similar to the one used in the *Cosmic Calls*) and developed to understand the more complex second component (Busch and Reddick 2010). The latter comprises over 8000 short statements by the wider audience sent directly to the Lone Signal website or retrieved from Facebook or Twitter accounts of registered users. In an attempt to fund a continuous operation of the *Lone Signal*, users had to pay $0.25 per message (after one free message) and could add dedications to loved ones while being able to live-track the location of the message on the website. Meanwhile, the project has ended, the website is defunct and it is impossible to collect data on message content.

JAXA METI Experiments (2013–2014)

The Japanese Aerospace Exploration Agency (JAXA) sent two short transmissions to the Cancer constellation between 2013 and 2014. The messages contained mosaic images showing parents holding a child's hand and another image showing the Sun and a human.

A Simple Response to an Elemental Message (ASREM, 2016)

As an example of a larger communication effort, *A Simple Response to an Elemental Message*, was devised by artist Paul Quast (University of Edinburgh) and developed in collaboration with the UK Astronomy Technology Centre, the European Space Agency and the University of Edinburgh. Unlike previous messages, *ASREM* was not primarily meant to establish contact with ETI but to 'to look at our civilisations' past, present and future environmental interactions on Earth' (Scuka 2016). As a consequence, the destination – the Polar Star system – was not chosen because of its habitability but due to its symbolic character.

ASREM researchers invited the public to submit their responses to the question 'How will our present, environmental interactions shape the future?' hoping to spark planetary stewardship and a communal discourse on ecological issues (Quast 2017). The second message component consisted of an honorary mention archive including quotes from Mahatma Ghandi, Ban Ki-moon and Koko the Gorilla. The third part showed pictures with a clear ecological focus. In addition, the *Arecibo Message* was added as a Rosette Stone to facilitate decoding.

Out of 4,203 messages submitted, N = 3775 messages by individuals from 146 countries in 16 different languages were selected. As the website is no longer active, raw data of original messages cannot be collected. However, Paul Quast published

a technical report with a detailed analysis of message themes (Quast 2017). He identifies several major topics revolving around the duality of utopia *vs* dystopia or concerns vs hopes concerning the planet's future.

Sónar Calling (2017–2018)

The *Sónar* message is the result of a concerted effort by key SETI figures such as Douglas Vakoch and the Sónar festival organizers. The message contains tutorials on decoding and a series of musical compositions selected by a committee of artists also including music by amateurs (Vakoch 2017). Six transmissions were sent to the Canis Minor constellation from the Tromsø EISCAT dish in Norway and are expected to arrive in 2030.

Discussion: Who Speaks for Earth?

For almost six decades, the humankind has been sending out purposefully-designed messages to outer space attempting to contact extraterrestrial intelligence. Especially the more recent attempts rely on more precise location parameters and more powerful signal intensity and a reply (if received) is expected to be returned within the next decade. As SETI leaves a cultural footprint of humanity in space, this work seeks to explore the sociological relevance of space communication.

Analysis was interested in three key categories, namely purpose, authorship, and content and found a striking shift in all three, from political and scientific elites celebrating nation, science and (high) culture to, more recently, for-profits and science facilitating commercial exploitation but also individual agency and planetary awareness. This section reviews these shifts and embeds them into the wider sociological literature.

Purpose. Early messages were meant to demonstrate feasibility and technological superiority. Soviet press celebrated the Morse Code (1962) as a political victory but the Arecibo Message as well as the Pioneer and Voyager missions also need to be seen in the context of the space race (Cadbury 2006; Garber 1999; Sagan 1978). In the more recent period, purposes multiply including educational, publicity and for-profit motives. The latter is a striking phenomenon and although only marginally linked to active SETI, corporate transmission make for the largest proportion overall (Table 1). Although a continuous business model has not yet been established in SETI (Fabre's $0.25 per message Lone Signal failed), both start-ups and established corporations (*e.g.*, Doritos or National Geographic) have begun to test space as a market place, slowly extending the industrial logic beyond Earth as forecast by Beck *et al.* (2003).

