# *The Charming Science of the Other: The cultural analysis of the scientific search for life beyond earth*

KLARA ANNA CAPOVA

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by

Klara Anna Capova

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Department of Anthropology

Durham University

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# Abstract

This dissertation presents the cultural study of scientific search for extraterrestrial life conducted over the past sixty years by the scientific community. It introduces an original piece of research that conceptualises the extraterrestrial life hypothesis as a significant part of the general world-view, constantly shaped by the work and discoveries of science. It sheds light on the ways in which alien life is imagined and theorised and presents its concept in both the scientific community and in popular culture.

Drawing from anthropology of science it offers elaboration of 'culture of science' and 'scientific culture' and describes the scientific search for other life as a specific culture of science, here referred to as 'charming science'. The three scientific search methods: message sending, analysing of cosmic signals and the search for extrasolar planets are conceptualised as the three search modes: messaging, listening and exploring respectively.

This work introduces the extraterrestrial 'Other' as a profoundly cultural concept, firstly presented as the missing subject of 'charming science'. Exploration of public understanding the extraterrestrial life and popular imagination of the 'Other' is intended to introduce the scientific search in broader social context and address the role of science in contemporary Western world.

The dissertation draws on the multi-sited and multi-method ethnographic fieldwork conducted over two years in the UK. The research methods included interviewing (semi-structured face-to-face interviews and interviews conducted via email), participation (conferences and scientific meetings), and data collection from the global 'online' community including social networks.



Keywords: science, extraterrestrial life, three modes, messaging, listening, exploring, anthropology of science, cultural analysis, multi-method and multi-sited fieldwork, visual anthropology, popular culture, cultural formations, scientific practices, SETI, astrobiology, Other, cosmology, Western world, culture of science, scientific culture

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# List of Abbreviations

| | |
|---|---|
| APA | American Philosophical Association |
| ATA | Allen Telescope Array |
| BBC | British Broadcasting Corporation |
| CETI | Communication with Extraterrestrial Intelligence |
| EDSC | Evpatoria (Yevpatoria) Deep Space Center, Ukraine |
| ESA | European Space Agency |
| ESO | European Southern Observatory |
| ETI | Extraterrestrial Intelligence |
| ETL | Extraterrestrial Life |
| IAA | International Academy of Astronautics |
| JPL | Jet Propulsion Laboratory, California Institute of Technology |
| IM/IMs | Interstellar Message(s) |
| METI | Messaging to Extraterrestrial Intelligence |
| NAIC | National Astronomy and Ionosphere Centre, USA |
| NASA | National Aeronautics and Space Administration, USA |
| NBC | National Broadcasting Company, USA |
| UFO/UFOs | Unidentified Flying Object(s) |
| UN | United Nations |
| UNOOSA | UN Office for Outer Space Office |
| USSR | Union of Soviet Socialist Republics (until 1991) |
| PDP | Post Detection Protocol |
| PUS | Public Understanding of Science |
| RF | Russian Federation (since 1991) |
| SETI | Search for Extraterrestrial Intelligence |
| SETL | Search for Extraterrestrial Life |
| STS | Science and Technology Studies |
| WIPP | Waste Isolation Pilot Plant |

## Statement of Copyright

# Acknowledgements

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# Dedication

I dedicate this dissertation to the five special people in my life:

Vlasta H.

&

Zdenka, Frantisek, Miroslav, and Petr

My work would not have been possible without your help and support throughout the research period and writing-up process.

# Chapter 1: In Search of the 'Other'

This dissertation is about the scientific search for extraterrestrial life: about its modus operandi as a scientific practice, about its conceptual meanders, and about its societal impact. This is a cultural study of science that can be broken down into two coherent areas. In the first I examine what I call the 'Other' as an umbrella term used to cover for the many conceptualisations of extraterrestrial life, both scientific and non-scientific (popular). This includes looking into the human imagination and the science fiction stories people tell nowadays, especially in the wider cultural context of science as a practice which combines both knowledge production and storytelling. I describe what I have referred to as a 'charming science' which is made up of three search modes: 'messaging', 'listening', and 'exploring'. The phrase 'mode' as used in the context of the search for other life refers to how the search is done and how it happened. The 'Other' as the true subject matter of the 'charming science' is introduced as a rather peculiar, elusive topic that always captures the attention of the media, fascinates the public, alerts scientists and evokes differing opinions and ongoing lively debate.

I use the term in two ways. Firstly I the 'Other' (derived form: 'Others', noun: 'Otherness') in its broad meaning to describe very unusual being, different in character and/or quality from the normal or expected. Its quality is to be distinct or different from that otherwise experienced or known. To my knowledge the term Other was used to describe the imagined extraterrestrial receiver of the Voyager Message by Nelson and Polansky (1993:373). Secondly, I use the term other life to denote the generic subject of the scientific search for life beyond earth.

Despite being a rather new discipline, the scientific search for extraterrestrial life has a rich and controversial tradition. The second half of the twentieth century was the era of the SETI: the Search for Extraterrestrial Intelligence. From the message sending (Pioneers) that emerged in the 1970s (1972, messaging) to the formation of the SETI Institute in the 1980s (1984, listening), scientists were in search of sentient, intelligent life forms. The latest mode of the search for life beyond earth is focused

on finding a life-supporting environment or and especially water (exploring), a discipline categorised as astrobiology. The whole field is currently undergoing an extensive revolution which is receiving great coverage in the media worldwide. In August 2012, at the time of writing up this dissertation, NASA's space probe Curiosity safely landed on Mars and started to collect and analyse samples of Martian soil. A few weeks later, while I was editing the final draft of this thesis, NASA announced that they had made a discovery that is going to be "one for the history books" (NASA, 21 November 2012). With great anticipation, the online community speculated that this announcement was related to the discovery of Martian life, yet NASA's subsequent withdrawal from history-making dismissed such hopes, at least for now. In the meantime, NASA's spacecraft Messenger found new evidence of water ice on Mercury (NASA e-Newsletter, 29 November 2012). In March 2013, just a few days before I submitted this dissertation, NASA announced that the Curiosity rover has found evidence of water-bearing minerals in Martian rock (NASA, 18 March 2013).

There is no doubt that 'extraterrestrial' matter, and later I argue that the scientific search for extraterrestrial life (ETL) – notwithstanding how it is perceived by the scientific community – also matters. By attempting to detect cultures beyond earth, a new culture of science has emerged which has produced and distributed stories about the 'Other'. What is more important, and is a main theme of this thesis is what it tells about ourselves as a species. The culture that manufactured the Pioneer Plaque (1972) and Voyager Record (1977), the messages that made it to the history books, is also the culture that convinced millions of people worldwide that it is worth running a program on their personal computer to help the SETI Institute with data analysis.

I owe the description 'charming' to one of my respondents, who used the phrase "charming and naive" (INT8E:17) when describing the scientific messages sent to outer space. I extended the use of the word 'charming' to the body of scientific research conducted on life in the universe to convey an attraction, which captures journalists, sponsors, moviemakers, and scientists. At the same time, the idea of a charm invokes something supernatural and possibly superstitious does SETI science. The third meaning of a 'charm' as a small ornament, such as one worn on a bracelet,

also fits with the description of SETI as a specific culture of science that embellishes the big science as it adds ornamentation to its refined conduct and rigid methodology.

On the pages to follow I aim to introduce the scientific search for extraterrestrial life as a "culture of science" (Franklin 1995:163) that I regard as a cultural practice. I ask what is scientific and what is extra-scientific about this particular culture of science. I look at its missing subject, at the imagined 'Other' as a cultural formulation that is presented both by scientists and also in Western popular culture and imagination. The readers of this dissertation are invited to enter the extraterrestrial spaces, explore cultural areas generated by contemporary science and popular culture, and see that in fact they are all related to fundamental questions of human existence.

## 1.1. The Big Questions

Although regarded as a controversial one, in terms of conduct and methodology, the ETL search is an interdisciplinary science that pushes disciplinary boundaries. The key feature of the SETI search is that it vocalises the questions that matter, the 'big' science questions. These are presented in a typical socio-scientific story broadcast in the UK in 2010:

> There are some great questions that have intrigued and haunted us since the dawn of humanity:
> What is out there?
> How did we get here?
> What is the world made of?
> The story of our search to answer those questions is the story of science.
> Of all human endeavours, science has had the greatest impact on our lives – on how we see the world, on how we see ourselves. Its ideas, its achievements, its results, are all around us (BBC 2010).

The opening narration of the series, entitled "The Story of Science: Power, Proof and Passion" (BBC 2010), gives us hints about the underlying plot of the pilot episode. The documentary presents the adventure of science, the linear narrative of human curiosity, the ethos of 'question asking', and the subsequent progress and

achievements that changed our world and our understanding of it. It poses the grand questions that we must ask about ourselves as a sentient species.

And there is more to be read between the lines. In fact, what we encounter here is a specific, underlying mindset that favours science over all other human accomplishments. This reflects the status and role that science plays for the target audience, which is essentially the contemporary Western world where science now holds primacy in question-answering and storytelling practices in interpreting 'our' world and informing 'our' cosmology. This authoritarian viewpoint is criticised by anthropologists of science and science regarded as essentially cultural (e.g. Haraway 1988; Harding 1992). Sarah Franklin introduced the term "cultures of science" (1995:163), to capture the cultural contexts which shape and inform scientific practice. The identity of the Western "scientific culture" and, as Sandra Harding put it (1991), becoming "scientifically literate" plays an important part. In many respects being able to read, comprehend, and even reproduce the idea of science renders Westerners inseparable from it. As in the BBC documentary, the lead protagonist in this dissertation is science itself.

In one of the first ethnographies of scientific practice, "Beamtimes and Lifetimes", a study of the world of high-energy physicists, Sharon Traweek identifies that one of the key characteristics that an anthropological study should offer is "accounts of how the world is interpreted in cultures" (Traweek 1988).

This study sets out to contextualise the otherworldly life hypothesis of the 'Other' in the two interrelated cultures driven and characterised by science: the "cultures of science" (Franklin 1995) by which I mean the expert knowledge communities and epistemological strategies; and the "scientific culture" (Harding 1991) by which I address the (popular, Western) culture affected and transformed by science. The 'Other' here is both a product and an ongoing dialogue between two ways of thinking about the unknown and imagined 'Other' in context with space exploration, mass media, science fiction and contemporary science.

## 1.2. The Two Cultures

In the general view it is the subject matter – the 'Other' - and the conceptualisation of Otherness what separates and defines the two cultures (see Fig 1, page 17). The first culture that I am interested in is the "culture of science" (Franklin 1995:163, from now on referred to as culture of science). No matter how this culture of science is usually described in research articles or how it is described by scientists themselves – the search for other life, the search for extraterrestrial intelligence (ETI), or extraterrestrial life (ETL) – the definition of the 'Other' for the scientific mind is simply just operational. For scientists, the 'Other' exists in the state of a hypothesis, and a subject matter is in fact still missing.

For the popular mind, for a Westerner, the representative of the "scientific culture" (Harding 1991, from now on referred to as scientific culture), the 'Other' exists as a mysterious and somewhat exciting yet potentially dangerous possibility. The imagined 'Other' appears in the various forms of imagination, fantasies, and fictions, and is presented in books, movies, distributed via mass media, and recently merchandised in commercial undertakings.

The labels of the two cultures I am using throughout the text – culture of science and scientific culture - were by no means mentioned by my informants or used as a self-conceptualisation. Nor is the selection random. I use those terms encompass my thinking about the phenomenon and locate my thoughts into two culturally dense areas of analysis. By doing so I aim to provide a solid theoretical structure; structure that is derived from and applicable to the established concepts in anthropological theory (Harding 1991, Franklin 1995).

And secondly I use those terms to clearly address the cultural significance and impact of this scientific practice. The scientific search for the extraterrestrial life does not take place in a value-neutral vacuum but unfolds in the dynamic space-time continuum of ideas and, to use a classic definition of culture, a "historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate,

perpetuate, and develop their knowledge about and their attitudes toward life" (Geertz 1973:89).

Here the contextual understanding of science stands out as an important moment and the scientific culture (Harding 1991) is clearly the recipient culture where the "symbols" with their meaning attached are also formed and represented. Because anthropology is principally "interpretative [science] in search of meaning" (Geertz 1973:5), I studied the landscapes in which search practices have evolved and unfolded, and where cultural formations emerged in response to scientific practice but also independently from it.

In writing about the culture of science I aim to introduce the history and uniqueness of this culture and excavate the conceptual roots of the search for the 'Other'. Methodologically, the culture of science in the search for life beyond earth operates upon three search strategies: message sending (e.g. Pioneer Plaque, Voyager Message), analysis of cosmic signals (SETI Institute, SETI@home), and the search for extrasolar planets (Kepler Mission), conceptualised as messaging, listening, and exploring respectively. By merging the search and detection efforts into three broad categories, I address topics related to science as a culture and to methods of scientific investigation that take place in the context of what Derek J. de Solla Price called the "big science" (1986).

Can we describe the search for extraterrestrial life as a scientific practice that magnifies works of a mainstream science and can in fact be used as a case study, or do we need to describe it as a marginal science? By introducing the three scientific practices dominated by the 'Other', I aim to address this question and focus the work of interpretation on a) their method, b) their practice, and c) their object. The fact that the subject matter of this science is missing has been a source of severe criticism over the years. Traweek described the world of high-energy physicists as an "extreme culture of objectivity: culture of no culture" (Traweek 1988:162), and I describe the science in the search for extraterrestrial intelligence, typically the works of the SETI Institute, as the 'science of no science' but, crucially, this is also as an engaged science that interacts with scientific culture and enhances the popularisation of science.

I can ask this question in another way and address the arrangement of the three modes as a scientific practice to show that the 'charming science' is an ongoing process, or what Bruno Latour describes as "science-in-the-making" (Latour 1987). By acknowledging the socio-historical dimension of the 'charming science' and the major impact of science on society, I can elaborate on the theme of 'history in the making'. Especially the latest developments in the field favour the historical and developmental approach. Different conceptions of the 'Other' together with the historicity of science inspired me to assess the 'charming science' retrospectively and also to employ comparative perspective on the three modes of essentially one scientific practice.

Hence, following the two conceptually interchangeable search modes– firstly, rather romantic messaging to the extraterrestrials, and, secondly, listening to the extraterrestrial signals coming from the skies– a new concept began to emerge during the past decade and eventually embodied a new understanding of the forms that extraterrestrial life might take. Here I call it the exploring, embedded in the works of astrobiology. The conceptual shift from intelligent life (addressed through messaging and listening) towards microbiological life (exploring) was described by Stefan Helmreich:

> The object of scientific study and yearning is no longer intelligence, but life. No longer culture, but nature. No extraterrestrial messages but otherworldly organisms (2009:254).

Despite conceptual shifts and negotiations about the hypothetical 'Other' as perceived by scientists, the culture of science has not abandoned one for another. "Intelligence" and "life" are currently present in science side by side as rather solid conceptualisations of the 'Other'. However, the same cannot be said for the popular expressions of scientific culture. Popular culture in this field operates with at least two idiosyncratic notions of the 'Other': UFOs and ETs (aliens). These are the stuff of Hollywood productions and give rise to an immense variety of images of alien life forms. These conceptual variants and fluctuations of the same idea directed me towards describing both the rational and the popular comprehension of the 'Other'.

The first thing that struck me when I was approaching the field and taking part in scientific sessions was the distance the scientists debating about extraterrestrial life were intent on keeping from the Unidentified Flying Object (UFO). UFOs and similar views on life beyond earth are, to the scientific mind, as pseudoscientific and irrational as crop circles, alien abduction hoaxes, and numerous stories of approaching cataclysm. But, these kinds of story are popular. Swiss author Erich von Däniken published his book "Chariots of the Gods" in 1968, in which he wrote about ancient astronauts coming to earth and distributing technology and knowledge to our primitive ancestors. The book was a bestseller in 38 countries according to von Däniken's World of Mysteries website.[1] One could object to a link being drawn between quite unbelievable legends about extraterrestrials and the science in the search for the ET. Yet, the divergence of popular and scientific concepts is precisely my point here. While in popular culture there is ambivalence in the terminology describing extraterrestrial life, for scientists the difference between unidentified flying objects, broadcasting extraterrestrial civilisations, and microbiological life is crystal clear. To render the specific character of the 'Other' as imagined and pictured in each of the two cultures– and acknowledge the differences and similarities– is the key to revealing its culture specific meanings.

## 1.3. Anthropology and the Significant 'Other'

The 'Other'- the other culture - in anthropological theory is an objectified subject of the analysing 'self' and de facto a product of the cultural analysis. This has been addressed by Johannes Fabian in his study "Time and the Other: How anthropology makes its object" who investigated how anthropologists produce the other as an object of their temporal and spatial enquiries (Fabian 1983). Edward Said in his pioneering study "Orientalism" described that the other "made Oriental" (Said 1977:7). The constitutive 'Other' was presented in some of the well-known ethnographies and cultural analyses in various contexts: a Balinese Cockfight (Geertz 1973), gym in a black ghetto of Chicago (Wacquant 2004), American abortion debate (Ginsburg 1989), high energy physicists (Traweek), and "E.T. culture" (Battaglia 2006). For me, the 'Other' is primarily the culture of science.

[1]Retrieved from http://www.daniken.com/e/index.html. Accessed 06 Jan 2012.

In describing the culture of science I need to make clear terminological distinction between the 'Other' as an object of anthropological analysis and the 'Other' as an imagined subject of both the science and popular culture. In this text, the significant other in an anthropological sense is the culture of science: the charming science of the (extreaterrestrial) other. My reason for doing that is to show that in a similar way to the anthropological constitution of the other, the 'charming science' also composes and represents the constructed 'Other' as an object of scientific enquiry.

Most of the references I use on the pages to follow include literature relevant to cultural studies of science, space exploration, 'Otherness' and related topics. My intellectual strategy to substantiate the ethnographic field was to describe its specifics while regarding it as essentially a totality of three scientific disciplines. Another part of the bibliographical story and objectives of this dissertation in which I see my work is situated is my personal mission to establish the cultural and social studies of science in my native country, the Czech Republic. To base the anthropological debate within solid theoretical frame I focused on the tradition of sociology, history and philosophy of science (Kuhn 1962; Russell 1985; Franklin 1995) and the pioneering inquiries into the scientific projects and scientific communities (Traweek 1988; Rabinow 1996; Kay 2000). During the preliminary bibliographic research and the writing-up I followed the latest developments in the debate, most of which can be found in Secondary References.

There is a growing volume of published studies dedicated to astroculture in outer space. Most notably the recent volume "Imagining Outer Space: European Astroculture in the Twentieth Century" edited by Alexander Geppert (2012).[2] The Autumn 2012 special collection of Anthropological Quarterly dedicated to the study of 'Extreme: Humans at Home in the Cosmos' contains contemporary ethnographies of outer space (Battaglia, Helmreich, Olson, Valentine 2012). Debora Battaglia in

[2] Current ethnographic or historical studies of contemporary projects in astronomy and space studies focus on studies of NASA projects (Messeri, Mirmalek, Vertesi), ethnographies of ESA (Redfield, Zabusky; Krige), the ethnography of the TMT observatory (de Laet) and of the National Observatory of Japan (Kato), and the curation and archiving of large-scale databases for the SDSS, Pan-STARRS, NVO and LSST (Borgman, Traweek, Fearon, Wynholds). Source: A list of people who are or have been engaged in ethnographic or historical studies of contemporary projects in astronomy and space studies. Compiled by Sharon Traweek, obtained from Stefan Helmreich in December 2009.

"E.T. Culture: Anthropology in Outerspace" (2005) has shown the relevance of the 'extraterrestrial' as a site of ethnographic research and anthropological analysis. The 'ET culture' to which Battaglia refers comprises ideas of extraterrestrial life and UFOs, and as she states in her editor's note:

> Our presentations on that occasion converged at points where science, magic, and religion flowed into and through one another, unsettling their boundaries and revealing the inner spaces of "alternative" seekers (Battaglia 2005:vii).

These observations accord closely with my own and the 'ET culture' is now an established filed of sociocultural enquiry. The theme of the extraterrestrials is complex, and although I focus primarily on the extraterrestrial within science, the magical and religious dimension of what's beyond earth are never far away. It is impossible to imagine the scientific search for other life without its immediate geographic and social vicinity. The 'charming science' is conceptualised as the very own scientific practice of the contemporary West.

## 1.4. Western Science as the Significant 'Other'

The concept of the 'Other' I develop here is a juxtaposition of the familiar 'us' with the unknown 'Other' as constructed by 'us'. Overlapping from one field to another, the two key perceptions so far presented as the scientific and the popular coexist and co-develop as two valid cultural categories with a long tradition. While in anthropological writings the other refers to the cultures that are subjected to ethnographic interest, I use the term 'Other' to refer to extraterrestrial life and address both the scientific and public understanding of extraterrestrial life and the many concepts it encompasses. As Sandra Harding puts it:

> From a sociocultural perspective, it is virtually irresistible to regard contemporary sciences and their technologies as fundamentally a social problem (Harding 1991:2).

The role of anthropological inquiry is to explore scientific practices as culturally inflected and to disclose the interrelationship between a realm considered to be a socially scientific and the sociocultural realm in which it is inevitably situated. As

suggested above this requires an understanding of the way that culture of science and scientific culture interact with one another. This line of enquiry provides a theoretical framework for ethnographic accounts of the scientific community. Science studies or social studies of science (SSS) sprang up from the tradition of sociology, history, and philosophy of science (Kuhn 1962; Russell 1985; Franklin 1995). The intellectual debate between scientists and social scientists originated in the mid-1990s and soon became known as the science wars – a 'war of the words' between two scholarly communities with different epistemological starting points (Segerstrale 2000).