At the same time, many messages seek to harvest SETI's potential as an educational or sensitizing tool to raise planetary awareness and trigger reflection on Earth's future. This applies to the privately-funded *A Message from Earth* and even more so to *A Simple Response to an Elemental Message (ASREM)*. Analyzing personal notes submitted to ASREM, Quast (2017: 16) identifies a 'homeworld effect', that is a 'philosophical shift in ecological awareness for our planet's frail biosphere'. Similar space-related effects on human thinking about Earth could be shown before. Apollo 9 astronaut Russell Schweickart, for example, was sure of the impact space technology had on humanity's development toward planetary consciousness (Schweickart 1988). In the same vein, images sent back from space missions such as the Earthrise or Blue Marble image, some of the most reproduced images in history, made the planet look small, fragile and lost in space – some argue it kicked off environmental thinking worldwide (Poole 2008).

Authorship. Until the late 1990s, the transmitting community consisted of a closed circle of policymakers (*e.g*., the Soviet Morse Code Message) and a small scientific elite. Indeed, three of six messages transmitted in the period 1962–1995, saw the direct involvement of a few central figures (notably Carl Sagan and Frank Drake). These SETI experts – together with large state agencies like NASA or the Japanese Space Agency – oversaw both the technical operation and selection of content. In the more recent period, while active SETI is not being performed in the absence of experts (notably Alexander Zaitsev involved in three SETIs) or public agencies (*e.g*., the European Space Agency), senders have become more diverse now including many for-profit organizations and individual entrepreneurs (RDF Media, Bebo, Charles Chafer, Pierre Fabre). If we add signals not analyzed here, which are of purely commercial and promotional character, the sky has become more accessible than at any moment in time before. Analyses of space capitalism have so far focused on space resources such as asteroid mining or low-orbit communication through satellites while the profitability of deep space communication has remained underexplored (*e.g.*, Parker 2009). It is difficult to forecast what the consequences would be if ETI was detected by a private for-profit organization or one particular country, yet some believe it would involve the risk of monopolizing information exchange (Wisian and Traphagan 2020).

At the same time, one might argue that the diversity in funding and content selection has led to a democratization of communication. Crowd-funding, message voting and public competitions (*e.g*., *Lone Signal*, *A Message from Earth*) as well as the deliberate inclusion of particular groups previously neglected (Russian teens in the *Teen Age Message*) or conversely, the deliberate inclusion of all (*e.g., A Simple Response*) might support this argument. These recent initiatives might support the rise of individual entitlement to participating in the SETI discourse, a general point stressed by world society research (*e.g*., Elliott 2007). Yet, do these new communication communities constitute a 'global public sphere'? As these initiatives attract a relatively limited (often technology-affine) audience (*e.g*., science magazine readers as in *Hello from Earth* or Bebo users in *A Message from Earth*), they leave aside other discourse actors such as democratically-elected politicians and parliaments, intergovernmental organizations, and non-governmental organizations, as well as national committees and councils specialized in advising on pressing societal questions (*e.g*., the French *Comité consultatif national d'éthique* or the German *Ethics Council*), which all constitute the broad array of actors in the public discourse (Dutil 2014; Volkmer 2014). As loosely coupled participants, dispersed across diverse initiative, 'organized irresponsibility' might actually increase rather than diminish.

It is also important to remember that scientists remain, after all, in the driver's seat. The expert discussion of proper communication protocols (*e.g*., advanced encoding and Rosetta Stone techniques), more precise targets and the debate on the consequences of SETI illustrate the central and ambiguous role of science in active SETI as has been shown before for the risk society in general (Beck 1998). Science is necessary to develop the technological infrastructure necessary to transmit and to assess the risk of messages (*e.g*., the San Marino Scale), yet it would need a stronger reflexivity in the science-society nexus to make legitimate decisions. If science and technology is the driver of social progress and world integration (Grinin 2017; Grinin and Grinin 2013; Grinin, Grinin and Korotayev 2020), it still needs corrective mechanisms to safeguard respon-

sible application of technologies that exceed foreseeable risks as is the case with SETI, particularly with the more recent generation of powerful satellites.

Content. Reflecting the shifts in purpose and authorship, message content has gone from political to general and scientific and, more recently, very profane items. Science as a universal language remains strong until today via the rational depiction of the natural and social world reflecting science's ontological quality (Meyer *et al.* 1997). These very carefully selected data contrast with musical compositions (*Sonar Calling*), children's drawings (*Teen Age Message*), personal messages and love dedications (*Cosmic Calls*, *Lone Signal*) and, rather trivially, images of rice dumplings (*NASDA METI Message*). While earlier critiques centered on ethno-centrism, sexism and elitism (Quast 2017; Sagan 2000), the more recent broadening of the content shows human life from an everyday perspective.

Interestingly, what is missing from these messages is crude nationalism (*e.g.*, anthems, specific flags) and religious symbols. The omission of the latter might be explained by the problematic relationship between religion and potential ETI in general (Dick 1982, 2013). Instead, it seems messengers are capable of imagining a united and peaceful humanity and perhaps it may take an extraterrestrial outgroup to bond a planet-wide ingroup (whatever that means for the out-group) (Vakoch 2018). This raises the question whether those messages are an accurate picture or an example of collective Goffmanian impression management. Upon first encounter, alien life might wonder what happened to the peaceful, science-trusting and earth-protecting (even communist) civilization that had been depicted in SETI messages for over half a century.

Conclusion

Arguing that by analyzing what has been sent out, we gain insight into what happens inside humankind, this study traced the evolution of N = 14 messages transmitted to extraterrestrial intelligence in the period 1962–2018. Early on, messages reflected national pride and scientific curiosity. The latter remains a key driving force in the active search for extraterrestrial intelligence (SETI) and provides messages with a universal language. However, private entrepreneurs, start-ups, media agencies and other corporate actors join the SETI endeavor and diversify funding and audience, while the strong statist role from the earlier period has mostly vanished. This new and diverse community of senders also opens up to the global public by inviting individuals from around the world to participate in devising messages reflecting a more democratic entitlement and individual agency to speak for earth on behalf of an imagined world society. Such opening-up has led to a variety of message types including the well-crafted, intentionally-designed scientific message as well as a more profane and loosely-aggregated type on the other.

In both cases, however far removed from reality, message content centers on worldwide peace, unity and empathy suggesting that active SETI seems to bring out humanity's best intentions for itself and extraterrestrial 'others'. At the same time, the diversification of the sending community and content reveals a fragmented and divided communication protocol as a prescient example of organized irresponsibility *vis-à-vis* SETI as a potential global risk. The ultimate question might not be what we send out but who is entitled to speak out to outer space on behalf of all and who is to be held accountable in the most unlikely of cases.

NOTES

[1] http://setiathome.berkeley.edu/meti_statement_0.html.

[2] I would like to thank Andriy Vasylchenko for translating the newspaper article.

[3] Jimmy Carter, Voyager Spacecraft Statement by the President. Online by Gerhard Peters and John T. Woolley, The American Presidency Project, https://www.presidency.ucsb.edu/node/243563.

[4] The Rosetta Stone was a stele discovered in 1799 that had inscriptions in hieroglyphic and Demotic scripts as well as ancient Greek and became key in deciphering Egyptian hieroglyphs.

REFERENCES

Achenbach, J. 1999. *Captured by Aliens: The Search for Life and Truth in a Very Large Universe.* Simon and Schuster.

Almár, I., and Schuch, P. H. 2007. The San Marino Scale: A New Analytical Tool for Assessing Transmission Risk. *Acta Astronautica* 60 (1): 57–59.

Almár, I., and Tarter, J. 2011. The Discovery of ETI as a High-Consequence, Low-Probability Event. *Acta Astronautica* 68 (3–4): 358–361. URL: https://doi.org/10.1016/j.actaastro.2009.07.007.

Beck, U. 1998. *World Risk Society*. Polity Press.

Beck, U., Bonss, W., and Lau, C. 2003. The Theory of Reflexive Modernization: Problematic, Hypotheses and Research Programme. *Theory, Culture and Society* 20 (2): 1–33. URL: https://doi.org/10.1177/0263276403020002001.