For social scientists, 'science' became an object of critical study with the two cultures as described by C. P. Snow revealing themselves in the original meanings of humanities and hard sciences (1964 and 1990). Social scientists by describing science as local practices performed in a social context identified sciences as culturally biased and far from objective (Segerstrale 2000; Franklin 1996; Martin 1991). Segerstrale distinguishes two main streams: postmodern cultural critiques and those proposed by social constructivists and relativists. Postmodernists claimed that science was a part of general culture and questioned scientific objectivity. From their critique, however, there also emerged reconciliatory voices. Jay Labinger, for example in his paper "Science as Culture: A View from the Petri Dish", called for participation by practising scientists and makes clear that "collaboration between scientist and SCSer (SCS stands for Social and Cultural studies of Science) might well be preferred to the treatment of scientists as non-participatory laboratory specimens" (Labinger 1995:285). More recently he science wars have been pacified by calls for new directions from within social sciences. Bruno Latour opens his paper "Why Has Critique Run out of Steam?" with a simple observation: "so many wars" (Latour 2004c). After all the criticism of science and scientists, Latour calls for new critical tools and for steps to be taken towards the matters of concern. Segerstrale clearly concludes that it is time for social scientists to cooperate with their scientific colleagues: "this would also mean a reorientation of the field of STS toward its original mission, including the question of science and social values and the moral responsibility of scientists" (Segerstrale 2000:25).

While the scientific communities directly engaged with the search for extraterrestrial life are relatively small, their activities and impact always address the general question of the position and role of science in contemporary society. Many excellent studies have proved that an anthropological approach to the study of small scientific communities is illuminating (e.g. Traweek 1988). Paul Rabinow in his study of biotechnology offers an ethnographic account of the PCR invention in the context of the environmental conditions and its key actors.[3] The study is contextual; Rabinow has shown that the invention emerges from the configuration of various elements: scientific, technical, cultural, social, economic, political, and legal. The role of the anthropological point of view is the "fashioning of the particularity of practices" (Rabinow 1996:17).

As mentioned earlier, Traweek (1988) opened up her study of high-energy physicists with an overview of what an ethnography of science and scientists should include. Similarly to Rabinow, she points out the importance of ecological settings and further lists the developmental cycle, social organisation, and cosmology of the group which make up the four domains of scientific community life. Traweek's study provides a strong theoretical and methodological background for any study that deals with the scientific community. One of the conclusions of Traweek's study is the designation of what makes a culture; her definition draws upon the work of Schneider and Geertz: "the group's shared set of meanings, its implicit and explicit messages, encoded in social action, about how to interpret experience" (Traweek 1988:7).

Having the two cultures as the research interest implies a new approach to research methodology. George E. Marcus's study "Ethnography in/of the World System: The Emergence of Multi-Sited Ethnography" has been crucial in helping me define and approach the research field and also because it points to the mutual relation between the single formation and the system, as Marcus described:

[3] PCR stands for polymerised chain reaction; PCR is a technique used in polymerization of DNA to replicate.

> Ethnography of a cultural formation in the world system is also an ethnography of the system, and therefore cannot be understood only in terms of the conventional single-site mise-en-scene of ethnographic research (Marcus 1995:99).

But before I proceed to the research methodology and the introduction of multiple sites of fieldwork conditioned by the nature of 'Other', I first ask what we might understand by the term 'Western', and whether the geographic distinction is relevant in describing the scientific society.

## 1.5. The Interchangeability of Western and Scientific Culture

The generic term 'Western' is broadly used in literature and mostly without explicit definition (Martin 1998). 'Western' is a term that is problematically generic yet also historically specific. As such, 'Western' refers to the geographical complex of non-Communist countries in the Cold War. From the religious point of view, the Western countries are those influenced by Graeco-Roman and Christian traditions.

Notwithstanding geopolitics, the Western culture I depict here is crucially defined by its science, by the prevalence of scientific discourse and a preference of positivistic knowledge-production in practice. It has been established in many works of social scientists and philosophers of science that the 'sciences 'are a fundamental pillar of recent Western development and out of which emerge key values: rationality, secularity, and the idea of progress. Of special relevance is reason as a basis of scientific deliberation, a core scientific value, and the principal inheritance of the Enlightenment (Schech and Haggis 2000). The history of rational and empirical discourse is rooted in Cartesian philosophy, Comte's positivism, and the ideals of the Enlightenment (Schech and Haggis 2000). Sandra Harding in "Whose Science? Whose Knowledge?: Thinking from Women's Lives" argued that the "indigenous peoples" of the modern West – those most at home in Western societies – have "culturally distinctive belief patterns in which scientific rationality plays a central role" (Harding 1991:3). Later, in her paper "After Eurocentrism: Changes for the Philosophy of Science", Harding directly specifies the "world-wide dominance of only one ethnoscience" (Harding 1992:311), by which she means the Western sciences and technologies.

From this viewpoint, the Western sciences are "one kind of culturally specific 'ethnoscience'" (Harding 1992:311) – that is, they provide an alternative but, as Harding pointed out, also an authoritative explanation of the world. Moreover, this is a world in which the Westerners are presumed to be the scientifically literate "knowers" who have a basic command of scientific conventions. Harding described the situation as follows: "we live in a scientific culture; to be scientifically illiterate is simply to be illiterate" (Harding 1991:55).

More than one century has passed since the pioneering time of science fiction (most notably Wells 1898, Verne 1900 etc.) as well as the scientific quest for other life forms. This was a century of developments, inventions, and scientific progress, which took humans to the moon and in which the Western world was transformed politically, economically, institutionally, and culturally. But also science itself has changed and evolved as studied most notably by Thomas S. Kuhn in his breakthrough study "The structure of scientific revolutions" (1962) and also in a preceding study "The Copernican revolution: planetary astronomy in the development of Western thought" (1957). The dynamics of science became the topic of Michael Callon's contribution to Handbook of Science and Technology Studies (Jasanoff ed., 1995) entitled "Four Models for the Dynamics of Science" to the models of scientific development subdivided along topics of social and cognitive dimension of scientific development: science as rational knowledge, science as competition, science as sociocultural practice and science as extended translation (Callon 1995, 29-63).

Taking Harding's cue about the importance of such literacy, scientific culture emerged as an important part of my fieldwork - which focused on material related to the "public understanding of science, PUS" (c.f. Fuller 2006). The connecting link between scientific disciplines and the societal response to their practice lies in the channels through which the messages of science are shared and distributed. Typically, this is science education, publications popularising science, science documentaries, and other science collateral. The participation of the scientific community in the entertainment industry and the impact of fictional films on construction of scientific knowledge and the public understanding of science was

explored by David Kirby in two of his papers: “Science Consultants, Fictional Films, and Scientific Practice” (2003a) and “Scientists on the set: science consultants and the communication of science in visual fiction” (2003b).

But the role of science fiction is deceiving by producing a false or misleading image of science. Barnett and others in "The Impact of Science Fiction Film on Student Understanding of Science" investigated the production of modern science fiction such as ‘The Core’ that captivated public imagination of Earth Science. According to the authors such image might be useful in using science fiction films to engage students in the critical evaluation of “both good and bad science when exposed to it in the popular media” (Barnett et al. 2006:190).

Above I used the term “knowers” to depict the first unifying feature of the areas of the contemporary Western world, the native cultural area of scientific culture. But because of the growing importance of technology in everyday life, it is necessary to extend the definition beyond just science and science education. Aronowitz for example defined a culture by the use of technology:

> American culture is technoculture, from the boardroom to the bedroom. This is not to say that there is only one American culture; there are many, yet each is a technoculture. Truckers and cyberpunks, rap musicians and concert pianists, even hippies and the Amish all employ technologies in such a way that their cultural activity is not intelligibly separate from the utilization of those technologies (Aronowitz, Martinsons et al. 1996:18).

European culture has also become a technoculture. Of course, science cannot be regarded as a coherent, solid monoblock, which is the reason why Franklin uses the plural form when describing the cultures of science. This approach enables to include the Soviet science that played a crucial role in the Space Race and represents the Eastern world, in the ‘charming science’ I have so far only labelled as Western. During the Space Race, the two super powers competed for supremacy in space exploration, and this competition was about advancement in science and technology. It is equally important to acknowledge the role of Russian scientists in the search for the ‘Other’. Historian of science, Loren Graham who specialises in the study of

contemporary science and technology in Russia, asked "What have we learned about science and technology from the Russian experience?" and especially noted, that "When the totalitarian and xenophobic features of the Stalinist Soviet Union were strongest, science and technology, with their emphasis on objective knowledge and international connections, tended to have liberating and westernizing effects." (Graham 1998:50). The connecting role of scientific objectivity was noted by Bruno Latour's in his description on science in "War of the Worlds: What about Peace?" where Latour addressed globalism, modernisation, and universality:

> Through the mediation of scientific objectivity, technical efficiency and economic profitability, anybody could join this fatherland without ancestors, this ethnic group without rituals, this country without borders; this country of reason, able to access unifying nature through the hard work of criticism and rational discussion (Latour and Tresch 2002:13).

Similarly, Lorraine Daston and Peter Galison, in their comprehensive description of the making of scientific images, "Objectivity", described science as a "collective empiricism", a collective that involves "investigators dispersed over continents and generations" (Daston and Galison 2007:22). Here we see that science stands out as a common attribute of such nations without borders and unites diverse areas into a more or less homogenous intellectual landscape. Notwithstanding the occidentality of 'the Western world' and 'Western thought', which excludes e.g. Soviet science, I define the area by its common enterprise, by shared "collective empiricism" and by looking for scientific answers to questions that have "haunted us since the dawn of humanity" (BBC 2010).

## 1.6. Introducing the Two Cultures

Bruno Latour in his influential essay on science studies, "Pandora's Hope", describes science studies as situated in the "no-man's land between the two cultures" (1999:17), referring to the two academic cultures as described by Snow (1964). I take this expression and twist its meaning to develop cultural analysis of the 'charming science' and to conceptualise and interpret the nature of and interactions between a culture of science and scientific culture. I present a cultural analysis of the

'Other' while being located in the anthropological no-man's land between the cultures. If I might borrow astrophysical terminology, the no man's land is the event horizon, a line beyond which the world as we know it ceases to exist, a point of no return.

To describe this domain I draw from Clifford Geertz's idea of "thick description" (1973), and combine it with George E. Marcus' suggestion that we "follow the thing" by means of multi-sited ethnography (Marcus 1995:106). The end result is what I describe as "thing description"[4], the approach to interpreting other life as it is articulated in and distributed within the overlapping areas of culture of science (Franklin 1995) and scientific culture (Harding 1991) as presented in the diagram below (Figure 1). Here one observes the overlapping of the two cultural areas and the emergence of "the thing".

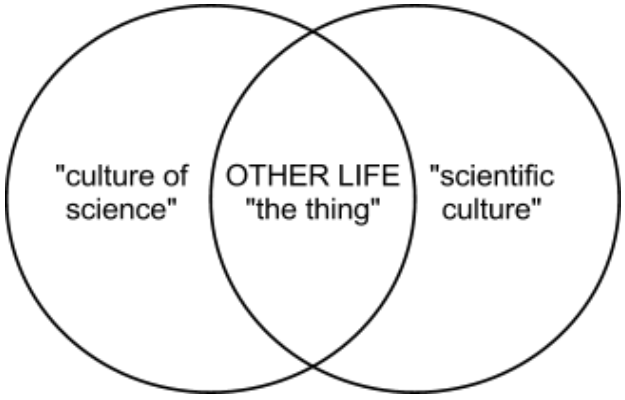


**Figure 1. Two cultures: "culture of science" and "scientific culture"(2012). Image Credit: Author.**

"Following the thing" is one of the many ways suggested by Marcus as a "mode of constructing the multi-sited space of research" (1995:106). The approach is particularly helpful for three reasons. Firstly, by focusing on 'Other' life as present in the two cultures, it defines and makes visible an ethnographic field. The 'Other' as "the thing" does not only emerge from the rational discourse of the scientific regions. Besides the works of science, this study recognises the scientific, recipient culture as the essential field of anthropological enquiry. Therefore "following the thing" approach makes it possible to identify both the reflections of the scientific search for

[4] The credit for inventing the expression "thing description" goes to my supervisor Prof Bob Simpson who suggested I merge the two terms into one while we were discussing my text about the research methodology.

the ‘Other’ in popular culture and also to include non-scientific, fictional other life concepts.

Secondly, it enables the scientific activities to be contextualised by “tracking circulation through different contexts of a manifestly material object of study” (Marcus 1995:106). Sociocultural reflections upon scientific efforts in the scientific culture are embedded in various elements of popular culture: mass media, science documentaries, science fiction, the school curriculum, modern narratives, and folk mythology where “the thing” that stands out in its many forms. Although the ‘Other’ is not necessarily a material object, I will show how it had been commoditised and commercialised.

Finally, “following the thing” (Marcus 1995:106) makes it possible to adopt an historical perspective which tracks the other life idea across temporal and social vicinities, but also to focus on causal connections and interactions between the two cultures. An example par excellence is the SETI@home project, the scientific enterprise that popularised the search for extraterrestrial intelligence and also brought in millions of users.

## 1.7. Anthropology of the “Thing” at Home

In the methodological exploration “Anthropological locations: Boundaries and grounds of a field science”, Akhil Gupta and James Ferguson explore new ideas regarding the idea of an anthropological field. To reconsider the traditional sites of ethnographic fieldwork in the way they suggest was a necessity for me to consider for two reasons. The charming culture of science is not what can be described as a “territorially fixed community” (Gupta and Ferguson 1997:4); instead, it is “mobile and multiply situated” (Marcus 1995:102). But the first issue related to anthropological location I address here is “home as a ‘site of difference’” (Gupta and Ferguson 1997:14).

This piece of research into the culture of science and scientific culture has been undertaken in the UK, employing also online data available from the USA and the EU. I was born in the former Czechoslovakia, which until 1989 was a part of the

Eastern Bloc, grew up in the democratic Czech Republic, and was conducting fieldwork in the United Kingdom about an initially American scientific enterprise. Consequently the first question I had to ask myself was about the geographical categories of scientific culture and hence my affiliation with the residential scientific culture typically ascribed to the Western world (although I was possibly expected to have a good knowledge of Soviet science). Yet for me personally, science initially meant something that crossed national traits, and because the scientific methods and rhetoric claim some degree of universality, I regarded my viewpoint as being inevitably emic. I was subjected to the long-term influence of science education, mass media, and in particular also personal interest in the subject; simply, as Harding would describe, I was an average scientifically literate knower.

But despite my egalitarian thinking, I had to address the question of my location, and the spatial, historical, and cultural bounds within which I was working. Am I at home in this culture? Am I an insider or rather an outsider? During my fieldwork I explored "home as a site of difference" (Gupta & Ferguson 1997:14) and I often recalled Paul Rabinow's book "Reflections on Fieldwork in Morocco" (1977) where Rabinow describes one of his informants as an "insider outsider" (Rabinow 1977:31). What Rabinow meant here was that one informant cannot experience (see) the whole culture and the whole culture cannot be seen through one person. Along with the question of what being an 'outsider' or 'insider' or even an 'in-betweener' mean comes yet another question: do I provide an account of my own or the other culture, or a little bit of both? Tangled up in ties of culture, both past and present, I was coming from within a culture that is bounded by its intellectual tradition and shared values. This area is dominated and united by its "Eurocentric perspective in understanding science" (Harding 1992) and the assumption that indigenous people are to some degree "scientifically literate" (Harding 1991).

Accessing fields dominated by the search for extraterrestrial 'Other' from this dislocated perspective enables the fields of science to be handled as a particular culture on their own, and so the ethnographic account begins to acquire ethic qualities. Once the researcher enters the field and attempts to provide a description and interpretation of it, the transformation from a 'native' to an 'observer' emerges.

To summarise, I am at home in the scientific culture. I adopt the standpoint described by Latour as from the "no-man's land between the two cultures" (1999:17).

## 1.8. Crossing the Boundaries of Time and Space

In the tradition of ethnographic fieldwork it has been established that anthropological writing should address the objectivity/subjectivity of the research practice and offer an account of self-reflection. Pierre Bourdieu introduced "participant objectivation" as a reflective methodological tool and argued that the researcher him/herself may distort the studied subject, and it is hence essential to address the personal history and background of the researcher. This seems to be a particularly useful methodological aid once conducting fieldwork at home. Here the process of transformation into the one who 'studies', the "participant objectivation", is essential in attempting to reach an adequate degree of cultural neutrality. Bourdieu refers to the "objectivation of the subject of objectivation, of the analysing subject – in short, of the researcher herself", by which he means the social conditions of the possibility of that experience (2003:282), and to the "particular position within the microcosm of anthropologists" (2003:283).

Let me provide an example of what I mean by working at "home as a 'site of difference'" (Gupta and Ferguson 1997:14). One day, just after I had completed one of my interviews, I met my colleagues with whom I occasionally discussed the issues related to research methodology. I explained how difficult it felt that time to switch to the field-mode while doing fieldwork on the campus. My colleague said to me: "Do you realise that whenever you speak about going to the field you actually keep drawing a line on / above your forehead?" Indeed, I drew the symbolic line whenever I was about to switch to/from the fieldwork mode. The difference between the 'field' and 'home' was to be negotiated every time I set off to an interview or to take part in a science conference. While from the perspective of my interviewees I was necessarily identified as an outsider, from my point of view I have been a member of a scientifically oriented society, studied as a university student and as a person I have been surrounded by many people who are potential research subjects as well as school curriculum, newspapers, magazines, books, reports, public announcements, TV news & debates, articles, films, videos, documentaries,

websites, blogs, e-newsletters, pop music, museum exhibits, postage stamps, even contemporary art exhibits. The overwhelming amount of data made me not just rethink the concept of the 'inside outsider' but also reflect upon my immersion in the topic. Here I am indebted to my friends and colleagues who discussed with me my difficulties regarding he 'field', giving me feedback about when commonplace knowledge became data and vice versa.

To be able to settle in the field successfully I had to have a working knowledge of the scientific concepts and use key terminology. As mentioned above, I made great use of social networks, in particular of Facebook. On Facebook I 'friended' or 'liked' a majority of the space exploration and ETI search-related institutions worldwide: notably NASA and SETI (List of Facebook pages is available in Appendix 1). Soon I realised the nature of my fieldnotes only reflected upon the current structure of science – which is a networked science – but more importantly refers to the position of the 'charming science' within mainstream science (as presented on Figures 52, 53 and 54).

Initially, during scientific meetings, I felt I was doing a sort of "halfie" anthropology. As Lila Abu-Lughod defined them in "Writing Against Culture", the "halfies" are "people whose national or cultural identity is mixed by virtue of migration, overseas education, or parentage" (Abu-Lughod 1991:466). Above I addressed the issue of cultural membership, or cultureship, that is in the broader sociocultural but also the political context of the scientific culture. The situation with a "halfie" takes place in the narrow context of a specific situation: a conference – a place where the culture of science takes place. There I indeed felt like describing a culture to which I actually belong and a culture I usually practise (although in a different academic discipline). I recognised the importance of building a network as well as attending scientific meetings to reach my informants who would then eventually recommend me to their peers or suggest that I contact someone.

## 1.9. Research Background

A few years ago, when I was both an undergraduate student in humanities with a keen interest in history and philosophy of science and a penchant for backyard

stargazing, I was preparing for an assessment for an interdisciplinary lecture in astrophysics. In search of the information I needed to complete the final essay, I was leafing through the pages of "Cosmos", a popular science book written by Carl Sagan in 1980. Suddenly I saw a photograph (Figure 2) of the protective cover of the famous Golden Record, a message attached to Voyager I and Voyager II probes and sent by NASA into interstellar space in 1977:


**Figure 2. The protective cover of Voyager Message's content (left) and the message itself - Golden Record (right). Image Credit: NASA.**

Although I knew there was a message that had been sent to the universe, I only vaguely recalled the (back then) controversial representation of a naked couple of earthlings that made the 1972 Pioneer Plaque engraving notorious and caused public indignation (Havel 1996). This is the iconic image (Figure 3) that is usually associated with the search for life beyond earth, or ETs:

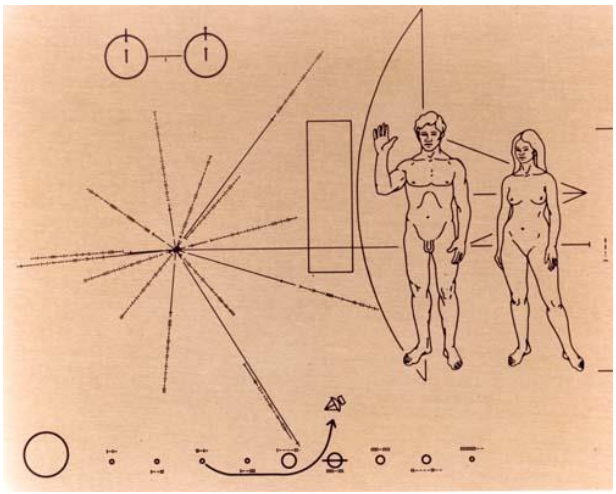

**Figure 3. The Pioneer Plaque (1972). Image Credit: NASA.**

I admit that back then the information I would have required to solve the riddle of the Voyager envelope and understand the message sheltered inside was locked away across the Atlantic Ocean in the distant English-speaking world. Yet it was not only the long distance or language barrier that separated me from solving the riddle. I simply was not sure what the engravings of Pioneers and Voyagers represented or were meant to represent. I could see a radial diagram, some other mysterious symbolism and a silhouette, but could not make sense or get the meaning of the diagrams.

Judging from a brief survey of the mysterious symbols carved in the shiny surface of the message, it was clear to me that the message was written in a specific language, a well-conceived one. After reading Sagan's comment on the Voyager message that "we did not want to send primarily scientific information" (Sagan 1985:287), I focused on the actual content of the message: that is to say, in a simplified way, what was sent. Subsequently, but of a greater importance, was the question: who sent this? Who was the "we" who had once spoken on behalf of humanity?

That day in 2005 I recall my first close encounter – a close encounter of the second kind – with the culture of science, as Sarah Franklin calls it (1995:163), the culture I later identified as the one that formed around the scientific search to find life beyond earth and now describe as 'messaging'. This fascinating encounter left me puzzled and intrigued about the meaning of the engravings and asking if this really represented human life on earth, or, as Sagan said, "speaks for all of us". In my Master's thesis, entitled "Voyager Message" (Capova 2008), I addressed these questions and concluded that the Voyager Message was assembled in the form of a documentary that presents the facts about people (humanity) and events (nature, technology).

I argued that the pictorial slide displays a scientific narrative about human beings; and, again, only the receiver who is "scientifically literate" (Harding 1991) is capable of understanding the story, of comprehending the scientific symbolism and revealing the meaning of the message. I regarded the scientific messages as artefacts of scientific consciousness, ornaments of successful space sciences blossoming during the Space Age.

Nevertheless, this story is just a beginning. It became apparent to me that the scientific messages present only a fragment of a whole theme and that it is important to understand what motivated scientists to conduct such search and how this discipline developed over the time. Several other topics emerged during preparation for fieldwork and especially during my contact with the culture of science.

## 1.10. Making First Contact with the Culture of Science

As indicated in the previous section, the research data were gathered from multiple sources. The ethnographic fieldwork was conducted in the UK at various time points during the 2010–2011 academic year using three qualitative research methods. Those were mostly used to enhance the contextual description of the two cultures. As shown above, the cultural analysis that attempts to conceive the cultural formations of other life is unavoidably drawn towards multiple sites of ethnographic research. Hence multi-sited ethnography is suitable where the object of study is complex and "ultimately mobile and multiply situated" (Marcus 1995:102).

Unavoidably, managing multiple sites requires employing the multi-method approach to research. For this reason, the ethnographical study of other life combines traditional anthropological fieldwork (interviews and observation) with visual and contextual ethnographic study and employs secondary data sources, typically related to science popularisation and popular understanding of science. The combination of research methods along with the juxtaposition of primary and secondary data types, e.g. archived documents and online materials, was utilised to maximise the analytical value of the study.

In one glance, the research involved semi-structured interviewing, participation, and analysis of visual and audio parts of scientific messages sent to outer space. In detail I included data detailed in Table 1 and described in subsections a, b, and c.

**Table 1: Overview of Primary Data Resources**

| Data Type | Specification |
|---|---|
| Semi-structured interviews with scientists | • face-to-face interviews<br>• email interviews |
| Observations and participation | • scientific meetings<br>• visiting a research lab |
| Scientific messages | • comparative content analysis (photographic documentation, visual & audio)<br>• public messages to the universe (photographic documentation, visual & audio)<br>• project websites (NASA Origins, SETI@home) |

### 1.10.a. Semi-Structured Interviews

To explore the scientific point of view, which is as a matter of fact the 'native's point of view', I employed what Russell Bernard described in his "Research methods in anthropology" (2002) as a narrow focused probability sample of key informants, mostly astrophysicists and astronomers. The final data set contains nine interviews that can be subdivided into two groups of respondents:

- scientists active in space exploration and related disciplines (seven respondents)
- specialised public e.g. science writers (two respondents)

The first group consisted of "focused ethnographic informants" (Bernard 2002), scientists who reside outside the SETI activities but who do have a good knowledge of the search for other life in the cosmos, and who in four cases had participated in a research project dedicated to the search for other life at some point in their career. Those respondents provide the cultural information and insights into how the SETI project is perceived by other scientists. The interview questions aimed to explore the SETI search as a specific culture of science in the context of the big science. The semi-structured approach to the interviewing practice was chosen as the best method when talking to elite members of the community because their time resources were limited. The structured design of the research practice enabled me to include the

email communications in the research process. In four cases, the email communication proved to be a very useful alternative to the face-to-face interviews. The principal purpose of the interviewing was to capture current trends in search strategies, evaluate past projects, define what the idea of extraterrestrial life is within science as well as for the respondents, and in particular to:

- document the contemporary concept of life in the universe;
- reveal the current concept of life and its origin (continuity, discontinuity);
- define the position of this specific field within science;
- identify the channels of representing the research with a special focus on its visual part (current cosmologies and its visualisation) and its presentation to the public; and
- detect the linguistic expressions and characteristic use of language (Kvale and Brinkmann 2009).

The set of interview questions was based on the preliminary theoretical (desk) research. As the research unfolded I updated the questions on the basis of information gathered in the informal meetings conducted during the settling-in period of the fieldwork (Bernard 2002, Denzin and Lincoln 2000).

In the interview guide, the research annotation was divided into five key themes identified during the initial research phase: the history of the search for life, and messaging and listening; the current concept of life in the universe; meteors, comets, the cosmic origin of life, habitable zones; civilisation, SETI, and UFOs; and finally personal beliefs versus scientific data. While the purpose of drafting the key areas was to give the participants the sense of general topics that may be discussed during the interview, the interview guide provided a specific set of semi-structured interview questions:

1. Do you think there is other life in the universe and what might it be like?
2. Is the question of whether there is other life in the universe of importance (within science/for you) and why?

3. What do you think about the SETI project and about message-sending activities (e.g. Pioneer Plaque and Voyager Record)?
4. What do you think about the messages that have been sent to the universe?
5. In your opinion, what happens if we detect ET life or discover life on another planet?
6. If you were given the opportunity to send a message, what would it be?

The acknowledgement of astrobiology as the third search mode was the first theme that emerged during the fieldwork and eventually led tome updating the original research proposal in 2009 (full text of updated fieldwork documents distributed to participants is available in Appendix 2 and 3).

As the fieldwork unfolded, the scenarios or predictions of the societal response to the detection of ET life were becoming clear. Especially interesting was the recognition of the role of anthropology in predicting the first contact with extraterrestrial life; the ethnographic accounts of encounters of cultures, such as the one described by Tzvetan Todorov in his book "The conquest of America" (1982); and, last but not least, the notions and thoughts about the alien 'Other', and how scientists understand this topic and SETI activities. In context with the SETI, I would like to acknowledge the contribution of my respondents who described the importance of popular culture and mass media in affecting and enhancing the public understanding of science. Two of my informants during the interviews mentioned the US motion picture "Contact" (USA 1997) as de facto a channel of distributing the concept of SETI towards public, lately also worldwide (discussed in detail in Chapter 4, page 133).

Another trend emerging from interviewing were the cross-generational differences in attitude towards SETI and science fiction. The available data suggest that the upcoming generation of scientists who encountered the 'Other' in their childhood stories is likely more perceptive towards the conceptualisations of 'Otherness' . This may point us to more than just personal opinions of respondents. There seems to be a societal change driving the changes within science itself. A further study is required which would take into consideration the generational differences and also political views of the respondents.

### 1.10.b. Observation and Participation

As a part of the fieldwork, participating in scientific meetings enhanced the notion of familiarity with the field and enriched the dataset. Although this research method cannot be regarded as traditional participant observation (nor was it intended to be), the participation in the scientific meetings and interaction with scientists became a source of field data e.g. first-hand observation of the meetings and conversation with participants (small talks, lunch-time talks). Participating in scientific meetings, e.g. the Astrobiology Society of Britain, and subscribing to e-newsletters also proved to be particularly useful.

These gatherings and events also provided a networking opportunity through which I met some of my key informants. During the research I took part in four important events as detailed in Table 2 below.

**Table 2: Overview of Scientific Meetings**

| Year | Event Title | Location |
|---|---|---|
| 2009 | "Water on Earth and Beyond". Series of Lectures. | Durham University |
| 2010 | Satellite meeting on "Towards a scientific and societal agenda on extraterrestrial life" | Royal Society London |
| 2011 | The discussion meeting on "The chemical origins of life and its early evolution". | Royal Society London |
| 2011 | The 2011 Grubb-Parsons Lecture "Are We Alone". Jill Tarter (Director, Center for SETI research, SETI Institute) | Durham University |

### 1.10.c. Scientific Messages

Scientific messages sent to the universe form the third part of the dataset. A basic description of three interstellar messages – Pioneer Message, Voyager Record and Arecibo Broadcast – has been provided in my MA thesis (Capova 2008). This work extends the former data set and includes another twelve interstellar messages from different time periods and geographical areas presented in Table 3.

**Table 3: Overview of Messages to Extraterrestrials**

| Title | Year | Country | Type | Origin |
|---|---|---|---|---|
| Message to Venus | 1962 | USSR | broadcast | science |
| Pioneer Message | 1972 | USA | spacecraft | science |
| Arecibo Transmission | 1974 | USA | broadcast | science |
| Voyagers 1 & 2 | 1977 | USA | spacecraft | science |
| Cosmic Call 1 | 1999 | Multi-national | broadcast | science |
| Teen Age Message | 2001 | RF | broadcast | science |
| Cosmic Call 2 | 2003 | Multi-national | broadcast | science |
| A Message from Earth | 2008 | Multi-national | broadcast | popular |
| Cosmic Connection | 2006 | France | broadcast | popular |
| Hello from Earth | 2009 | Australia | broadcast | popular |
| Kepler DVD | 2009 | USA | spacecraft | science |
| Penguin Books Competition | 2010 | UK | broadcast | popular |
| The Wow! Reply | 2012 | USA | broadcast | popular |

For more than a decade now, the messaging mode as a scientific practice has been on hold. Yet various messages are being sent to outer space. The analysis was further supplemented with videos, speeches, lectures, and interviews available online from project websites and audio archives, for example SETI podcasts and the Silicon Valley Astronomy Lectures. The face-to-face interviews were supplemented with data from the interviews with SETI scientists available freely on the Internet. To keep up with the latest developments it became essential to monitor the media sites and selected websites regularly (Overview of important websites is available in Appendix 5).

## 1.11. Reading, Seeing, and Hearing the Scientific

In the above chapter I have presented a personal background of my study of the scientific search for extraterrestrial life and how it unfolded in my own space-time.

Although there is a clear and deliberate continuity in the research interest, in this doctoral dissertation I aim to provide a substantial extension on previous research and offer a novel perspective on the research topic.

In drawing on the tradition of science studies and anthropology in the realm of the scientific understanding of the extraterrestrial, I focus on the cosmology of the group (Traweek 1988) and on textual and visual epistemological strategies (Daston and Galison 2007) employed in their scientific practice. I have two reasons for doing so. First of all, the cultures of science are written; writing and publishing have a central role within the culture of science. Along with the inscribed knowledge, the cultures of science are using the visual to present themselves. The rhetoric of science is not only textual but also visual and, as will be shown later, also audio: the culture of science can be read, seen, and heard.

It has been suggested elsewhere that the visuality of science originates in the classical tradition of realism (Knowles and Sweetman 2004:5), making use of the "mimetic truth of photography" (Cosgrove 1994), and also uses images as "mechanical objectivity" (Daston and Galison 2007). The roles of imagery and photographic evidence in science as a visualisation practice and representation are key elements of scientific practices (Chen 2003), and, as Daston and Galison noted in their exploration of scientific objectivity, "making a scientific image is a part of making a scientific self" (Daston and Galison 2007). That is to say that imagery can be used as a distinctive characteristic in a study of the culture of science. Sarah Pink in "Doing Visual Ethnography" (2001) presented photography, video, and electronic media in general as "cultural texts" that can be regarded as valid ethnographic material.

Similarly, in a narrow definition of culture, a scientific culture might be defined in terms of its visual manifestation (El Guindi 2004). In understanding the science and the way it uses visualisation techniques and imagery, the tradition of scientific realism stands out (Pink 2001), where visual representations serve as a support of the project, as hard evidence: "an uncomplicated record of already existing phenomena or events" (Knowles and Sweetman 2004:5). Visual information enables the receiver to "virtually witness" the reality (Kirby 2003a) and at the same time gives the false

notion of neutrality (Wright 1998). Knowles and Sweetman (2004:5) identified three key approaches to visual images: the classical tradition of realism; the poststructuralist approach, where images help to construct reality; and semiotics or semiology. The poststructuralist approach towards images, where the images "help to construct the reality", may be especially useful in describing the use of mass media in Cold War propaganda, such as posters and postage stamps (see e.g. Figure 66). I will show various examples of images carrying not only a cultural but also a political charge.

But, in terms of research methodology, the most relevant of the three approaches to imagery is the last one: the semiotic. Using the semiotic perspective enables images to be regarded "as text which can be read to uncover their wider cultural significance and the ideological and other messages" (Knowles and Sweetman 2004:5). I am thus using the imagery in two ways: firstly to illustrate the text to provide a necessary bit of scientific realism, and secondly as ethnographic material that is to be analysed to enhance the microscopic description of "the Thing". I adopt the term "cultural text" to refer to the textual and visual as a focal point of the cultural analysis and to demonstrate the appearances of the 'Other' in both the culture of science and scientific culture.

### 1.11.a. Film and TV as Ethnographic Material

Throughout the text I refer to various visual resources including films and documentaries, mostly when addressing the sociocultural issues related to popular culture. Ash and Ash in their contribution "Film as Ethnographic Research" discussed the usability of film for ethnographic research and listed fictional films amongst four categories of films of potential interest to anthropologists (Ash and Ash 1995:351). One can argue here that while a science fiction film does not provide an account of a real-life reality, nor do the scientific documentaries about alien life. Those are hardly documentaries but rather science fictions or science visions of the anticipated future.

John H. Weakland in "Feature films as cultural products", his contribution to the edition "Principles of visual anthropology", says: "In the broadest sense, feature films are cultural documents by definition – what product of any culture is not?"

(Weakland 1995:46). This description substantiates the use of documentaries from scientific production that I recognise as a popular by-product of the culture of science. This product is processed and manufactured according to the tradition of scientific realism as described above. Here I especially address the imagining techniques and so-called artists' concepts of 'Other' worlds. But this applies also to science fiction that is distributed amongst viewers worldwide. Hence I also use the more general classification and significance of films for sociocultural anthropology that covers the use of film (documentaries, feature films) throughout both cultures:

> Rather, these films are taken as projecting IMAGES of human social behaviour, and these images are the first object of study. (...) They may reflect cultural premises and patterns of thought or feelings. They may influence the behaviour of viewers and they may throw light on actual behaviour, whether they are similar or different from it (Weakland1995:47).

To make it clear, science fiction stories (typically Hollywood productions) are not about actual behaviour but rather about imagining the behaviour or being influenced by the imagined behaviour. Science documentaries present scenarios based on rational assumptions; on something we could call an educated guess. Both however provide a narrative. In Weakland's wording, "fictional films are useful precisely because they are not factual. Instead, they tell a story; they present an interpretation of a segment of life by selection, structuring, and ordering images of behaviour" or "they are likely to project important cultural views" (Weakland 1995:60).

Because this is the study of contemporary Western society, I will focus mostly on US Hollywood productions and Russian films (from the USSR). This includes full-length films and TV episodes, most notably "Star Trek". Where applicable this will be supplemented with science fiction novels that were frequently adapted into films. This includes in particular H. G. Wells's "The War of the Worlds" (1898) and film adaptation of Carl Sagan's "Contact" (1997), where there are some analyses available from the growing field of Science Fiction Studies (SFS). The SFS literature I use here typically includes analyses of Star Trek (e.g. Tulloch and Jenkins 1995; Harrison 1996) and various science fiction genres (Malmgren 1993). I will also

include socio-cultural analyses of science fiction (e.g. King 1999, Bryld and Lykke 2000).

The emphasis I place on the visual is conditioned by the very nature of the two cultures. As my fieldwork unfolded, the image galleries and multimedia sets began to form a data resource that became equally important, because it supports the data collected through interviews and participation. Clearly, the visual is where scientific culture can be seen and recognised. Hence I used the following multimedia to locate the other life idea within popular culture as shown in Table 4.

**Table 4: Overview of Multimedia**

| Multimedia Type | Specification |
|---|---|
| Science Facts | science documentaries |
| Science Fiction | cinematographic works and novels (including a radio play) |
| Secondary Interviews | public talks & radio lectures by NASA & SETI scientists (this includes podcasts available from project websites) |
| Vox Populi | public opinion as publicised in the online community<br>• social networks (Facebook, Twitter)<br>• blogs, forums, comment sections (corporate, press, institutional websites)<br>• public polls (quantitative data) |

Alongside science documentaries and that have been selected to document the appearance of the 'Other' idea throughout popular culture, I looked into public opinion research to assess the overall perception of the 'Other' as presented in the media (List of documentaries and films available in Appendix 5). I also monitored blogs and comment sections on web pages to disclose various manifestations of the scientific culture in response to the 'Other'. Hence I looked at websites dedicated to UFO sightings and abduction stories, groups of UFO investigators, even religious movements formed around the UFO phenomenon– in the words of Battaglia, on the online "E.T. culture" (Battaglia 2006:1).

### 1.11.b. Tag It Research Method

Along with the fieldnotes I kept during the interviews and conferences, I setup a private blog named Micrograph where I stored links, images, and notes to relevant research material online. This is because the otherworldly-life idea involves many disciplines, and so I also (more or less successfully) included readings in biology, origins of life, planetary protection policies, post-detection protocols, formation of extrasolar planets, intelligent message design, detection techniques and prebiotic chemistry in the background research. Most of those readings are listed in the References. Another valuable source of data were the scientific presentations of the current search for extrasolar planets (images, artists' concepts, etc.).

Soon I established a tagging procedure I found exceptionally useful in organising the data. A 'tag' was literally a piece of paper stuck on the wall in my study. As I was collecting the data I would create a tag for each key topic, such as: SETI, astrobiology, Voyager Message. It was important to have good knowledge of basic scientific concepts, especially during the interviews, and hence my tag map was also used as a dictionary with the key concepts described and terminology explained, such as "exogeny" or "bio-signatures" or "habitable zone". The process of creating this large mind map was time consuming, and as I was proceeding with the research I would add, rearrange, or even remove tags. The image below (Figure 4) shows one of the mind maps (as of July 2011) before it was taken down, transcribed, and organised into the three modes that will be introduced in the chapters to follow.

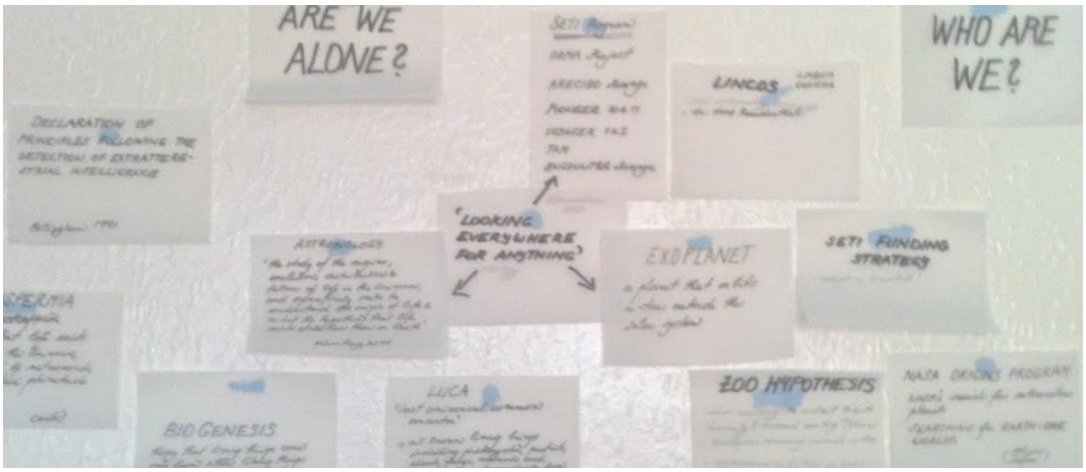


**Figure 4. Using a tag map as a research tool (2012). Image Credit: Author.**

I found the tag map particularly useful in attempting to conceive and later merge the three fields of ETI search and in being able to identify the key motives and related topics that would cluster around a key tag. Initially the mind map was organised in groups around three questions: who are we? Where do we come from? Are we alone? Not only the location but also an arrow would indicate the relation between tags, as you can see on the attached image. The tag map is a visual alternative to fieldnotes and also an initial phase of data analysis on-the-go. I worked in a similar way with the visual part of the messages (listed in Table 3) but also with audio recordings whereas available. To see and to listen to the contents enabled me to examine and cross-compare the messages, identify the common themes, but also to experience the messages as a sentient – yet unintended - receiver.

### 1.11.c. The Importance of the Internet and Social Networks

With the use of the Internet as an information source emerges the question of the Internet as a source of "scientific literacy" and a potential means of assessing the level of general knowledge; the Internet is a dispensing channel, a point of interaction, and also an emergent research tool. True, the Internet is an ultimate data source and makes it possible to reach information not otherwise available, although there is always a question over the reliability of the resources. Some of the NASA projects' documentation is available online, and as it originates from trusted domains or was recommended to me by my informants, I felt confident in including those websites in the primary dataset. The Voyager Message for example has a dedicated website and the content of the Golden Record is also available from NASA's website.