Bilder, R. B. 2020. On the Search for Extraterrestrial Intelligence (SETI). *American Journal of International Law* 114 (1): 87–95. URL: https://doi.org/10.1017/ajil.2019.86.

Billingham, J., and Benford, J. 2011. *Costs and Difficulties of Large-Scale 'Messaging', and the Need for International Debate on Potential Risks*. Cornell University Library.

Braastad, R., and Zaitsev, A. L. 2003. *Synthesis and Transmission of Cosmic Call 2003 Interstellar Radio Message*. Press Conference. URL: http://www.cplire.ru/html/raandsr/irm/CosmicCall-2003/index.html.

Brin, D. 2014. The Search for Extra-Terrestrial Intelligence (SETI) and whether to Send 'Messages' (METI): A Case for Conversation, Patience and due Diligence. *Journal of the British Interplanetary Society* 67: 8–16.

Bryant, A., and Charmaz, K. 2007. Grounded theory research: Methods and practices. In Bryant A., and Charmaz K. (eds.), *The Sage Handbook of Grounded Theory*. SAGE.

Busch, M. W., and Reddick, R. M. 2010. *Testing SETI Messages Design. Astrobiology Science Conference 2010.* URL: https://www.lpi.usra.edu/meetings/abscicon2010/pdf/5070.pdf.

Cadbury, D. 2006. *Space Race: The Epic Battle between America and the Soviet Union for Dominance of Space.* Harper Collins Publishers.

Ćirković, M. M. 2018. *The Great Silence: Science and Philosophy of Fermi's Paradox.* Oxford University Press.

Cole, W. M. 2016. Human Rights and the Individual: Cross-Cultural Variation in Human Rights Scores, 1980 to 2010. *Social Forces* 95 (2): 721–752. URL: https://doi.org/10.1093/sf/sow078.

Corbin, J., and Strauss, A. 2008. *Basics of qualitative research.* 3rd ed. Sage.

Dator, J. A. 2012. *Social Foundations of Human Space Exploration*. Springer.

De Magalhaes, J. P. 2015. A Direct Communication Proposal to test the Zoo Hypothesis. *Space Policy* 38: 22–26.

Dick, S. J. 1982. *Plurality of Words. The Origins of the Extraterrestrial Life Debate from Democritus to Kant*. Cambridge University Press.

Dick, S. J. 2013. The Societal Impact of Extraterrestrial Life: The Relevance of History and the Social Sciences. In Vakoch, D. A. (ed.), *Astrobiology, History, and Society: Life Beyond Earth and the Impact of Discovery* (pp. 227–257). Springer Publishing Company.

Dickens, P., and Ormrod, J. S. 2007. Outer Space and Internal Nature: Towards a Sociology of the Universe. *Sociology* 41 (4): 609–626. URL: https://doi.org/10.1177/0038038507078915.

Dumas, S. 2007. *The 1999 and 2003 Messages Explained*. URL: https://www.plover.com/misc/Dumas-Dutil/messages.pdf.

Dumas, S. 2015. *Message to Extra-Terrestrial Intelligence – a Historical Perspective*. URL: https://www.researchgate.net/publication/281036518_Message_to_Extra-Terrestrial_Intelligence_-_a_ historical_perspective.

Dutil, Y. 2014. Equity and Democracy: Seeking the Common Good as a Common Ground for Interstellar Communication. In Vakoch, D. A. (ed.), *Extraterrestrial Altruism* (pp. 261–273). Springer Berlin Heidelberg.

Elliott, M. A. 2007. Human Rights and the Triumph of the Individual in World Culture. *Cultural Sociology* 1 (3): 343–363. URL: https://doi.org/10.1177/1749975507082052.

Frank, D. J., and Meyer, J. W. 2007. University Expansion and the Knowledge Society. *Theory and Society* 36 (4): 287–311. DOI: 10.1007/s11186-007-9035-z.

Garber, S. J. 1999. Searching for Good Science. The Cancellation of NASA's SETI Program. *Journal of the British Interplanetary Society* 52: 3–12.