The Internet enables people to access a data source online, which presents a new way of what Margaret Mead in "Study of Culture at a Distance" (Mead and Mâetraux 1953) described as a distant study of an unreachable culture using archival data. Another suitable theoretical frame provides Faye Ginsburg in her "Fieldwork at the Movies: Anthropology and Media" (2002) describes anthropological studies of media and discusses how anthropologist approached the media as social spaces. Yet nowadays, the mass media are much more diversified and include digital media.

To use the online environment as a resource centre to "study culture at a distance" is hence only one way of using the digital media; it is a field of research itself. From the World Wide Web a new cultural form emerged: online presence. The role of the Internet as a point of interaction in particular is marked with growing popularity and the usage of social media cannot be ignored. The social-networking tool Facebook has more than 50 groups and pages related to the search for other life and space-exploration programmes, most of which I became involved with in order to receive the latest news and updates as well as to see how institutions such as NASA and especially SETI engage with Internet users using online platforms. Social networks enjoy great popularity amongst scientific institutions as they enable engagement with the public, and the role of Facebook, in particular, in relationship to development strategies has been recognised by recent media studies (Waters et al., 2009).

## 1.12. Limitations

It is clear that by focusing on global, the particular context of national traditions might have been overlooked although there are clear indications that the charming science had been contested by political and even imperialistic traits.

First mode, the messaging as a the scientific practice, has emerged in the context of Cold War as initially Soviet activity and later taken over by the Americans; to be later co-conducted by both Americans and Russians scientists before becoming essentially commercial activity. The SETI Institute – the centre of listening - is located in the United States, California. There is no other scientific research institute elsewhere in the world that could be equivalent to SETI. The two modes should be viewed as embedded within the complex network of the national government, local science policy and decision makers. In case of the third mode, exploring, the scientific effort seems to have transformed into a worldwide effort rather than being limited to a nation or country although established scientific centres such as NASA are leading the way.

As a 'culture of science', the three modes operate on principles identical to any other science and are based on the very same socio-scientific tradition. The three modes are to be seen as situated in the context of the 'big science' but at the same time

remain rather local. All of the modes are limited to the interests of a particular group of scientists and in this text interpreted within a particular historical tradition of Euro-American world and epistemology.

## 1.13. Dissertation Outline

I explore the culture of science and describe the extraterrestrial-life hypothesis that is embedded in the three scientific search modes: message sending, listening to (analysing) cosmic signals, and the search for extrasolar planets (exoplanets), conceptualised as messaging, listening, and exploring. In attempting to contribute to the growing anthropological literature related to the understanding of the culture of science (as Franklin proposed, 1995), I aim to illustrate how the other life idea is perceived by the scientific community. Exploration of the public understanding of extraterrestrial life is intended to set the scientific search into its broader social context.

The dissertation has been organised in the following way. The first two chapters give a theoretical and methodological background and introduce the research practice. The theme of the two cultures is developed in an overview of the recent history of the search for other life, which is followed by a synthesis of space exploration and a detailed description of the design and characterisation of the culture of science and scientific culture in Chapter 2. This is precisely where:

> A sense of historicity is essential for understanding the grip that science has had on the global imagination (Fuller 1997:80).

The cultural analysis of the search practices of messaging, listening, and exploring is introduced in chapters 3, 4, and 5. This is where I present the visual documentation and the other data gathered throughout the research process. The final part of the thesis deals with the 'charming science' in chapter 6 from an analytical perspective. The last chapter assesses the whole work and suggests future research. Appendices include a list of science papers published on the search for extraterrestrial life, most of which I studied as part of the fieldwork. This is where I also present the overview of online resources and important websites and social media profiles.

# Chapter 2: The Two Cultures of the 'Other' Introduced

I am arguing in this thesis that the extraterrestrial life idea is present and presented in both the cultures of science and the scientific culture and as such is embedded in the Western rational discourse and popular culture. The key note here is to address the sociocultural dimension of scientific practice as contextual and circumstantial, rather than made up of strictly causal relations. Even so, the historicity of the search practice gives a hint of complex relations that go beyond the dichotomy of science and society. Those interwoven relations are spontaneous, cultural, political, and even fictional. We see here that in the term scientific culture, the isolated terms of science and society do not exist; moreover, those are melted into one cultural entirety. I bear in mind Emily Martin's description of culture, which says that:

> Like string figures, culture is nonlinear, alternately complex and simple, convoluted and contradictory. As often as not, its processes celebrate mystery and opacity (Martin 1998:40).

In the cultural analysis of science, I proceed similarly from the particular sociocultural settings of the emergence of the other life idea, showing that the narrative of the 'Other' can be read across the cultures of science and scientific culture. The history of the 'Other' as recognised and vocalised in the specific culture of science is inevitably the history of Western rational discourse, and I regard the two cultures as having been developed simultaneously.

To borrow an expression from Greek mythology, we trace Ariadne's thread through the labyrinth of the cultural vicinities of science in order to follow the "thing" (Marcus 1995:106). In Marcus's interpretation, the "thing" can be any material object, such as a commodity, work of art, or intellectual property. One may wonder why I use the word "thing" instead of theme or "metaphor" (Marcus 1995:108) to treat and conceptualise the 'Other'. I use this term to denote the 'Other' exactly because of its 'thing-ness', which makes it an inanimate object, a thought, and an artefact. The "thing" is an elusive subject. We can encounter the 'Other' presumed as a receiver of a scientific message, exhibited in the many science fiction stories,

disguised as a UFOnaut in the abduction stories, showing off in new forms of art and overall presented as one of the icons of the Space Age.

The ‘Other’ is not only a socio-scientific product; it is a lived culture. The ’Other’ we track through different contexts guides us through the complex, variable, multinational, and fluent sociocultural landscapes of scientific culture and the culture of science. In the previous chapter I introduced the two cultures as two overlapping fields and the ‘Other’ that stands out in the overlapping margins of the two cultures as localised in the diagram (see Figure 1). From the analytical perspective, I presented the ‘Other’ as a convoluted “thing” that forms an ethnographic field and an emergent culture of the ‘Other’.

It is no surprise, then, that even for some scientists the search for other life resides beyond the standard conduct of the practice of normative science and is located somewhat outside it. This in fact defines the specific culture of science as a ‘charming science’ and identifies it within many other cultures of science. In this chapter, I present the two cultures as two parallel developments and examine the metamorphoses of the ‘Other’ into a variety of novel forms. The concepts of other life are culturally distinctive and are rooted in a particular cultural ethos. More specifically, in this chapter I explore the impact that the scientific search for other life has had on popular culture and I open this chapter with an overview of the ‘Other’.

## 2.1. The ‘Other’: A Working Hypothesis

> “Science, as a dominant factor in determining the beliefs of educated men, has existed for about 300 years; as a source of economic technique, for about 150 years.”
> (Russell 1985:11)

Paradoxically, the ‘Other’ as the subject matter of the ‘charming science’ is also the greatest problem of the discipline, exactly because the subject matter of this science is missing. The ongoing debate within the scientific community as to what

extraterrestrial life may be like also shows the same conceptual flux. I made the observation of the debate within the group of scientist who work on SETI during the meeting in London in 2010. But we must not forget that the 'Other' is not only a scientific concept. In its specific way, the 'Other' is a lived culture that is being produced in a complex arrangement of science, science fiction and popular culture. In these settings, the other life is a somewhat peculiar idea that has a life of its own. Implicitly, the 'Other' is not only imagined within the rational frame but also fantasised and talked about in the many science fiction novels, comics, and motion pictures. As Richard Doyle put it in his contribution to ET culture: "On any ordinary day – to the extent that there are such things – I see an awful lot of aliens" (Doyle 2005:200).

The tacit configurations of the 'Other' within both the culture of science and scientific culture play a key role in producing new meanings– meanings that are frequently perceived as contradictory. A typical example is the conceptual void formed between the 'UFOs' and 'ETs' that are in fact a derivate of essentially the same "thing". The research company Gallup, known for conducting public polls, explored in 2005 paranormal beliefs in the US, Canada, and the UK. What we see here is firstly that the opinion about "extraterrestrial beings" is worth exploring. The report shows that almost one quarter (21%) of respondents believed that "extraterrestrial beings have visited Earth at some time in the past" (Lyons 2005).

More importantly, in the poll question, the other life is classified as a "paranormal belief". The word 'paranormal' means both 'outside normal sensory channels' and 'not in accordance with scientific laws'. Interestingly enough, the idiosyncrasies of the 'Other' also begin to appear outside the Western scientific culture. According to the 2010 international survey conducted by global market research company Ipsos in 22 countries on behalf of Thompson Reuters, 20% of respondents were most likely to agree that "alien beings have come to earth and walk amongst us in our communities disguised as us" (Ipsos 2010).

So far I have presented a simple idea that a history of scientific progress and cultures heavily influenced by science have been running as two parallel processes concurrently since the emergence a post-enlightenment and distinctively modern

science. The practice of speculating about the possibility of other life existing also has a longstanding tradition in philosophy. When Lewis W. Beck in his presidential address to the American Philosophical Association in 1971 addressed the problem of extraterrestrial life, he said:

> Many eminent philosophers among others – Aristotle, Nicholas of Cusa, Giordano Bruno, Gassendi, Locke, Lambert, Kant, and William Whewell – have believed that there is extraterrestrial life; yet I know of only one or two living professional philosophers writing in English who have even discussed the question (Beck 1971:5).

The tradition of philosophy would appear to be all but silent on the concept of other life. Conceptually unseizable yet ever so challenging, the other life idea is yet to be discovered although it is present in the socio-scientific landscape. This chapter intends to show how many variants of the 'Other' are present in scientific culture and cultures of science and further clarify the use of the term "one thing" as a generic term that covers the plurality of cultural forms available out there.

To start with science, we can identify two outstanding concepts of the 'Other'. The first one clearly stems from a longer tradition of SETI search: an intelligent, detectable, and inherently peaceful (scientific) civilisation that initiates the contact. The second and most recent concept is that of microbiological life, which has become the subject matter of the new field of astrobiology. The following list drafts the key concepts of other life as presented and worked with in the scientific search for ETL:

- advanced life forms in advanced stage of technological development
    - advanced civilisation (SETI)
    - post biological civilisation (SETI)
    - remainders of a civilisation (SETI)
- life in pre-development or early stages of development
    - traces of microbiological life (astrobiology)
    - evidence of past microbiological life (astrobiology)

- habitable environment (earth-like), habitable environment likely to support life (SETI, astrobiology)

- unknown variable
  - unimaginable & unpredictable (within the rational frame)
  - anything beyond the above

During my fieldwork I noticed the clear conceptual distinctions in the ETL concepts in the scientific community. But in popular understanding, do people really distinguish between UFOs, aliens, and ETL? When searching Google.com one gets nearly 3 million search results for the phrase "extraterrestrial life", but the number increases up to 51 million for the phrase "UFO", and one gets nearly 40 million search results when searching for the phrase "aliens".


**Figure 5. UK Daily Telegraph on Edinburgh University's announcement of the degree-style course on the search for extraterrestrial life (2012). Image Credit: UK Daily Telegraph**

Even the SETI Institute's website has a FAQ section explaining why the SETI Institute does no UFO Research. Arguably, as we have seen in the public polls, the attitudes towards the other life oscillate around 50% while the other life definition in the survey design is not explicit at all, and the questionnaire operates with three concepts of 'extraterrestrial life', 'aliens', and 'alien beings'. The snapshot of the UK Daily Telegraph's news item (Figure 5) announcing the new online programme in the search for life in the universe offered by Edinburgh University also illustrates how popular media do not distinguish between popular and scientific concepts.[5] The

[5]Retrieved from http://www.telegraph.co.uk/education/educationnews/9406342/Top-university-offers-free-degree-style-course-on-alien-life.html. Accessed 27 January 2013.

photo montage shows a body of space alien, an image usually associated with UFO phenomenon and the popular myth of alien spaceship that crashed during the 1950s in so called Area 51 in Nevada, USA.

Not only science but also science fiction (books & films) facilitates the diffusion of Other-related ideas that are assimilated into contemporary popular culture.[6] In the overview I made (Figure 6), the popular culture narratives represent an alternative to scientific understanding of the ETL, but have embodied many variants of alien species:

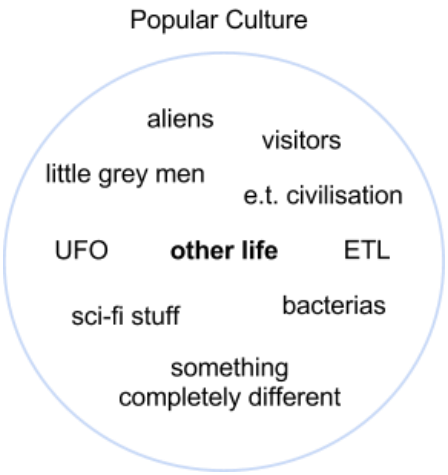


**Figure 6: The variants of alien species in popular culture (2012). Image Credit: Author.**

Exactly because paranormal beliefs are regarded as non-scientific and in popular culture refer to supernatural and unexplained mysteries to which approximately one quarter of the population is prone to believe, I keep addressing them as essentially one 'thing', one culture of the 'Other'. Contrary to my attempt to describe the variety of imagined life forms, one of my respondents said:

> On earth we observe a remarkable evolutionary convergence. So we might expect similar conditions leading to similar results. There is some uncertainty however on

[6] As an example of what is available on the Internet I will use Wikipedia's entry "Fictional Extraterrestrials" that list nearly one thousand of 'other' life forms as imagined and presented in various genres of science fiction. Available from http://en.wikipedia.org/wiki/List_of_fictional_extraterrestrials. Accessed 26 March 2013. Another Wikipedia entry presents the list of films featuring extraterrestrials. The list counts more than three hundreds art works, first of them, A Trip To The Moon, originates from 1902. Available from http://en.wikipedia.org/wiki/List_of_films_featuring_extraterrestrials. Accessed 26 March 2013. This is to show that the Others take significant place in Western narrative history and imagination of its natives.

> what "similar" means. Remarkably, all "fantasy aliens" portrayed in science fiction are based on terrestrial life forms. Our imagination is quite limited. We only see the results of the evolution of life from its beginnings until now. However, the Sun is only about halfway through its lifetime, which means that life could further evolve over a long time span, likely to create life forms that may be as incomprehensible to us as we are to amoebae (INT9E:6).

Even for some scientists the search for other life is beyond the scientific practice and disciplinary normality, outside science. The problematic nature of the 'Other' in fact enables the culture of science to be identified and defined within many cultures of science. Hence as of now I will refer to this culture of science in the singular form whenever I refer to the scientific search for other life (messaging, listening, exploring). The other life, "the thing", on the pages to follow encompasses the many concepts of the 'Other' and stands out as a philosophical speculation, herald of a scientific practice, icon of the modern Space Age, and an agent in the many works of popular art.

## 2.2. What Does Society Think?

> "Culture, science, and technology, although distinct
> on specific levels, have been and continue to be inextricably
> bound to one another in such a fashion that each actually
> merges into the other, laying lines of contact and support"
> (Aronowitz, Martinsons et al. 1996)

Before proceeding further I wish to expand on the popular understanding of the 'Other' and turn to the quantitative evidence available on the topic. Following the emergence of the ETL idea in public awareness, several surveys have been undertaken to map public opinion. In this section I present some views from public polls conducted in the UK and US, the latter being a centre of SETI activities.

The 2008 UK YouGov survey examines what people think about UFO sightings. In this survey 43% of respondents stated that they "have never seen a UFO but believe

they exist" and 9% of respondents reported that they have seen a UFO (YouGov 2008). While 36% of people said they don't believe UFOs exist, almost the same percentage of people said that both the British and US governments have information on UFOs and extraterrestrials that they are concealing. Two years later, in a survey commissioned by the Royal Society, nearly one half of respondents said that they believed extraterrestrial life exists, while 28% said they did not, and the same percentage of respondents didn't know (YouGov 2010a). Nearly one quarter of those surveyed expressed the belief that scientists should not be actively searching for and attempting to make contact with extraterrestrial life.

Another YouGov survey from the same year (YouGov 2010b) explored the key areas of social life related to scientific discoveries including global warming, public health, and religion. The survey showed that public opinion about finding evidence of life elsewhere in the universe is almost 50:50, yet 71% of respondents stated we will not make contact with alien life.[7] Judging just by the numbers available from public polls, one could assume that the idea of the existence of extraterrestrial life does not seem to be something completely absurd, at least within the above-mentioned geographical areas. Taking another angle, I now present the interview data to illustrate what scientific minds think about the aliens.

## 2.3. What Do Scientists Think?

There is no need to introduce the renowned scientist Stephen Hawking, author of the international bestseller and popular science book "A Brief History of Time" who played himself in an episode of "Star Trek: New Generation".[8] In 2010 Hawking declared publicly that humankind should not attempt to contact extraterrestrial life. According to the BBC website, Hawking said:

> "If aliens visit us, the outcome would be much as when Columbus landed in America, which didn't turn out well for the Native Americans," and further

[7]This survey also illustrates a broader secularisation tendency, with a total of 84% not believing that Jesus Christ will return to earth.

[8] Star Trek: The Next Generation. Episode: TNG 252 - Descent, Part I. Season 6 Ep. 26 Air Date: 06/21/1993. Created by Gene Roddenberry. USA: Paramount Television,

> explained that: "We only have to look at ourselves to see how intelligent life might develop into something we wouldn't want to meet."[9]

This announcement excited the interest of the scientific community and not surprisingly received great coverage on media sites. For example, the UK's Daily Telegraph informed its online readers that "Stephen Hawking has suggested that aliens almost certainly exist but has warned humanity not to try to contact them". On the US NBC News website readers could find out that: "Aliens may pose risks to Earth. Astrophysicist says extraterrestrials likely exist, but could be dangerous" while Daily Mail UK takes it a step further by saying "Stephen Hawking: Earth could be at risk of an invasion by aliens living in 'massive ships'". I detected a reaction to Hawking's statement during one of my interviews with an astrophysicist, who commented on Hawking's statement:

> I disagree with Stephen Hawking and others. That somehow by advertising our presence we make us vulnerable to a danger coming to take us over or use the resources on the Earth. I think that's highly unlikely. And I don't see how you stop it anyway because the radio waves that we send out naturally into the universe would be picked up by any intelligent life form. So they are going to know about our presence at some point if they are there (INT3:195).

There is a variety of opinions whether to attempt to contact the extraterrestrials, mostly the concern is related to the alien encounter. While some disagree with Hawking, other scientists were likely to agree with the warning. As one of my respondents put it:

> Such efforts dig into the completely unknown; we neither know the outcome nor the consequences. The driving factor is a quest for ourselves. Do we want to know? (INT9E:26).

My respondent above addressed the technological emissions that make us visible to the extraterrestrial receiver. Here I recall what was described as the "broadcasting universe" in the book "Cosmodolphins: feminist cultural studies of technology,

[9]Available from http://news.bbc.co.uk/1/hi/8642558.stm. Last accessed 14 Jan 2013.

animals, and the sacred" Mette Bryld and Nina Lykke (2000), a term I use later to describe the scientific conception of the audible cosmos. As we can see here, not only is the universe broadcasting, but the earth is emitting detectable information. That is the science fact, the technological consequence of human activities. The emitting earth, extrasolar planets, conditions of interstellar communication, and finally contact scenarios are the motives that occur in the scientific talks and writings about the search.

Hence, to further document the opinions of scientists outside SETI activities, I asked my respondents about the science of SETI but also about their personal opinions about the existence of life in the universe. Below I present some of the responses to the question of whether there is other life in the universe:

> Since we could never understand the mindset of a race of intelligent aliens when we can never be truly sure that morality plays any role in their lives and bringing malevolent creatures to Earth may be dangerous. However, practically it is improbable, since any alien that actually finds these messages (on Voyager & Pioneer) probably already knew we existed anyway as they would have to be in the vicinity of our Sun anyway (INT4E:59).

> The scientific answer to life beyond Earth is: we do not know. There is no evidence neither for its presence nor for its absence. If we are alone, however, we must be the result of a fluke. Accepting that we should not be here comes with a substantial personal discomfort. It is possible, though (INT9E:6).

> Yes. It exists in a range of forms, some (most?) of which we are simply unable to contemplate (INT8E:2).

> Yes, I think that chances are very high. But it would be crazy for me to say 75%. I just think that it's high (INT2:252).

Although some scientists are optimistic about the discovery of extraterrestrial life and some have estimated that this will occur within the next 40 years or our lifetime, not all scientists are convinced there is life beyond earth. One of my respondents said:

> I believe that we are alone. ... The search for extraterrestrial life is worth doing despite my scepticism. Why? First reason is technological. It is a tremendous input to devising systems for finding a signal in noise. Second is human enquiry – that is an anthropological phenomenon. And thirdly, even if intelligent life exists out there, I imagine that it is so different from us that communication would be fantastically difficult (INT1).

The public polls point us to the presence of the 'Other' in the popular mind. They give us a hint on how the other life idea is present and presented by my scientist informants. In the next chapter I draw from Marshall Sahlins' reflections on culture – "From what I know about culture, then, traditions are invented in the specific terms of the people who construct them" (1999:409) – and look at the invention of the traditions, the historical play of scientific culture that deals with the 'Other'.

## 2.4. The Cultures of Science as Milestones of Western World

An obvious starting point in any attempt to describe the becoming of cultures of science is the conceptual background that shapes the intellectual history of the Western world. But what I address here are not only the historical events, often described as milestones of Western civilisation, or what Margaret Jacob in her study of "Scientific culture and the making of the industrial West" described as the "intellectual foundations of science from Copernicus and Galileo to Newton" (Jacob 1997:1). I aim to provide an overview of basic historical facts and later focus on the front end of the conceptual changes. The question of life beyond earth is the cosmological question that brings us to ask: what is the place of man in the universe? The 'Other' is now present in the grand question of human existence.

Initially, rather than combining historical data with fieldwork and providing the historical ethnography or ethnography of events (e.g. Colclough 1992, Vaughan 2004), I focus on the idea of other life itself and its conceptual background. Secondly I look at science as a process, at "science in the making" (Latour 1999), especially at cosmography, cosmology, and astronomy, because those are the conditions of the emergence of the scientific search for other life. Lastly, in greater detail I review the

visualised research output of the scientific disciplines, namely astronomy and cosmology, to address the recent conceptual shifts and paradigm changes (Kuhn 1962), or more precisely science in the state of quasi-permanent change, and use science imagery to give the reader an idea of the latest concepts in cosmology.

The sense of historicity poses an important point in academic practice, and in the majority of writings it is a respected custom to look back to ancient wisdom, to antiquity. It is typically the Greek philosophical discourse that represents the cradle of intellectual thoughts of the modern West. The acknowledgement of such tradition does not only indicate the institutional affiliation to what has become a culture of science; it also portrays the cultural stereotype of recognising this tradition as a key characteristic of the intellectual discourse we are native to. The BBC documentary I introduced at the very beginning of this dissertation on an implicit level reflects upon this custom in popular culture. The narrative opens with the hardcore scientific questions, and is later followed by what Jacob has called the intellectual foundations of the new science in Europe (Jacob 1997), that is Copernican model of universe, Cartesian rationalism and the Newtonian Enlightenment.

Similarly the search of the inhabited universe is inseparably related to both the history of science and the development of Western thought, recognised above as a scientific discourse (scientific culture). Frequently noted Greek Pre-Socratic philosopher Epicurus in the Letter to Herodotus around 300 BC suggested there are multiple worlds. Drawing from the atomic theory (Solmsen 1951), Epicurus assumed that life was a logical consequence of the atomic doctrine that states there is an infinite number of atoms. Hence, Epicurus concluded that:

> Moreover, there is an infinite number of worlds, some like this world, others unlike it.

It would not be correct to assume that Epicurus did suggest the existence of extraterrestrial life as scientists think of it today. Arguably, Epicurus says there exists a plurality of other worlds and therefore potentially a plurality of life. Scientists however are likely to perceive Epicurus's science of atoms as a conceptual legacy that is important for the history of their search. The optical distortion of the past as

seen through the optics is exactly the point that refers us to the historicity of the modern scientific mind. The first instance *par excellence* is the world system. The ancient, geocentric model is based on the work of Ptolemy of Alexandria, "The Almagest", which contains the astronomical observations and theories of the Ancient worlds. The philosophy of Aristotle and the Ptolemaic model of the solar system were adopted by the Roman-Catholic church as an official doctrine and medieval cosmology.

The solid spheres were residing in the eternal quintessential arena intact until the early sixteenth century when the sun was stopped and the earth set into motion by mathematician and astronomer Nicolas Copernicus. Copernicus's heliocentric solar system (Figure 7) removed earth from the centre of the universe and claimed that earth along with other planets revolves around the sun; the heliocentric model of the solar system had been introduced.

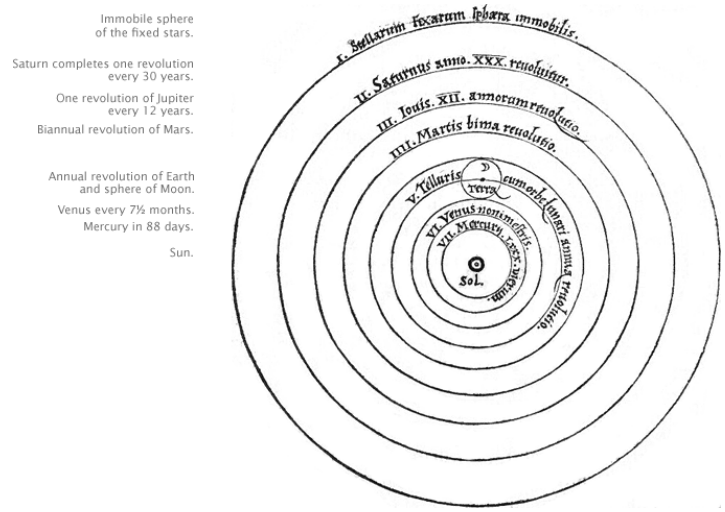


**Figure 7. The revolutionary heliocentric cosmological model by mediaeval astronomer Nicolaus Copernicus. Image adapted from Nicolaus Copernicus, 1543, De revolutionibus orbium coelestium ("On the Revolutions of the Heavenly Spheres. Courtesy: NASA Earth Observatory.**

The events that followed the early history of science describe scientific emancipation from the hierarchical world system towards the rational conception of the seventeenth century's scientific revolution. At the beginning of the era of science the geocentric concept of the universe had to be dissolved and hence man's privileged position in the universe was questioned.

The notorious case of refashioning the dominant model of the universe was described by Kuhn as the Copernican revolution (Kuhn 1957) and later theorised as a scientific revolution, involving an immense conceptual change (Kuhn 1962). From

the anthropology-of-science perspective, where the science is not only subjected to change but also regarded as a profoundly cultural practice, it is necessary to bear in mind that this ethno-astronomy is a discourse specific to a Western geographic and intellectual area, which also means specific to a local culture of science. Here I recall Constance Classen's description of the alternative approach to cosmologies in her analysis of two South American Cosmologies entitled "Creation by Sound / Creation by Light":

> Nor are cosmologies the dry constructions of moral, spatial, and temporal structures that they are often made out to be in studies written by Western academics. Cosmologies are wet and warm, fragrant and foul, full of sound, colour and feeling. The visualist abstractions which mark the conception of the universe in the modern West would in fact seem to be the exception, rather than a rule, among the diverse cosmologies of the world (Classen 1991:254).

On a similar note Harding interprets Western history as the one that has been written by the "'natives' of the enterprise they chronicle" (Harding 1991: 243). There is a set of 'big' names or lead characters that play the main roles in the story about modern science: notably Copernicus, Galileo, Kepler, Newton, Darwin, and Einstein. The continuous progress of the scientific practices is perceived as a value per se of the intellectual ergo Western ergo scientific tradition. The historical milestones along with the 'big' names described above signify the cosmological revolution that will constitute the ways future generations of scientists will be educated and think of the universe in ages to come, in the regime of the light of reason.

Such medieval imaginings of the cosmos and their later incarnations were to be transformed by the growing authority of scientific thinking into a new cosmology. This transformation is demonstrated by the two images below. The image to the left (Figure 8) is said to be the most accurate cosmological simulation available to date showing how galaxies are distributed within the sphere of the universe, in order to offer an accurate sample of the observable universe.[10]

[10]Retrieved from http://www.nas.nasa.gov/SC11/demos/demo33.html. Accessed 17 September 2012.

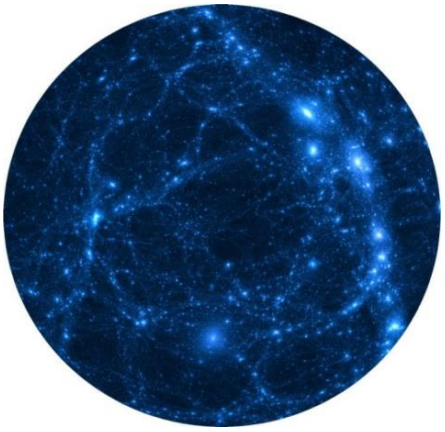

**Figure 8. Simulation of distribution of galaxies in the universe (2011). Image Credit: Stefan Gottloeber, Leibniz-Institute for Astrophysics Potsdam; Chris Henze,**

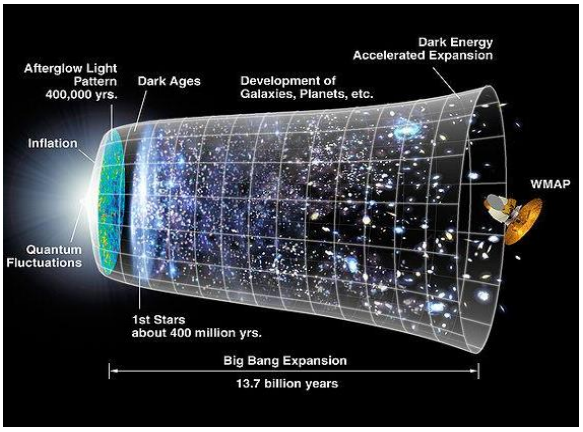


**Figure 9. The 13.7 billion years long timeline of the universe based on the Big Bang theory (2012). Image Credit: NASA/WMAP Science Team**

Another exemplary cosmological map is given in the image to the right (Figure 9), which presents the cosmic evolution of the universe on a timeline of nearly 14 billion years.[11] Both images are based on imagining the cosmos as seen from the superficial void, from the 'outside'. We can look at the image in two ways. We can view it firstly as another example of the scientific obsession with visualisation (Daston and Galison 2007), or as an image that presents what Chen would describe as a new scientific frontier (Chen 2003).

Alongside illustrating the conceptual leap that resulted in the contemporary understandings of outer space that may fill the astronomy textbooks in the very near future, I have used the large-scale cosmological images to draw our attention to another outstanding feature of those models and astronomy and that is the significance of light. American astronomer Edwin C. Krupp in his book "Beyond the Blue Horizon: Myths and Legends of the Sun, Moon, Stars, and Planets" discusses light and dark as a manifestation of our binary understanding of the world (1992:40). Krupp addressed the symbolic fight between night and day as the re-establishment of cosmic order, referring to the work of Peter Roe and Mircea Eliade (Krupp 1992:37). Especially interesting is Krupp's notion of the first biblical light. The opening verses of Genesis, the first book of the Bible, describe the creation of the world:

[11]Image credits: NASA. Image retrieved from http://map.gsfc.nasa.gov/media/060915/index.html Accessed 27 August 2012.

> In the beginning God created the heavens and the earth.
> And the earth was waste and void; and darkness was on the face of the deep: and the Spirit of God moved upon the face of the waters.
> And God said, Let there be light; and there was light.
> And God saw the light, that it was good; and God divided the light from the darkness.

Light played a central role in the Allegory of the Cave, introduced in a Socratic dialogue "Republic" by Plato.[12] Here the philosopher leaves the dark cave of ignorance to look into the light outside and to see the true nature of things while others only observe the shadows cast by the fire inside. The light carries hidden meaning and myth par excellence as it moves at maximum speed and makes our worlds visible. The rational– reason, reasoning – is tied in with the notion of light, enlightenment and therefore, inevitably, seeing.

Both visual concepts of the whole cosmos have again this outstanding feature: the motive of light. Certainly, what we see of the universe is the light. Our cosmos is light, not the primordial divine light but electromagnetic radio, illuminatus ("enlightening" us). But here, the structure of the cosmos is enlightened. If we reproduce Krupp's linguistic experiment with the phrase 'up' and review the usage of the word 'light', the simple etymological and phraseological experiment leads us to regard light in various contexts, such as:

- the light of reason
- light at the end of the tunnel
- Enlightenment or Age of Reason
- see the light (of day) (to come into being)
- see the light (to gain sudden insight into or understanding of something)
- shed (or throw) light on to clarify or supply additional information on

Motives of light seem to play a central role within scientific practice and science stories. The light is temporal as it measures distances, and since Albert Einstein, the speed of light is a universal physical constant (and maximum velocity). Light limits

[12]The Republic by Plato. Translated by Benjamin Jowett. The Project Gutenberg EBook of The Republic, by Plato. Release Date: August 27, 2008 [EBook #1497].

our outlook to the observable universe – that is, what we can 'see' of it. Science operates with visual models and visualisation techniques (Pink 2001; Chen 2003; Daston and Galison 2007). Space sciences (astrophysics and cosmology) also provide cosmogony, which is by definition the origin and evolution of the cosmos, and current research focuses e.g. on drawing a planetary map of "our galactic region" (INT4E:100). This of course has implications for terrestrial affairs.

Astronomer, science populariser, and highly visible public figure in his time, Carl Sagan described the place of human life in the cosmos as follows: "We find that we live on an insignificant planet of a humdrum star lost in a galaxy tucked away in some forgotten corner of a universe in which there are far more galaxies than people" (Sagan 1985:193). Sagan's expressions "insignificant planet" and "some forgotten corner of a universe" underline what Bernard Russell had already described in the 1920s as one of the effects of science: the dethronement of 'purpose'. In Russell's wording:

> Life is a brief, small, and transitory phenomenon in an obscure corner, not at all the sort of thing that one would make a fuss about if one were not personally concerned (Russell 1985:25).

Russell described the ability of science to affect or to alter the world-view as follows: "Science used to be valued as a means of getting to know the world; now, owing to the triumph of technique, it is conceived as showing how to change the world" (Russell 1985:91). In the changed world, science has "degraded [man] from the standpoint of contemplation, and exalted him from that of action" (Russell 1985:23). The following image (Figure 10) provides a visual commentary on Russell's brilliant expression of the "obscure corner" using an astronomical photograph of a galaxy (supposedly our Galaxy, yet this is most likely M31 in Andromeda) to localise human life within the new eccentric enlightened universe.

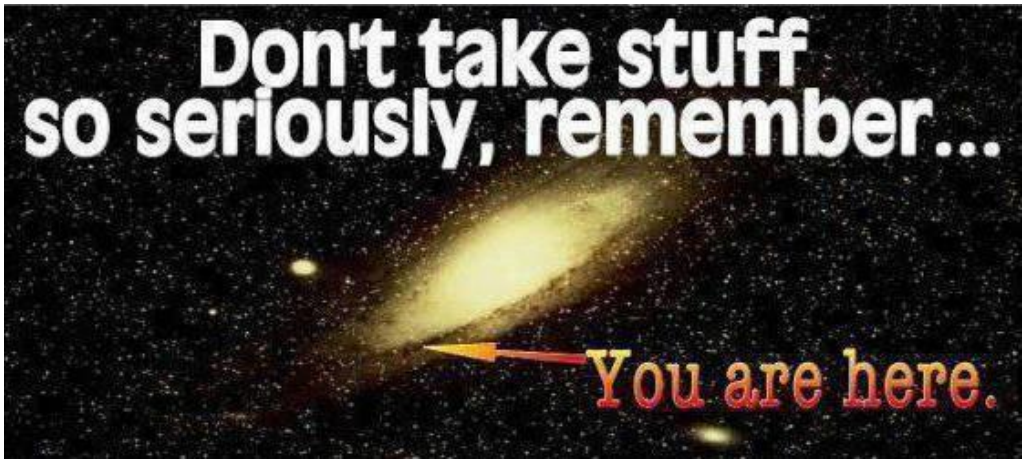


**Figure 10. Humorous Facebook post "Don't take stuff so seriously" (2012).**
**Image Credit: Facebook / George Takei.**

The humorous message "Don't take stuff so seriously, remember …You are here" was published on the Facebook page of George Takei, the "Star Trek" star, and tens of thousands of people clicked on the 'Like' button in their Facebook profiles.[13] What is presented here is in fact the transformed people's view of the world as a consequence of a decentralised vision of humanity, seemingly relocated to an outpost of a galaxy that is merely one of the millions that now populate the cosmos. Science can also be seen as a revolutionary force and alter human's vision of the cosmos. This transforming power of science was recognised by the philosopher Bertrand Russell who described the "new philosophy (is growing up), involving a changed conception of man's place in the universe" (1985:11).

What we are seeing here is a cosmological revolution-in-the-making. The key feature of this current cosmological revolution is firstly its continuance and fluency in the popularisation of science (mass media). In 1969 man stepped on the moon, and earth was seen from outside, for the first time, but exactly as envisioned by Johannes Kepler. Our cosmos would appear to exist in the state of a working draft that is updated according to the latest discoveries of science, such as the detection of extrasolar solar systems. We see here that the scientific field is the site of "permanent revolution", as Pierre Bourdieu calls the new scientific field, and is being established by the "state of relations of power among the protagonists in the

[13]George Takei's Official Facebook Page, Wall Photos. Image retrieved from http://www.facebook.com/photo.php?fbid=508751402487651&set=a.223098324386295.105971.205344452828349&type=1&theater. Accessed 16 August 2012.

struggle" (Bourdieu 1991:3). Bourdieu's socio-political interpretation is useful in exploring the causal connections in the relation between science and the public or popular culture. Also embedded into the grand draft is the idea of extraterrestrial life, the existence of which is formulated as a yes/no question. Science generates a worldview and a cosmology, and by doing so shifts the way people relate to the cosmos. Harding described science as follows: "It is an 'origins story', a fundamental part of the way certain groups in the modern West identify themselves and distinguish themselves from others. It is metaphysics, an epistemology and an ethics" (1991:87).

## 2.5. Imagining the 'Other' (Science Fiction Enters the Scene)

> "Individual science fiction stories may seem as trivial as ever
> to the blinder critics and philosophers of today – but the core
> of science fiction, its essence has become crucial
> to our salvation if we are to be saved at all."
> Isaac Asimov

The reason I start the history of the scientific imaginings of other life with the history of science fiction text is the imaginative invention of the genre itself: part science, part fiction. Johannes Kepler is known for describing the motion of objects within the heliocentric system; his calculations of celestial motions and the laws of planetary motion helped to overcome an earlier geocentric theory which was later to be replaced definitively with a heliocentric one. A few years after his death, in 1630, his scientific fantasy known as "The Dream", in the original Latin "Somnivm, seu Opus Posthumanum de Astronomia Lunari", was published; this has frequently been referred to as the first work of science fiction and has attracted the attention of many researchers (Menzel 1975; Evans 1999). Kepler describes astronomical phenomena as seen from the outside, such as the motion of earth as seen from the moon's surface. NASA's famous photo of earth as seen from the moon's surface was actually a tribute to Kepler. We must not confuse scientific fantasy, or more precisely scientific fiction, with contemporary science fiction and its many forms,

but to address the correlation between a literary fantasy and an imagined scientific concept is extremely useful.

The first example I use is the most obvious one. In 1898, H.G. Wells – whose work has been described as a turning point in the science fiction tradition (Suvin 1982) – published his famous book "The War of the Worlds", which went on to become a signature science fiction novel. Only one year later, in 1899, Nikola Tesla, known as the father of wireless transmission, was up late in his laboratory in Colorado Springs when he detected a suspicious sound. Tesla described his sensations as follows:

> My first observations positively terrified me, as there was present in them something mysterious, not to say supernatural, and I was alone in my laboratory at night (Tesla 1901).

Tesla believed the signal originated from Mars and that in fact he had detected a message from the inhabitants of Mars. Mars got a lot of attention from former generations of scientists, being a logical first-hand target along with the moon and Venus. The famous astronomer Percival Lowell, during his observations of Mars's surface, described the canals and concluded that the Martian canals are of an artificial origin (Lowell 1903; Lowell 1909). Shortly after that, in 1913, Edmund Ferrier in the North American Review summarised contemporary discoveries and discussed the evidence from Percival Lowell's observations of Mars's surface, asking the following question:

> Does all this mean that there are no inhabitants in the planet Mars? No. Mars is certainly inhabited. The collapse of the fairy world constructed by bold imaginations on the base of the canals of Schiaparelli disposes only of the wonderful engineers of whom Mr. H. G. Wells has given us, in his War of the Worlds, such a fantastic and captivating description (Ferrier 1913:108).

Supporting the role of science in shaping the concept of the inhabited universe will show that the culturally specific, e.g. the scientific understanding of extraterrestrial life, soon crossed its original boundaries and entered various domains of public culture. Sci-fi films of the past thirty years or so in particular present various forms,

shapes and types of extraterrestrials. Since the invention of cinematography, more than 300 movies presenting a non-human life form have been produced, including more adaptations of "The War of the Worlds". The film of that title from 1953 directed by Byron Haskins was released in the US and ten European countries between 1953 and 1955 (IMDb 2012a). Steven Spielberg's "War of the Worlds" was distributed to 67 countries worldwide in 2005, showing on more than 4,000 screens in the US and UK alone (IMDb 2012b). Reaching a global audience, the fictional invasion of a superior alien race became a popular part of the modern narrative history of scientifically minded Westerners – and transmitted around the globe.

Martians became even more popular in 1939 when Orson Welles adapted "The War of the Worlds" for a radio broadcast. The on-air dramatisation of alien attack caused a nationwide panic amongst at least one million of its listeners in the US (Cantril, Koch et al. 1966) and clearly demonstrated the "power of a narrative" (Berger 1997:138) as well as the compelling power of mass media. Moreover, it provided a blueprint for a detection scenario that has shaped mainstream contemporary expectations of the societal response to the discovery of ETL: contact with an alien race will be a distressing event with global impact. The alien superiority is clear from the first lines of H.G. Wells's book:

> And we men, the creatures who inhabit this earth, must be to them at least as alien and lowly as are the monkeys and lemurs to us (Wells 1898).