Geppert, A. C. T. 2012. *Imagining Outer Space: European Astroculture in the Twentieth Century. Palgrave Macmillan.*

Gertz, J. 2016. Reviewing METI: A Critical Analysis of the Arguments. *Journal of the British Interplanetary Society* 69: 31–36.

Grinin, L. 2017. The Processes of Systemic Integration in the World System. *Journal of Globalization Studies* 8 (1).

Grinin, L., and Grinin A. 2013. Global Technological Transformations. In Grinin, L. E., Ilyin, I. V. and Korotayev, A. V. (eds.), *Globalistics and Globalization Studies: Theories, Research & Teaching* (pp. 98–128). Volgograd: 'Uchitel' Publishing House.

Grinin L., Grinin A., Korotayev A. V. 2020. Dynamics of Technological Growth Rate and the Forthcoming Singularity. In Korotayev A., LePoire D. (eds.), *The 21st Century Singularity and Global Futures* (pp. 287–344). World-Systems Evolution and Global Futures. Springer, Cham.

Harrison, A. A. 2011. The Search for Extraterrestrial Intelligence: Astrosociology and Cultural Aspects. *Astropolitics* 9 (1): 63–83. DOI: 10.1080/14777622.2011.557619.

Ivanova, A., Schmidt, A., and Schäfer, M. S. 2014. Global Climate Change, Global Public Sphere? Media Attention for Climate Change in 27 Countries. In Canel M. J., and Voltmer K. (eds.), *Comparing Political Communication across Time and Space* (pp. 210–227). Palgrave Macmillan.

Kiss, J. 2008. Bebo Tries to Contact Earth-like planet. *The Guardian*. URL: https://www.theguardian.com/media/2008/jul/29/bebo.digitalmedia.

Kutuza, B. G., and Rzhiga, O. N. 2012. Radio Physical Studies of Planets and the Earth at the Institute of Radio Technology and Electronics of the USSR Academy of Sciences. In Braude, S. Y., Dubinskii, B. A., Kaidanovskii, N. L., *et al.* (eds.), *A Brief History of Radio Astronomy in the USSR A Collection of Scientific Essays* (pp. 205–224). Springer.

Lampert, M., and Papadongonas, P. 2018. *Majority of Humanity Say We Are Not Alone in the Universe.* Glocalities. URL: https://glocalities.com/latest/reports/majority-of-humanity-say-we-are-not-alone-in-the-universe.

Meyer, J. W, Boli, J., and Thomas, G. M. 1987. Ontology and Rationalization in the Western Cultural Account. In Thomas, G. M., Meyer, J. W., Boli, J., and Ramirez, F. O. (eds.), *Institutional Structure: Constituting State, Society, and the Individual* (pp. 12–37). Sage Publications.

Meyer, J. W., Frank, D. J., Hironaka, A., Schofer, E., and Tuma, N. B. 1997. The Structuring of a World Environmental Regime, 1870–1990. *International Organization* 51 (4): 623–651. doi: 10.1162/002081897550474.

Mythen, G. 2020. Ulrich Beck: E-Special Introduction. *Theory, Culture and Society*. Epub ahead of print 15 June 2020. DOI: 10.1177/0263276420912178.

NASA 2020. *Voyager Golden Record*. https://voyager.jpl.nasa.gov

Parker, M. 2009. Capitalists in Space. *The Sociological Review* 57 (1): 83–97. URL: https://doi.org/10.1111/j.1467-954X.2009.01818.x.

Pink Tentacle 2008. *Alien e-mail Reply to Arrive in 2015?* URL: http://pinktentacle.com/2008/05/alien-e-mail-reply-to-arrive-in-2015/.

Poole, R. 2008. *Earthrise: How Man First Saw the Earth*. Yale University Press.

Quast, P. E. 2017. *A Human Perspective of Earth: An Overview of Dominant Themes to Emerge from Global 'A Simple Response…' messages*. Epub ahead of print January 2017. DOI: 10.13140/RG.2.2.36341.78563.·

Quast, P. E. 2018. A Profile of Humanity: The Cultural Signature of Earth's Inhabitants beyond the Atmosphere. *International Journal of Astrobiology,* 1–21. doi: 10.1017/S1473550418000290.

Sagan, C. 1978. *Murmurs of Earth: The Voyager Interstellar Record*. Random House.

Sagan, C. 2000. *Carl Sagan's Cosmic Connection. An Extraterrestrial Perspective*. Cambridge University Press.

Schulz, P., and Cobley, P. 2013. *Theories and Models of Communication*. De Gruyter Mouton.

Schweickart, R. L. 1988. Space-Age and Planetary Awareness: A Personal Experience. In Grof, S., and Valier M. L. (eds.), *Human Survival and Consciousness Evolution.* State University of New York Press.

Scuka, D. 2016. *A Simple Response.* European Space Agency. URL: http://blogs.esa.int/rocketscience/2016/07/28/a-simple-response/.

SETI Institute 2018. *Protocols for an ETI Signal Detection*. URL: https://www.seti.org/protocols-eti-signal-detection.

Tarter, J. C., Dreher, J., Ellingson, S. W., and Welch, W. J. 2015. *Recent Progress and Current Activities in the Search for Extraterrestrial Intelligence (SETI).* URL: https://

www.researchgate.net/publication/267955322_36_Recent_Progress_and_Current_Activities_in_the_Search_for_Extraterrestrial_Intelligence_SETI.

Vakoch, D. A. 2009. Asymmetry in Active SETI: A Case for Transmissions from Earth. *Acta Astronautica* 68 (3–4): 476–488. DOI: 10.1016/j.actaastro.2010.03.008.

Vakoch, D. A. 2017. *The Message we're Sending to Nearby Aliens is no Threat to Earth*. New Scientists. URL: https://www.newscientist.com/article/2153948-the-message-were-sending-to-nearby-aliens-is-no-threat-to-earth/#ixzz6RTgzsJRZ.

Vakoch, D. A. 2018. *Extraterrestrial Altruism. Evolution and Ethics in the Cosmos*. Springer-Verlag Berlin Heidelberg.

Volkmer, I. 2014. *The Global Public Sphere. Public Communication in the Age of Reflective Interdependence.* Polity.

Westby, T., and Conselice, C. J. 2020. The Astrobiological Copernican Weak and Strong Limits for Intelligent Life. *The Astrophysical Journal* 896 (1): 58. DOI: 10.3847/1538-4357/ab8225.

Wisian, K. W., and Traphagan, J. W. 2020. The Search for Extraterrestrial Intelligence: A Realpolitik Consideration. *Space Policy* 52: 101377. URL: https://doi.org/10.1016/j.spacepol.2020.101377.

Wolverton, M. 2004. *The Depths of Space: The Story of the Pioneer Planetary Probes*. National Academies Press.

Zaitsev, A. L. 2002a. *A Teen-Age Message to the Stars.* 1st International Workshop 'The Art and Science of Interstellar Message Composition', Paris, France. URL: http://www.cplire.ru/html/raand sr/irm/teen-age-message.html.

Zaitsev, A. L. 2002b. *Design and Implementation of the 1st Theremin Concert for Aliens*. 6th International Space Arts Workshop "The Collaborative Process in Space Art", Paris, France. URL: http://www.cplire.ru/html/raandsr/irm/Theremin-concert.html.

Zaitsev, A. L. 2006. *Messaging to Extra-Terrestrial Intelligence*. URL: https://arxiv.org/abs/physics/0610031.

Zaitsev, A. L. 2008. Sending and Searching for Interstellar Messages. *Acta Astronautica* 63 (5–6): 614–617. URL: https://doi.org/10.1016/j.actaastro.2008.05.014.

Zaitsev, A. L. 2011. METI: Messaging to ExtraTerrestrial Intelligence. In Schuch, H. P. (ed.), *Searching for Extraterrestrial Intelligence. The Frontiers Collection* (pp. 399–428). Springer, Berlin Heidelberg.

Zaitsev, A. L. 2012. Classification of Interstellar Radio Messages. *Acta Astronautica* 78: 16–19. URL: https://doi.org/10.1016/j.actaastro.2011.05.026.