This is the authoritative view taken as definitive, the first stereotypic representation of a superior 'Other', an archetype that will be reproduced in scientific culture and visible it its many cultural texts, such as novels and films. Carl Malmgren in his SFS paper "Self and Other in SF: Alien Encounters" (1993) described how the speculative first contact is presented in science fiction stories. Here is where the cultural universe is formed around the extraterrestrial affairs that capture and provoke earthlings' imagination. The close encounters with other life take place in the world of fantasy. Notably in filmography of Steven Spielberg we find references to alien life, UFOs and abductions. The first humanoids to leave the alien spaceship after successful contact in his "Close Encounters of the Third Kind" (USA 1977) were the abducted pilots. American sociologist Irving Lewis Allen in "Talking

About Media Experiences: Everyday Life as Popular Culture" addressed the role of mass media content and its role in face-to-face interaction and everyday conversation. Allen described the role of the film as "Close Encounters tried, at least, to give us an ascending trichotomy to classify fantasies of contact with extraterrestrial life." (Allen 1982:109) And so did, one may argue, also Spielberg's "E.T. the Extra-Terrestrial" a film that presents a story of a little boy and a stranded, friendly 'E.T.' who wants to go home (USA 1982). Janice Rushing in her "ET as rhetorical transcendence" addressed the role of space science fiction in cosmological matters and argues that E.T.'s story is "one example of rhetorical message" (1985:42) and concludes that "E.T. is a significant experiment in the rhetoric of mythic transcendence" (1985:44).

Also UFO sightings and abduction stories developed into folk mythology and are reflected in classic cinematography. The nine seasons of the TV series The X Files from 1993, narrating the story of an FBI agent who investigates paranormal activities and seeks "the truth out there" were followed by a film The X Files (1998) where "Mulder and Scully must fight the government in a conspiracy and find the truth about an alien colonization of Earth" (IMDB 2012c).

The diverse, sometimes even contradictory elements of an imagined 'Other' are narrated in Western stories; and the role science fiction may play has been recognised by anthropologists. In 1994 Arturo Escobar, along with Haraway, proposed that we pay attention to science fiction:

> New science-fiction landscapes are populated with cyborgs of all kinds (human beings and other organisms with innumerable prostheses and technological interfaces) moving in vast cyberspaces, virtual realities, and computer mediated environments. But while science-fiction writers and technology builders are generally uncritical of these trends, it remains to be seen to what extent and in what concrete ways the transformations envisioned by them are in the process of becoming real. This is another task for the anthropology of cyberculture (Escobar, Hess et al. 1994, 213/214).

Although the cyborg explication is an important facet of the genre, for us it is not only cyborgs that populate science fiction stories but also space aliens. Of course, Haraway has argued that "the boundary between science fiction and social reality is an optical illusion" (1991:117), but such correlation is not the real subject here. First of all we look at the formation of science fiction as a literary genre and the impact that such narratives have on their audiences. Science Fiction Studies (SFS) introduces a critique of science fiction as a literary genre. Jules Verne, the "inventor of science fiction" as described by Costello (1978), inspired generations of scientists. Science fiction is imagining the potential – science then is making the potential possible. One of my respondents commented:

> Yes it does (bring new ideas into science). It inspires at the very least. And it inspired us to search. Whether it brings useful scientific methods or new insights, I'm less optimistic about. But it certainly inspired scientists in their imagination to search and think that there is a possibility that there is life out there (INT3:65).

Certainly, not every science fiction features extraterrestrials. Yet the most recognised one is the meta-narrative of the invading Martians by H. G. Wells. Steven J. Dick, the former director of the NASA History Office (1998), mentioned another two "inventors of extraterrestrials": the French science fiction author Jules Verne and the German philosopher Kurd Lasswitz. But for the mass production and distribution of somewhat standardised 'Otherness' as present in current popular culture I name two exemplary phenomena: TV show Star Trek and UFO stories.

### 2.5.a. Star Trek

> "Space ... the Final Frontier. These are the voyages of the Starship Enterprise. Its 5-year mission: to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no one has gone before."
>
> Star Trek [opening narration] (IMDB 2012d)

As a science fiction and a cultural formation, "Star Trek" (henceforth referred to as Star Trek) is too important to be ignored. This has been recognised by social scientists who have studied Star Trek from various perspectives, firstly approaching Star Trek critically as a cultural phenomenon (Harrison 1996) and introducing its

audiences (Tulloch and Jenkins 1995), and later studying Star Trek as religion and American culture (Porter and McLaren 1999) and examining science fiction as transcendence (Cowan 2010).

A popular American TV show, Star Trek has developed into a subculture of its own with an extensive global fan culture.[14] Star Trek provides a mass-mediated vision of the future of humankind, the peaceful explorers of a (more or less) united galactic civilisation. The current channels of cultural diffusion are multiple: television, cinema, and recently DVD production and video-sharing websites such as YouTube, and regular Star Trek conventions. Star Trek also produced many artificial languages to characterise fictional alien races, most notably the language of warrior Klingon race that made it to language classrooms.[15]

Star Trek was initially a TV show. The role of television as a social space where new narratives are being produced and distributed already evokes interest in approaching television as an ethnographic genre. Abu-Lughod in her study "The interpretation of cultures after television" argues that "Geertz's call for thick description as a method of ethnography is still compelling. But it needs some creative stretching to fit mass-mediated lives" (1997:110). Abu-Lughod concluded that television "renders more and more problematic a concept of cultures as localised communities of people suspended in shared webs of meanings" (Abu-Lughod 1997:123).

The Star Trek stars William Shatner, who played Captain Kirk of the Enterprise, and Wil Wheaton, another Star Trek Next Generation star, narrate the new NASA Mars Curiosity Rover video and similarly other programmes about space exploration, e.g. a NASA documentary about the new generation of space rockets such as The Space Shuttle Endeavour.[16] During one of the Star Trek conventions Shatner commented on NASA strategy back then:

[14] On 8 September 2012 the Google logo, known as the Google Doodle, celebrated the 46th anniversary of Star Trek (google.ru).
[15]The Klingon Language institute offers Klingon language courses. Website: http://www.kli.org/. Accessed 16 September 2012.
[16]NASA News, available from http://www.nasa.gov/home/hqnews/2012/jul/HQ_12-258_Shatner_and_Wheaton_Curiosity_Video.html. Accessed 27 August 2012. Information about other programs from NASA Multimedia, available from http://www.nasa.gov/multimedia/videogallery/index.html?media_id=79936041. Accessed 27 August 2012.

> In the days when we were doing the show, NASA would be sending up the rockets trying to get to the moon, and our ratings (Star Trek show) would go up. And as our ratings would go up, more money was appropriated to NASA because of the popularity of our show. And so, from time to time, one of us would be invited to rocket lift off. And it was extraordinary and I was invited to see the LEM, the Lunar Module, and in fact I got into the Lunar Module (6:45).

Carl Sagan's son, Nick Sagan, a professional writer, is credited with writing two Star Trek episodes and story edited another five.[17] According to the website, "At age six, Nick Sagan's greeting, 'Hello from the children of planet Earth,' was recorded and placed aboard the Voyager Interstellar Record as a representation of the English language."

### 2.5.b. Identifying the Unidentified Objects

The term UFO stands for Unidentified Flying Object, and it is mostly used as a synonym for flying saucers. A flying saucer is an alien spaceship piloted by "UFOnauts" or "little green men" as described by Sanarov (Sanarov 1981:63). The way the topic is currently approached by social scientists, typically psychologists and anthropologists, would suggest we treat UFOs as a separate sociocultural phenomenon.

The tradition of studying the UFO sightings as myths was established by Carl G. Jung in 1959, in "Flying Saucers: A Modern Myth of Things Seen in the Skies". One of my respondents responded to my question about UFO abduction and its relation to projecting fear of technology:

> Yes, exactly. I think alien abductions is about that and it is also about linking it to this sense of vulnerability of human beings. Not just in the face of technology but in the face of non-human forces. So I think there are similarities with stories of angels and daemons which are also about humans being vulnerable in the face of non-human powers. (...) What's interesting about alien abduction is how the personal story overwrites the rational mind. What I mean by that is if you read some of the surveys which say "Three million Americans believe that they have been abducted

[17]Information available from the Sagan Portal at http://www.carlsagan.com/. Accessed 28 August 2012.

> by aliens", you then have to say to yourself: why would aliens want to abduct three million Americans? But no one ever seems to ask that question because your personal story of being abducted by an alien means that you don't think about the bigger question (INT3:150).[18]

UFO sightings however present a great and most visible part of the other life idea as such, and as we could see in public polls are sometimes inseparable from and confused with other life concepts. I had this idea during the fieldwork; I was jokingly labelled as the "one who studies the aliens" or the one who is "talking to ET". The response to my research topic made me rethink the concepts of the other life and more importantly to regard the popular understanding as biased by and opposed to scientific concepts. The reaction of the scientific community towards unidentified flying objects was recorded by Hynek, who is known to have classified the close encounters into three kinds in 1974:

> During an evening reception of several hundred astronomers at Victoria, British Columbia, in the summer of 1968, word spread that just outside the hall strangely manoeuvring lights –UFOs –had been spotted. The news was met by casual banter and the giggling sound that often accompanies an embarrassing situation. Not one astronomer ventured outside in the summer night to see for himself.
>
> The scientific world has surely not been eager to find out about the UFO phenomenon and has expressed no inclination to astonishment. The almost universal attitude of scientists has been militantly negative. Indeed, it would seem that the reaction has been grossly out of proportion to the stimulus. The emotionally loaded, highly exaggerated reaction that has generally been exhibited by scientists to the mention of UFOs might be of considerable interest to psychologists (Hynek 1972:21).

The reason why I chose to introduce the Star Trek and UFO themes is their regular occurrence in my interviews. UFOs stand out as the archetypal pseudo-scientific phenomenon. Scientists usually delimit the scope of the scientific search for extraterrestrial life, within which the UFO does not belong. Both Star Trek and

[18]I asked about "The UFO abductions are often described as a violent process; it's an act of violence and may be a fear of technology projected?"

UFOs have strong presence in popular culture. Both Star Trek and UFOs are typically American and dispersed (telecommunicated) throughout the world. Star Trek is a mass distributed science fiction about human outreach towards the stars while the UFO narratives feature the alien visitors coming to earth.

## 2.6. Joking about the ETs – Witty Narratives

Arthur A. Berger in the book "Narratives in Popular Culture, Media, and Everyday Life", which I use as a theoretical frame for narrative, defines a joke as "a short fictional narrative, meant to amuse others that ends with a punch line" (1997:163)– again, joke here is regarded as a cultural text that can be analysed. But another way of understanding the role of a joke is to look at its cultural meaning and societal role.

Chad Bryan, in the Journal of Contemporary History, in a study of Czech jokes told during the Nazi Occupation, describes joke-telling as a sign of resistance and opposition to the regime whereby "jokes deflected Nazi propaganda" (2006:145) but also "united the Czech nation through language and humour …" (2006:150). Cultural historian Robert Darnton in his contribution "Workers Revolt" (Darnton in Daerji and Schudson 1991), by addressing the inability to "get a joke", shows that the receiver of a joke needs to be a native to the culture that produced the joke:

> When you realize that you are not getting something – a joke, a proverb, a ceremony – that is particularly meaningful to the natives, you can see where to grasp a foreign system of meaning in order to unravel it (Darnton 1991:99).

Just as prominent anthropologist Mary Douglas said that a joke "cannot be perceived unless it corresponds to the form of social experience" (Douglas 1975:100), Darnton argues that jokes are culturally specific. A joke is a narrative that is set in context, that "sets the action in the frame of reference" (Darnton 1991:99). Whatever we choose to call it, the joke– the laughter, the making of a joke – addresses a topic present in the culture. There might be another dimension to it regarding various cultural levels of meanings a joke may have.

Douglas says that "In classing the joke as a symbol of social, physical, and mental experience, we are already treating it as a rite" (Douglas 1975:101), although she later concludes that a joke is an anti-rite because the "rite imposes order and harmony while the joke disorganises" (Douglas 1975:201).

To illustrate this point I reproduce some recent versions of the engravings on the protective cover of Golden Record. The picture on the left (Figure 11) shows an edition of "Nature" with the image of the protective cover of the Voyager message accompanied by the text: "Dear ET ..."The parody on the right (Figure 12), named "Vöyagaar", was created more than three decades after the message was sent.[19] The message is clear – if the receiver does not understand the original set of instructions on how to play the record, he is encouraged to call NASA to get technical support.


**Figure 11. The cover image of Nature shows NASA's Golden Record. Image Credit: Nature**

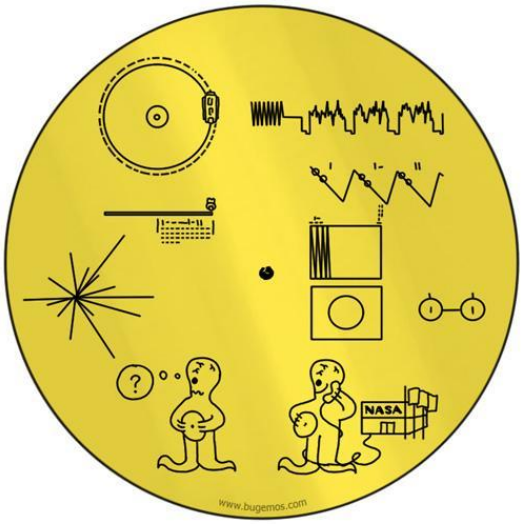


**Figure 12. The image that imitates and rephrases the inscriptions of Voyager's Golden Record (2012). Image Credit: Bugemos.com.**

Give aliens a chance? In the cartoon below (Figure 13), terrestrial problems are transposed into an alien world using some familiar rhetoric. The group of demonstrating aliens provides a social critique of terrestrial conditions:

[19]Image Vöyagaar retrieved from the Bugemos website: http://en.bugemos.com/?q=node/28. Accessed 29 August 2012.

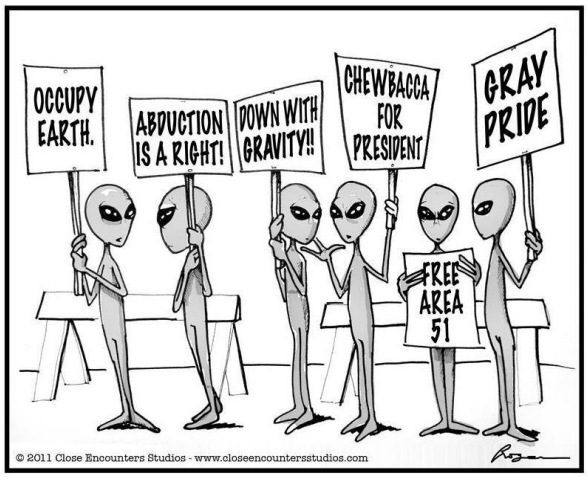


**Figure 13. The cartoon of demonstrating aliens by Close Encounters Studios. Image Credit: CES 2011.**

The following example takes a rather different tack. The so-called "Alien on CCTV Experiment" video presented an "eight-foot-tall alien" walking near a roundabout in Bournemouth in 1996. The music producer James Sanger explains the rationale of the project:

> In 1985 Bournemouth became Britain's first town watched by Closed Circuit TV cameras. By 1996 residents were fed up with "Big Brother". Addressing another social problem, the CCTV in the town was overcctvised. I hope to make them believe there is an eight foot alien walking down the road ...and that they gonna have to check it out.

Police were sent to the area by the CCTV controller and arrived on the scene within minutes, proving the efficiency of the CCTV. The screenshot below (Figure 14) shows the site of the contact, with the policemen and disguised alien on the left.[20]

**Figure 14. Alien captured on CCTV in Bournemouth (1996, screenshot of the video). Image Credit: Undercurrents**

[20]Credits: Undercurrents. Video available from http://www.youtube.com/watch?v=u-ZDgVrP55g. Last accessed 20 March 2013.

Is alien life really completely alien to us? Would the police in Bournemouth have gone to check on a walking alien in only two cars back in the 1960s, or would the army have been involved, as we are presented with in the majority of Hollywood films? Even in the science fiction genre we encounter parodies, such as in the Star Trek parody "Galaxy Quest" (USA 1999), in which the representatives of an alien race visiting earth are initially ignored because, in their human-like forms, they look too like the other fans of the defunct "Galaxy Quest" television series. Another life form is, sadly, eaten by a dog in "Hitchhikers Guide to the Galaxy" (2005) because it is too small to be seen by humans.

Oscar Wilde once said that "worse than being talked about is not being talked about". Where the SETI search is concerned we may paraphrase this statement and say that worse than being laughed about is not being laughed about. The mysterious, unanswered question of whether we are alone in the universe draws attention of general public, generates media exposure and 'talkability', because once you are talked about it increases visibility in the public domain.[21]

## 2.7. Introducing the Three Modes of Charming Science

> "This dialectic of similarity and difference, of convergence of contents and divergence of schemes, is a normal mode of cultural production. It is not unique to the contemporary globalizing world."
>
> Marshall Sahlins (1999:411)

I choose to start with the culture of science, with the three modes that each present the methodological strategy for comprehending the ETL search. Messaging, listening, and exploring are idioms of legitimate scientific procedure that encompass

[21] Exemplary media sensation I collected during fieldwork was the story reported by a global online tech publication, The Register.co.uk, the article informing that "Bird rescuers find alien in duck. Then sell it on eBay, naturally". According to the news, a duck was "brought to the International Bird Rescue Research Center (IBRRC), with what appeared to be a broken wing ... Marie Travers, assistant manager of the center, radiographed the mallard and was immediately shocked by what was revealed on the x-ray. A very clear image of what appeared to be the face, or head, of an extraterrestrial alien was in the bird's stomach." What looked like a heaof extraterrestrial alien turned out to be an optic illusion caused by "grains of food in the duck's digestive system". Retrieved from http://www.theregister.co.uk/2006/06/01/alien_duck/print.html. Accessed 31 March 2013.

the fashion and design of the ETL search. The ethnographic material from both the primary and the secondary resources I use to illustrate the three modes has been organised into five distinct premises:

a. the terms messaging, listening, and exploring reflect upon the historical and conceptual development of the scientific understanding of the life-in-the-universe idea;
b. the scientific search for life in the universe also encompasses and vocalises the understanding of terrestrial life;
c. the imagining of extraterrestrials is derived from imagining the terrestrials and both depend on the current stage of science;
d. scientific methods and detection strategies refer to the conceptual background of such a search; and
e. the scientific search for life in the universe influences the public understanding of the idea and produces and formulates a new worldview.

It is clear now that the three modes are characteristic manifestations of the scientific search for extraterrestrial life. The first one, 'messaging', refers to message-sending activity. Messaging is understood as a point of departure for the development of the scientific search for extraterrestrial life. There are several messaging types which have emerged from the various countries that have sent messages to selected targets in the universe over the past 50 years. I will examine not only the messages as narratives but also the narrative components and the meanings of those messages– that is, creating, sending, and processing a message – and celestial messengers as media that carry the messages, e.g. probes and spacecrafts. The 'material interstellar message' is a physical message attached to a spacecraft as a plaque, plate, or record. The second form is known as a 'radio interstellar message', which is a message in the form of a signal transmitted by a radio telescope to space. Signal transmission is often referred to as the more 'efficient' one, as the signal travels at the speed of light, which is the maximum known velocity. The key symbol is the Golden Record or the engraving of the Greeting Couple.

The second mode, 'listening', is mainly related to the activities of the SETI Institute. In short, listening to the voices of the sky consists of signal detection and subsequent

analysis in search of an artificial source of that signal, which would be proof of an advanced extraterrestrial intelligence with present or past communicative capability and technological advancement. The listening mode involves literally paying close attention to sounds originating from the universe, listening as an act of hearing attentively in an attempt to recognise an extraterrestrial voice. The listening is mediated by radio telescopes, the big ears. The listening method embodies the activities of the SETI Institute (Search for Extraterrestrial Life): the conduct of scientific research on life in the universe using radio telescopic (audio) data. The emergence of the SETI programme signifies a shift from active messaging to signal recording and analysis in search of a pattern that would prove the artificial source of the signal. This part of SETI activities is the SETI@home programme, known as the distributed computing effort that engages over 3 million users. The key symbol of this mode would be the Arecibo Radio telescope.

The third and final mode, called 'exploring', revolves around the search for planets beyond our solar system– that is, extrasolar planets– but also includes the search for traces of life on planets of our solar system, especially on Mars. It can be stated beforehand that the exploring mode operates with a distinctively different concept of extraterrestrial life, as exploring is not about making contact but about detection of a suitable planet. Given the recent successes in the field, the exploring mode also qualifies as a primary scientific mode of the search for other life in our era. By exploring I refer to contemporary projects in space studies, e.g. planetary science, astrophysics, and astrobiology (exobiology). The field of the search for extrasolar planets evolves rapidly and globally engages a number of research institutes (e.g. the NASA Origins Program). The exploring method operates on the basis of the hypotheses of an extraterrestrial origin of life (the idea of exogenesis), cosmic biological evolution, and the concept of Rare Earth. The key symbol of this mode would be either the artist's impression of a planet discovered in another planetary system or the Kepler Telescope as an instrument used to detect those systems.

An illustration by Ian Harlow Williams, published online on the Science Notes blog (Figure 15), depicts the three modes that will be dealt with in the following chapters

on a descriptive and analytical level.[22] From right to left, the image presents three symbols of the science in search of the other life: the greeting couple of the Pioneer Plaque, the radio telescope pointed towards the stars, and the telescope detecting distant solar systems, in this work recognised as messaging, listening, and exploring respectively.


**Figure 15. An illustration from Science Notes 2006 blog. Image Credit: Ian Harlow Williams**

## 2.8. Search for Extraterrestrial Life – as a Science and a Culture

Most of what I have said already suggests that the three modes will be introduced as fields of scientific efforts, and, taken together, the three modes are embodied in the scientific search. I will present the three modes in more detail in the following three chapters, and offer an interpretation of their linear development as it proceeded over the course of time. Yet, the difference between the three modes is not only phraseological. Each mode is specific in terms of its 'method' and also broader sociocultural context, which I will address in each chapter. Although one may argue that the exploring mode as the "most scientific" one would have a privileged position, I believe it is exactly the degree of credibility and science involved that makes the 'charming science' so attractive for anthropological analysis. Although I split the ETL search into the triads of three different strategies, three different modes, three different concepts of other life, and three generations of scientists, I

[22]Student of University of California, Santa Cruz. Illustration appeared on a Science Notes 2006 blog, entitled: Where Is Everybody? by Erik Vance. Available from http://sciencenotes.ucsc.edu/0601/seti/index.html. Accessed 19 September 2012.

keep in mind that behind different facets of scientific search for the 'Other' (Figure 16) and that there is only one big question nevertheless: who are we?

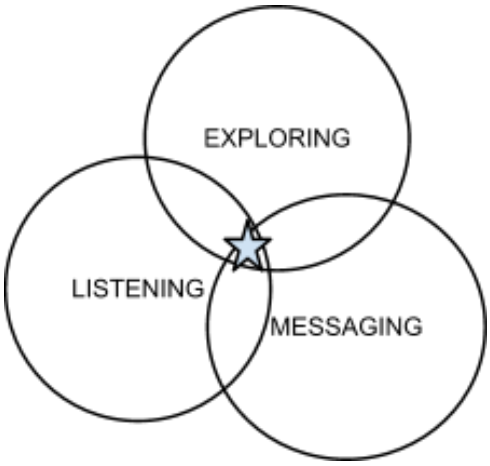


**Figure 16. The three modes of search for the 'Other' (2011). Image Credit: Author.**

Despite the variety in the actual concept of other life and the differences in search strategies and tools used in the search, and despite my tendency to present the search as gradually evolving practice, in fact the three modes have been coexisting and developed in parallel to each other. Also, the search for other life is a collective effort of the scientific community, even though its representatives may have different backgrounds. The three modes are oriented vertically looking to find the answers beyond the blue horizon (Krupp 1992), transcending from the world of common human experience into the hypothetical world of the extraterrestrial. The ETL search provides a variety of narratives but also seems to inspire new stories about science, humanity, and on the largest scale ever imaginable about our environment – that is, our cosmos.

# Chapter 3: The Naive Science of Messaging

In this chapter I will look at the messaging and I will be "following the thing" (Marcus 1995:109) throughout the scientific practice of messaging and subsequently through the public spaces and general conceptual landscape. Furthermore, my aim in this chapter is to display the material and radio messages in terms of the evolutionary lineage of the messaging phenomenon, to outline the major events in the development of the messaging mode, address their content, and finally introduce the public and commercial messages.

Messaging to outer space, a process which one of my respondents described as a "charming and naive" enterprise (INT8E:17), is recognised here as a scientific enterprise that is typical for the second half of the twentieth century. During this era, as a coincidental event, public awareness of the other life idea had been developing and new concepts of alien life emerged in the popular imagination. Steven Spielberg's motion picture "Close Encounters of the Third Kind" (USA 1977) presented the scenario of contact with alien life forms. With respect to this trend, there is nothing accidental; the increase in the popularity of the other life idea emerges from a particular cultural and historical context, as a result of scientific activity and popularisation. The narrative description of past events enables us to include both scientific culture and cultures of science in the contextual analysis and navigate through the immediate socio-historical context.

Secondly, each of the messages presented below is a cultural or 'culturoscientific' archive precisely because it is a time capsule designed to communicate across space-time. To be able to unlock the archive we firstly need to understand how a message is done; this involves looking into key practices and principles of message construction. Of particular interest is then the ability to grasp the meaning of the message in terrestrial conditions– in other words, to question the comprehensibility of the potential terrestrial receiver, the "knower" (Harding 1991) who should more readily than the extraterrestrial receiver be able to comprehend the symbolism of a message. With regard to the content analysis, the messaging is a conceptual common

space where the new meanings are produced but also where the "lingua franca" (Samuels 2005:108) of interstellar communication is revealed.

Scientific messaging is not a static practice; on the contrary, it is a continuing process. The pioneering projects formed in the 1980s bring to our attention two important names in the history of message sending and the search for life beyond earth: Frank Drake (for radio broadcasts) and Carl Sagan (for material messages). It is more or less obvious that their work provided a theoretical frame and a blueprint for subsequent messaging and inseparably listening activity. Similarly to the universal wavelength defined by two Cornell University scientists, Giuseppe Cocconi and Philip Morrison, in their paper "Searching for Interstellar Communications" (Cocconi and Morrison 1959), which is a central term in interstellar communication, the work of Drake and Sagan constitutes this scientific practice in the US.

There are several messaging types which have emerged from the various countries that have sent messages to selected targets in the universe over the past 50 years. Funded from public sources, the governmental projects were formed in the 1950s, 1960s, and 1970s as part of the 'big' science that was taking place in the context of the Cold War (USSR and USA). The Pioneer and Voyager Messages (NASA, USA) have already been examined from various perspectives (Havel 1996; Nelson and Polansky 1993; Chen 2003; Macauley 2006; Macauley 2010). Messaging projects are also described by a term Communication with extraterrestrial intelligence (CETI) which involves the design of language and message composition. Russian form of the same scientific activity is known as Messaging to extraterrestrial intelligence (METI).

However, little attention (if any) has been paid to the latest messaging projects and especially to their outreach to the commercial era. Here I don't depict solely the partnership of science with the sphere of commerce, also known as the co-production of knowledge in a research context (e.g. Gibbons 1994). I also draw attention to recent commercial projects and private ventures; here I call them commercial or public messages. Those are presented on the timeline below next to the scientific messages. In doing so I am interested in the 'bigger picture' and I address the design,

characterisation, and evaluation of messages sent to space between 1962 and 2012.[23] The following Table 5 shows the most significant moments in messaging history as recognised in this piece of research:

**Table 5: Timetable of Scientific Search for Extraterrestrial Life**

| Year | Event |
|---|---|
| 1899 | Nikola Tesla detected the signal (supposedly from Mars) |
| 1940 | Radio antennas construction (Samuels 2005) |
| 1958 | NASA established |
| 1959 | Cocconi and Morrison publish "Searching for Interstellar Communications" in "Nature" |
| 1960 | OZMA Project (first 'listening' project) conducted by Frank Drake at the National Radio Astronomy Observatory at Green Bank |
| 1961 | Drake equation, which estimates the number of advanced civilisations in the universe, formulated by Frank Drake (basis for SETI programme establishment) |
| 1962 | USSR transmitted a message in Morse Code to Venus (arguably first 'messaging' project) |
| 1972 | NASA launched Pioneer 10 spacecraft carrying a small plate |
| 1974 | Arecibo Message broadcast into space by Frank Drake |
| 1977 | Potential non-terrestrial signal detected: Wow! (hoax) |
| 1977 | NASA's Voyager Messages I&II sent to outer space |
| 1984 | SETI Institute founded in California, USA, to conduct scientific research on life in the universe. |
| 1999 | Cosmic Call I broadcast funded by company called Team Encounter and rebroadcast in 2003 |
| 2001 | Teen Age Message created with help of groups of teenagers sent from Russia |
| 2006 | Cosmic Connection – French TV documentary broadcast to extraterrestrial |

[23]According to the SETI website, over 10,000 messages known as Message from Human Beings to the Universe were sent from the radio telescope of Nançay in France in 1987, but there is no further evidence on their contents available.

| | |
|---|---|
| | audiences[24] |
| 2008 | Doritos advertisement broadcast into universe; this year also another public "A Message from Earth" sent out. In 2008 NASA broadcast the Beatles' song "Across the Universe". According to the NASA public Release this was to commemorate the 40th anniversary of the day The Beatles recorded the song. |
| 2009 | A DVD that contained names and opinions about space exploration collected from the public was placed on the Kepler spacecraft. Another public message 'Hello from Earth' sent. |
| 2010 | Penguin Books announced a competition to celebrate Paul Davies encouraging people to submit a message to aliens |
| 2012 | Wow! Reply |

As one can see from the overview, in the past decade, messaging transformed into half scientific undertaking and half popular public enterprise. Yet, originally, messaging was initiated by scientists and the very nature of early messages was the scientific one as I argue below. American astronomers and SETI pioneers and advocates Carl Sagan and Frank Drake are the two important people to mention. Russian scientist Aleksandr Leonidovich Zaitsev, the chief scientist at the Russian Academy of Science's Institute of Radio Engineering and Electronics, is known for his work on interstellar radio messaging (METI).

## 3.1. The Naive and 'Charming Science' of Messaging

Messaging as a historical phenomenon emerged in both parts of the world polarised by the Cold War and bisected by the East/West geographical axis; hence it was also politically charged as a territory-marking process that logically extended to newly discovered places. The curious history of messaging starts in the immediate context of the Cold War. The first ever message transmitted to outer space was a simple radar signal sent in 1962 from the former USSR.[25] Now known as the Morse message, the simple broadcast was composed of three Russian words: MIR (Russian

[24]More information available from the La Société Française d'Exobiologie website (French): http://www.exobiologie.fr/index.php/actualites/evenements/cosmic-connection-sur-arte-2/. Accessed 19 February 2013.

[25] Authors: Vladimir F. Morozov, Oleg N. Rghiga, and Vladimir M. Dubrovin (Institute of Radio Engineering and Electronics). According to the calculation made in 2002 the message is heading towards the Lyra constellation.

word for peace and world), CCCP (USSR), and Lenin. The political charge of the message is clear, although from the scientific perspective the message was intended to test the new radio telescope (also referred to as 'planetary radar'). The message was transmitted from Evpatoria, now the Center for Deep Space Communications based in Ukraine.[26] Noam Chomsky has noticed that success in the conquest of space has led to a militarisation of outer space and has increased authority, power, and global control (Chomsky 2004).

In the development of scientific messaging we can observe also a politicisation of outer space. President Carter's greeting to the universe sent on both Voyagers' interstellar probes in 1977 was addressed to the "community of galactic civilizations", signifying the first move in interstellar diplomacy.[27] Yet, despite the universalistic introduction and the spoken greetings from earth in 50 languages, the Voyager message also included the American flag.[28] Below I argue that any message sent to outer space carries not only contents but also a charge, be it cultural, political, or latterly commercial.

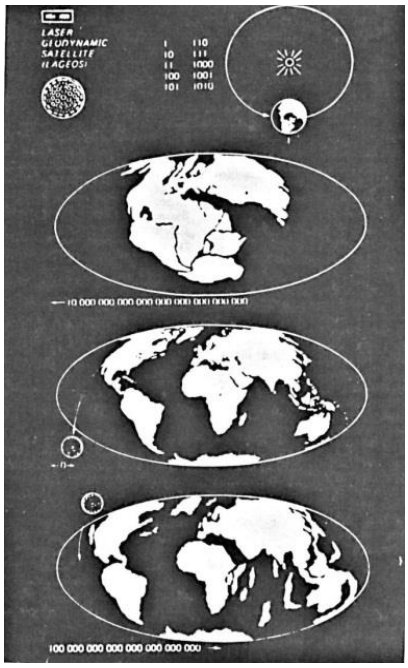


**Figure 17. The LAGEOS plaque (1976). Image Credit: NASA.**

As I described in my MA thesis (Capova 2008:72), the idea to install informative plaques or messages on US spacecrafts became a standard of the NASA space exploration programme. David Samuels, in his contribution to the "E.T. Culture" edition "Alien Tongues", mentioned that NASA asked Sagan to arrange the informative plaque for the LAGEOS I Satellite (Laser Geodynamic Satellite) in 1976 (Samuels 2005). The attached image depicts the

[26] Retrieved from http://www.cplire.ru/html/ra&sr/irm/MIR-LENIN-SSSR.html. Accessed 13 August 2012.
[27]The full text of the Statement is available from http://www.bigear.org/CSMO/HTML/CS07/cs07p02.htm. Accessed 13 August 2012.
[28] This seems to continue in a tradition expressed also in famous JFK's speech: "For the eyes of the world now look into space, to the moon and to the planets beyond, and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace." John F. Kennedy during his Moon Speech at Rice Stadium, September 12, 1962. This historic speech is known as the proposal for American space program, especially NASA's Apollo Program.

LAGEOS Message (Figure 17), a simple plaque that was attached to the satellite launched to orbit around earth.[29] The content had been compiled by Carl Sagan, the Sagan who later led the scientific team that created the Voyager Message. The diagram that presents the position of continents in the distant past, present and remote future was drawn by American "space artist" Jon Lomberg, who also later provided illustrations for the Voyager Message.[30] Rather than a means to communicate with extraterrestrials, the LAGEOS inscription was intended for future generations of humans. LAGEOS is a mark left behind, a legacy of culture of science.

Another example is possibly the most famous one: the 'bootprint' that was made by the boot of Neil Armstrong, the first human who stepped out of the Apollo 11 lunar lander onto the moon's surface in 1969. Above all, the bootprint also signifies the ultimate victory of the USA in the Space Race by reaching the moon's surface first. The iconic bootprint photograph, a key symbol of the Space Age, is frequently used to illustrate the success of the US space exploration programme or the general progress of humankind. The legacy of the bootprint is something permanent, as NASA commented:

> The footprints left by the astronauts in the Sea of Tranquillity are more permanent than most solid structures on Earth. Barring a chance meteorite impact, these impressions in the lunar soil will probably last for millions of years.

Each of the US spacecrafts carries its own informative plate that is conveying information about its country of origin: Made in USA. For example, the Apollo 11 lunar message was again intended as a message for future humankind, left on the moon to commemorate the lunar landing in 1969 rather than to greet extraterrestrials.[31] The Apollo 11 Goodwill Messages from 73 countries were written on a small silicon disk and left on the moon. Like the Nazca lines in Peru, the

[29]NASA LAGEOS satellite information available from http://ilrs.gsfc.nasa.gov/satellite_missions/list_of_satellites/lag1_general.html. Accessed 13 August 2012. SETI Archive available from http://seti.sentry.net/archive/public/1999/4-99/00000151.htm. Accessed 13 August 2012.
[30]Image retrieved from http://www.bigear.org/CSMO/HTML/CS07/cs07p02.htm. Cosmic Search: Issue 7 (Volume 2 Number 3; Summer (July, Aug., Sept.) 1980) – Putting Our Best Signal Forward.
[31]The text on the plaque says: "Here men from the planet Earth first set foot upon the Moon. July 1969, A.D. We came in peace for all mankind."

Egyptian pyramids, or the Australian Aboriginal rock painting of a handprint, Armstrong's bootprint will continue in existence longer than the civilisation that created it – just as the messages that we have sent to outer space to discover and conquer the new worlds are to become something permanent that was intended to speak for us all and perhaps provoke interest and curiosity as an unresolved mystery one day in the distant future.

I mention two messages that exemplify the connection of messaging to governmental expectations of scientific research, these are the Message to Venus (USSR, 1962) and the Voyager message (USA, 1977); each demonstrate an aspect of science that has interested social scientists (e.g. Rossiter 1985, Dennis 2006). The curious case of the two messages sent to extraterrestrial arenas proved that space, once perceived as an uncontested area, now provided an opportunity to promote a political system. Fundamental in this respect was the context of the Cold War in which the Space Race took place. Using Fabian's description of space (and time) as an "ideologically constructed instrument of power" (Fabian 1983:144), I extend this definition also to interstellar places.

## 3.2. American Blueprint of Interstellar Communication

The enduring American cultural icons, the Pioneer and Voyager messages continue in their pioneering voyage through interstellar space and also terrestrial media and news. The messages also received interest of social scientists in some aspects of both the context of message production and contents. The formation of NASA's Pioneer and Voyager messaging projects has been examined by William R. Macauley in his master dissertation entitled "Inscribing scientific knowledge: NASA's Pioneer plaque and the history of interstellar communication, 1957-1972" (2006) and further developed into doctoral thesis "Picturing Knowledge: NASA's Pioneer Plaque, Voyager Record and the History of Interstellar Communication" (2010). Macauley analysed historical evidence available on design of the two interstellar messages and concluded that "visual inscriptions of scientific knowledge and mathematics are products of socially embedded practices" (Macauley 2006:58). Alongside this analysis, only partial studies of messaging have been provided looking at both the

backstage and front end of messaging (e.g. Havel 1996; Nelson and Polansky 1993; Chen 2003).

### 3.2.a. Pioneers

The pioneering scientific American message, and one of the most important events in NASA history, is the gold-anodised plaque attached to the Pioneer 10 and Pioneer 11 spacecrafts, described by NASA as an "intellectual cave painting" (NASA 1977a). The plaque was authored by Carl Sagan, Frank Drake, and Linda Salzman Sagan. NASA launched the Pioneer 10 spacecraft in 1972, and Pioneer 11 followed one year later.[32]

I will use NASA's description to give an account of what is included on the small plaque that was attached to the spacecraft. Although the Pioneer Plaque only consists of a few engravings, one can regard it as an attempt at a scientific narrative to be read and understood by an alien receiver. The Pioneer engravings present a key part of the messaging story and a blueprint for future messaging (Figure 3). The symbols of neutral hydrogen as a universally recognisable constituent of the universe, the map locating earth within the universe, the procreation couple greeting the extraterrestrials– it all presents a story. Berger states that "drawings, paintings, photographs – anything pictorial in one frame – are not generally thought to be narratives, though they may be parts of narrative" (Berger 1997:6). And so the messages to extraterrestrials account for a part of the scientific meta-narrative about human beings and their planet. The lines of a message to follow– that is, the Arecibo broadcast– also suggest they are to be 'read' as a linear story presented by those who created the message.

### 3.2.b. Arecibo Broadcast

One of the most significant events in the search for extraterrestrial intelligence is the Arecibo message created and beamed to outer space by Frank Drake in 1974. The message name originates from the transmitting location, a large radio telescope in Arecibo, Puerto Rico, a part of the National Astronomy and Ionosphere Centre (NAIC). These days, Arecibo is, except for common observation activity, used

[32] Ray A. Williamson in "Outer Space as Frontier: Lessons for Today" described "In a metaphorical sense, then, "Pioneer 10 extends the boundaries of the true frontier for humans because space is perhaps more appropriate for the things of humans than for humans themselves." (Williamson 1987:267)

mainly as a source of data for the SETI@home project. The attached image (Figure 18) presents the message itself as a result of '1979 bits of information': the product of a binary stream that should be arranged into a 73x23 matrix (Sagan, Drake et al. 1978:62). The receiver has to decode the numerical labyrinth correctly to be able to view this message and then as a matter of course start reading the encrypted information about life (science) on planet earth. Intrigued by the message content and puzzled by the scientific language, I decided to undergo the process of deciphering the Arecibo Message. Firstly I was interested in exploring the thinking process behind the zero-one front-end to see how a message is done; and secondly I wanted to learn how to read the code – that is, how to understand the message itself.

The settings of my experiment were quite simple. I possessed the 'key' to read the cipher explained in Sagan's book "Murmurs of Earth" (Sagan, Drake et al. 1978:60), which provided me with guidance on how to understand and translate the 0/1 binary code and also what the final product should look like. I drew a matrix of 23x73 squares on a large sheet of paper and filled in the 00000010101010000000000 sequence in the first line of the matrix and continued over the next 72 lines, challenging my intellectual and drawing abilities. Yet I failed two times when deciphering the message and reaching a result– see attached photo of the final product (Figure 19).

Undertaking this task, during which I got lost many times, I concluded that without prior knowledge of how to decipher it, I would not have been able to comprehend its message. Having spent a few hours with a mix of orange squares forming objects that did not make any sense to me, I realised that I not only needed the instructions about how to "read it" but also instructions about how to "understand it", because I was not sure how to interpret the symbols. Having had my intellectual abilities tested, I left my diagram on the desk in the living room and left. Later one of my housemates, who was just completing a postgraduate degree, noted:

> Klara, did you realise that a part of your 0/1 diagram actually resembles the shape of a human being?

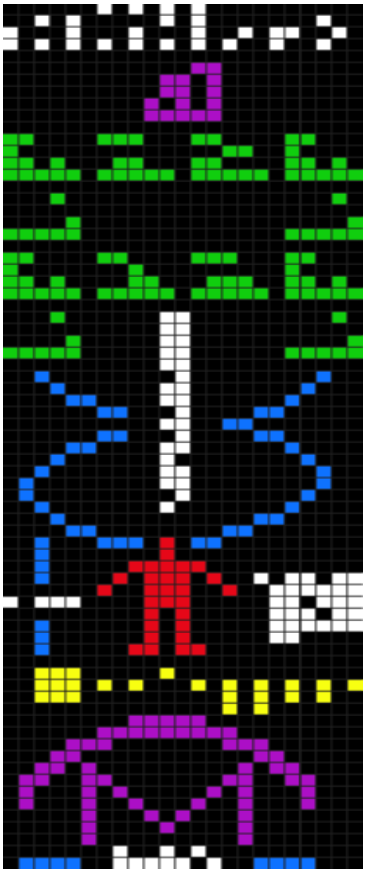

**Figure 19 . Arecibo Message (1974). Image Credit: NAIC.**

**Figure 18. Arecibo Message deciphered (2010). Image Credit: Author**

Not only very good knowledge of mathematics, chemistry, physics, and binary code, but also a fair portion of patience, imagination, and abstract thinking was needed to understand the message. The first few lines of the diagram contain cardinal numbers 1–10 followed by the atomic numbers of atomic elements (H, C, N, O, P) and formulas for sugars, bases, and phosphate in DNA nucleotides, the double helix structure of DNA, and the number of nucleotides in the human genome – that is, the scientific information about human life using the DNA sequence of an organism.[33] According to Kay, the genetic code represents the "metaphor for biological specificity" (Kay 2000); in this case, Kay's description represents the unifying

[33]As a matter of fact, the transcript of the original Arecibo Message I had at my disposal contained a mistake in the 11th row where one of the zeroes was missed out, which turns the message into a nonsense … three times. To give the reader a hint of how difficult the message is to read, I challenge him/her to recognise what part of the Arecibo message says there is human life on earth? The answer is found below the representation of humans where there is a portrayal of our solar system. The third planet, earth, is highlighted to signify the origin of the human life form. The ninth planet, Pluto, is portrayed on the diagram. Pluto was in 2006 excluded from the solar system at the 26th General Assembly of the International Astronomical Union in Prague and is no longer regarded as a planet.

feature of humanity. In the bottom part the diagram is also described the average height of a human; the size of the human population is on the right, and also a schematic representation of the solar system. In the bottom part of the diagram, we can identify the shape of the Arecibo transmitting telescope and finally its diameter (Sagan, Drake et al. 1978:63).

The Arecibo Message (AM) is the first radio message. It is not only the immediate predecessor of the Golden Record but also the first arranged expression of "a lingua franca for such communication" (Samuels 2005:108) which is considered numerical and mathematical. The Arecibo message is the key to understanding the concept and pattern of all messages to the universe, since it stresses the importance of abstract thinking and the ability to translate numbers into visual display. The AM provides insight into the contact message production.

### 3.2.c. Voyager's Golden Record

Possibly the most renowned message to ET is the Golden Record carried by Voyager probes that were launched from Cape Canaveral in 1977.[34] According to NASA, the contents were selected to "portray the diversity of life and culture on Earth" and contain scenes, greetings, music, and sounds from earth.[35] An anthropological project conceptually similar to the Voyager message was the Cambridge Experimental Videodisc Project conducted by the Department of Social Anthropology at Cambridge University and the Audio-Visual Aids Unit of the University of London in 1983 (Macfarlane 1990). Like Voyager's Golden Record, the optical disc of the Cambridge Videodisc project looks like a gramophone record

[34]Voyager II on 20 August and Voyager I on 5 September 1977. Our witness here is the 1977 Yearbook, published in the year of the Voyager Probe launch. In 1977, Jimmy Carter became the US President, and the famous rocket scientist Werner von Braun, who designed Saturn V, which was used by NASA's Apollo programme, died. Ohio State University (part of the SETI project) detected the famous "WOW" signal, which was believed to originate from an artificial extraterrestrial source. The first outer solar system asteroid was discovered. In 1977 the nuclear non-proliferation pact was signed by 15 countries, including the United States and the Soviet Union, but also the first democratic elections were held in Spain and the last guillotine execution was performed in France. In 1977 the famous "Star Wars" and Spielberg's "Close Encounters of the Third Kind" were seen by audiences for the first time.

[35]Scenes from Earth – 118 images and diagrams about our species and our planet (including basic mathematical, chemical, and physical definitions); Greetings from Earth – spoken greetings from Earth from people in fifty-five languages and printed messages from President Jimmy Carter and U.N. Secretary General Waldheim; Music from Earth – musical selections from different cultures and eras (27 audio recordings of Eastern and Western classics and a variety of ethnic music); Sounds of Earth – variety of natural sounds (21 audio recordings of human activities, machines, and natural phenomena).

(Macfarlane 1990:9), a storage device designed to hold a large amount of recordable information. The aim of this project was to produce one of the first academic videodiscs, containing 10,000 still frames of an anthropological and academic nature – that is, to create a permanent archival medium.[36]

Much has been written about the Golden Record from the history-of-science perspective. The contribution of the legendary Voyagers to the history of the NASA space exploration programme has been emphasised in many places (e.g. Evans 2007; Dethloff and Schorn 2003) and NASA protects the Voyagers' legacy. The probes provided scientists with detailed high-resolution images of planets of our solar system. It was not only the scientific data provided by the fine instruments of the interstellar probe that made the Voyager project famous. Identical interstellar messages were placed on the external surfaces of both Voyager spacecrafts on behalf of all people on planet earth.

In one of the first studies provided on scientific messages, "The Music of the Voyager Interstellar Record", Technical Writer at NASA JPL Stephanie Nelson and assistant professor of music at Dartmouth College Larry Polansky used an applied communication approach to examine the musical selection of Voyager's Golden Record. Regarding the one-hour-long musical selection of Western classical and "other cultures" as both cultural category and text, they concluded that "by imagining an Other listening, we reflect back upon ourselves" (Nelson and Polansky 1993:373). The Pioneer and Voyager messages were also mentioned in "Mapping Scientific Frontiers" by Chaomei Chen as examples that "provoke us to rethink the basis of communication, which we have been taking for granted" (Chen 2003:19).

Our messages, the "time capsule" or "message in a bottle" that will "survive us all" and "speak for us" a "billion years from now", as Carl Sagan said about the Voyagers, are an immortal sentiment that we have left behind. Certain romanticism can be read in Sagan's words describing the Voyager message: "A billion years from now, when everything on Earth we've ever made has crumbled into dust, when the

[36]According to Macfarlane, the Naga videodisc was later converted into a website (translating a culture into still frames). Source: http://www.alanmacfarlane.com. The Naga Project website: http://linux02.lib.cam.ac.uk/nagas/coll/4/xcontents/detail/all/index.html. Accessed 25 August 2012.

continents are changed beyond recognition and our species is unimaginably altered or extinct, the Voyager record will still speak for us." Hence, the interstellar messages of Voyagers and Pioneers are not only robotic probes but also the conquerors of distant times and places, the first footprints of humankind in interstellar space. The exploration (and exploitation) of outer space has imperial colonial implications and "it signifies the expansion of a specific socio-economic order across space" (Cosgrove 1994:289).

### 3.3. The Witnesses of the Past: Time Capsule

It should be clear now that the language in which the messages were written and also the rational frame within which the knowledge was presented to the extraterrestrial audiences presents a very strong point. Necessarily, the communicative intent of the scientific community needs to be addressed first. In general understanding, a message is a written or spoken communication that conveys a piece of information; a narrative then is a message that (by definition) tells the particulars of occurrence and a course of events.

The science here narrates the story of the other life simply by transcribing the lived world into a message. By saying message here I refer both to the medium that comprehends and carries such a piece of information, and the piece of information itself. There is a semantic similarity with memorial plaques: metal or stone plates with an inscribed memo attached to a wall, which are used to mark a notable person or event. The similarity is evident, as one of my respondents described:

> The message sending is more of a sociological question, as it probably means more as a time capsule of some sort, i.e. if humans eventually destroy themselves or are wiped out by some cataclysm on earth before we have the technology to live our whole lives on other planets, then these messages are records of our presence that will last essentially forever (...) However, practically it is improbable since any alien that actually finds these messages probably already knew we existed anyway, as they would have to be in the vicinity of our sun anyway. Therefore I have no objections to sending messages; I just don't think they will have the desired effect they were designed for (INT4E:50).

What my respondent says here is clear: a scientific message is of more value in preserving information about our life than in its supposed intention of communicating to alien audiences. Creating a time capsule is a popular tradition and part of a cultural tradition that has been used for thousands of years (Jarvis 2003). The time capsule as such is basically a cache that contains information about its originators and/or the event for which the capsule was created (bridges, buildings). The contents differ depending on its creators but are likely typical for the period in which the capsule is created and are usually accompanied by a written message and samples of goods (corn, hair samples). The message in a cache is buried under the ground, waiting to give out its testimonial once reopened.

**Figure 20. New York Times Capsule (2000). Image Credits: Wired.com.**

The rather futuristic piece of art presented in the image (Figure 20) is the New York Times Capsule displayed at the American Museum of Natural History in New York.[37] The content of the capsule was put together from existing material, partly designated by the New York Times, and partly based on suggestions from people from small towns around the world and the New York Times readers. What will future generations find once they open the NY Times capsule on 1 January 3000?

The final list of items is rather fascinating and includes artefacts of popular culture such as WalMart barcodes; Protector Plus condoms from Bulawayo; Day of Sound 2000 worldwide recordings; wild apple seeds from Kazakhstan; a Macintosh mouse; the Holy Bible in multiple translations; 28 hair samples; monthly bills; a Manhattan telephone book; and a reservation list for the Four Seasons restaurant.[38] But along

[37] Image retrieved from http://www.wired.com/techbiz/media/news/2001/04/43400#. Last accessed 25 March 2013.

[38] When going through the list of items one cannot stop thinking of Ralph Linton's essay "One Hundred Percent American" (Linton 1937). Linton here described an ordinary day in the life of an average American who "reads the news of the day, imprinted in characters invented by the Semites upon a material invented in China by a process invented in Germany. As he absorbs the account of foreign troubles he will, if he is a good conservative citizen, thank a Hebrew deity in a Indo-European language that he is 100 percent American."

with items marking the global age and somewhat hybrid culture, future generations may be handed over from the past more dangerous heritage; this is precisely the point that makes the next case of a terrestrial message towards future generations a challenging scientific task.

The Sandia Report (1993) shows how the scientific team solved the problem of creating a warning message to future generations: "Do not dig here before A.D. 12,000". The specific time capsule was going to be buried deep under the ground for thousands of years along with radioactive waste (Sandia Report 1993). The panel of scientists were called into action to provide "expert judgment on markers to deter inadvertent human intrusion". The problematic of the Sandia Report was brought to my attention during the SETI meeting in London (2009) as a case study of unilateral communication with an unknown (but presupposed) receiver, and not surprisingly the Marker Development Expert Panel included Frank Drake and Jon Lomberg, with Carl Sagan as external advisor (due to his busy schedule). In short, the task for a special committee was to create warning information about the nuclear waste disposal in New Mexico and to discourage our descendants from using or entering the Waste Isolation Pilot Plant (WIPP)[39]. According to the US Department of Energy in the Carlsbad Field Office (2003):

> Panels of linguists, scientists, science-related writers, and anthropologists studied potential scenarios of human intrusion to the WIPP site and brainstormed about the most efficient way to retain WIPP knowledge over thousands of years.

The complex system of warnings surrounding the facility includes pillars on the ground, buried markers, and messages to the future in the information centre. The radioactive site needs to remain intact for more than ten millennia as shown in Figure 21 below:

[39] The excerpts from the WIPP report available from http://www.wipp.energy.gov/picsprog/articles/wipp%20exhibit%20message%20to%2012,000%20ad.htm. Accessed 25 March 2012.


**Figure 21. A screenshot of one of the WIPP warning messages from Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant (1993). Credit: Sandia National Laboratories. Report SAND92-1382.**

The WIPP warning shows how scientists communicate information with unknown receivers, irrespective of the specific location of the receiver. The 300-page report documents the thinking process driving the final appearance of the warning signs and also discusses the types of media suitable for such a message. In fact, this is a scientific message sent to the future and amongst scientists is being referred to as a terrestrial example of communication with the assumed, unknown, receiver (FW Lon Oct 10).

From a sociocultural perspective, where the meanings of symbols are regarded as contextual and cultural, the report clearly addresses cognitive assumptions and cultural stereotypes. Will the future 'Other' recognise the face tortured in horror, a representation of anxiety clearly inspired by Edvard Munch's famous painting, The Scream by? Will they read the English text or know what 'radioactive' and 'poison' means? We do not know and we cannot know but it would seem unlikely. Similarly, we do not know how a scientific message would be perceived by an alien mind. However, speaking for all people of earth, a scientific message typically should include either a language that is common for a large sample of earth representatives, or a language that is believed to be universal and hence believed to be comprehensible to the 'Other'. The scientists answered this question by using mathematics as a language of interstellar communication. But before addressing the actual design of the messaging, I first want to ask about the characteristics of interstellar communication.

## 3.4. Speaking With the Intelligent 'Other'

Communication with an imagined other life is beyond any doubt one-way communication only, just as the messaging is a unilateral transmission of

information performed by only one group in a particular situation and without the presence of the receiver of such communication. But without a receiver, how can we talk about communication? Within a communication theory approach, which would seem appropriate to consider when analysing a message, communication is an act of bilateral action that intends to generate mutual understanding (Habermas and Cooke 1999:21). Hence the communication to the 'Other', despite the communicative intent, clearly lacks an answer; there is apparently no interactive environment. Yet although in this case the basic condition of mutuality in the communication– that, is the receiver– is missing (or remains just hypothetical), we can still look at conditions that according to the sender could make such communication possible.

However, this is to show that the messages, despite the attempt to initiate bilateral communicative action, are loaded with a one-way cultural charge as well as displaying expectations and assumptions about the cognitive abilities of the receiver. A message sent to the universe is a case apart; the bilateralism of such communication is questioned by a simple fact: the receiver is unknown and its communicative abilities only presupposed. If there is such a receiver, however, due to distances in space and the speed a message could possibly reach, sending a message always implies sending it to the future with the possibility that there will be no immediate response. Therefore, such a message not only carries a piece of information across space, but is also necessarily transcendent across time.

Yet, once again communication theory is useful, because it points us to the actual channels of communication and enables us to focus on the senders by projecting what the extraterrestrial 'hearer' is supposed to be capable of comprehending. To put it simply, the communicative intent of the scientific community is based on the condition that a sender ("a speaker) and receiver ("addressee") are using "a common language" or "common suppositions" (Habermas and Cooke 1999:145). It is exactly this "common language" that was brought to the attention of social scientists and fits within one of the most significant current discussions in the cultural study of science. The encoded messages contain the numerical and mathematical symbols that are intended to be "read". Interstellar communication is based on what is within science believed to be a universal means of communication that guarantees mutual understanding, namely mathematics (Samuels 2005). Although on a primary level

operating with rational mathematical symbolism, the messages are strictly based on the ability to think and on the ability to perceive visually. The terms "cognitive competency" (Havel 1996), "intellectual abilities" (Battaglia 2005) and possibly also "command over a common language" (Habermas and Cooke 1999) substantiate the statements that the early concept of the extraterrestrial 'Other' operates exclusively with the concept of an advanced, intelligent, and technological ergo scientific society (Capova 2008, Helmreich 2009).

The scientific nature of the communication also explains the robust use of visual channels to convey the knowledge, which again rely on eyesight, another assumed biological faculty of the 'Other'. This is no coincidence or surprise. Photography as evidence, visual representation, and other visualisation techniques are key elements of scientific practices (Pink 2001; Chen 2003; Daston and Galison 2007). In the tradition of scientific realism, the visual representations serve as a support of the project, as hard evidence that re-presents the reality; in other words, they provide "an uncomplicated record of already existing phenomena or events" (Knowles and Sweetman 2004:5). Most notably, Daston and Galison, in their exploration of scientific objectivity, described how the scientific identity is being established through visual information, because "making a scientific image is a part of making a scientific self" (2007:363). Visual information enables the receiver to "virtually witness" the reality (Kirby 2003a) and at the same time gives the false notion of neutrality (Wright 1998).

We can go one step further and show that in a narrow definition of a culture of science, such culture might be defined in terms of its visual manifestation. For the above-mentioned reasons, it seems to be relevant to approach and interpret the culture of science as a visual culture. Note here also that the binary streams of a radiobroadcast are in an ideal scenario supposed to be translated into an image that is to be 'read'. The use of images and graphics in the scientific messages can be interpreted as "practical and persuasive tools" (Macauley 2006:4) and also depicts the role of imagery as a general character of science.

## 3.5. The Lingua Cosmica - The Calling of the 'Other'

The three messages introduced above – Pioneer, Arecibo, and Voyager – represent the more scientifically informed attempts at messaged; they are also the ones that achieved fame and popularity. Hence I asked my respondents, who were mostly astrophysicists, what they thought about messaging as a scientific method. Later I asked what message they would send if they had the opportunity. The interview question was targeted towards the scientific value of the messages– that is, was sending a message worth it.[40] The second issue addressed was the language in which the messages were or should be written– that is, mathematics and music presented as binary opposites, reason versus emotions (possibly suggesting scientific and non-scientific comprehension of life on earth).

> Interesting question ... I am not sure I want to send a message to be honest in terms of I am not sure whether I would have anything to contribute beyond the basic messages that would be sent that would be of any significance. I suppose as a Christian I would want to send the Bible because I believe that is God's communication with us, which is of fundamental importance. But from a scientific perspective I don't think I would want to contribute anything that isn't already there (INT3:232).

> I suppose the question would be the obvious things. We don't need to say we are here because that is already achieved if they receive the message, so some sort of question. Maybe do you believe in God would be an interesting one, if that means anything to them. Because as we know on the earth there are all these different societies, primitive societies that have their version of God, and it would be very interesting to know whether the completely alien, maybe a highly advanced society, achieved beliefs in God (INT2:283).

The first apparent motive emerging from the interviews is the zero or low efficiency of message sending as a contact method. This logically presents one of the key rational arguments against the active search for ET life: the scientific argument that could be called the 'pointlessness' of the search. A spacecraft only travels at a limited speed and so far only Voyager has crossed the border of our solar system. To

[40]This question was based on Sagan's SETI optimism and belief that despite the obstacles the search for the answer to this cosmic question is worth doing (Sagan 1997:55).

give you a sense of the interstellar travel rates, the Voyager's Golden Record for instance is due to deliver the message in thousands of years. The speed limit of spaceflight is one of the reasons why radio waves were used to carry a message. A broadcast, such as the Arecibo message, travels at the speed of light, which is the maximum speed achievable.[41] Yet the distances in the cosmos are far greater, as one of my respondents explained:

> Considering message sending – with modern technology it will take 200 years to get a reply to a message sent to a "nearby" star at 100 light years distance. What we need is "tachyons", faster-than-light particles, but these have not yet been discovered (INT1:14).

The message is pointed towards a carefully chosen target object, typically a star or constellation. The night sky has been transformed into a pinpointed target map. The reason behind the selection process is simple. Nowadays, for example, in order to maximise the probability of detection, the transmissions are directed to newly discovered extrasolar planetary systems. Yet the chances of a probe such as Pioneer being detected are remote (e.g. INT3:94). In fact, this is one of the key arguments in showing that messages say more about their creators, rather than being a real contribution to communication with the 'Other'. One of my respondents commented:

> I think it is interesting to send these messages and it sparks discussion about what we think about ourselves, and what part of this we want to portray to others, in this case ET life. However, I am not sure any of the messages are actually sent with any confidence of contact, and indeed it is my understanding that the Arecibo message will not even reach its intended target, as the cluster of stars we sent the message to will have moved! In terms of the Arecibo message I think the content was sensible; sending the message in some kind of mathematical form is possibly the simplest way we can think of in terms of what other intelligent life may be able to understand (that is if mathematics are universal) (INT5E:69).

[41]Distances in the cosmos are usually measured in light years (ly): 1 ly is the distance light travels in one year. The speed of light is a universal physical constant (and maximum velocity) and its value is 299 792 458 metres per second (m/s). One light year is about 6 trillion miles (that is about 10 trillion kilometres).

The scientists I interviewed favoured radio broadcasts and messages that are designed mathematically, that is in line with current messaging trends and claims on mathematics as a "lingua franca" (Samuels 2005:108) of scientific practice. I asked another respondent what type of media he would use to convey the message, after it was suggested that it would be interesting to ask if the 'Others' had God. How would he depict the metaphysical beyond, the original philosophical meaning of meta ta physica?[42]

> Well, that's a good question isn't it? Because language –unless you pick a Babel fish like in Hitchhikers Guide to the Galaxy, then just typing in a message on the laptop isn't going to work ... I don't know. I didn't have enough thought actually about how to get a message across. But you could start off by saying we are us, you are you, and initiate the communication, something beyond us and beyond you (INT2:292; 298).

My respondent would initiate the communication by defining the basic terms. This again seems to be the common characteristic of the scientific mind: methodologically defining the basic terms before proceeding to complex problems. The image below shows the opening image of the Cosmic Call 1 (and 2) message written by Canadian astrophysicists Yvan Dutil and Stephane Dumas and first broadcast in 1999. The Cosmic Call message was intended to be an update of the Arecibo message and therefore is larger in size, duration, and scope. The original 23-page-long Cosmic Call 1 was updated four years later with photos, drawings, and audio and video files that were submitted by Team Encounter members worldwide, and was resent in 2003 (also known as the Encounter Message).

The reason I mention the Cosmic Call message here is the language used to convey the message; and by language I especially mean a systematic means of communicating by the use of conventional symbols. In this case the symbols were designed by Dutil and Dumas on the basis of the principles of interstellar communication as proposed by Hans Freudenthal, Professor of Mathematics at the University of Utrecht. The artificial language known as Lincos – lingua cosmica –

[42]Aristoteles, Ta Meta Ta Physika, Available from: http://books.google.co.uk/books/about/Ta_Meta_Ta_Physika.html?id=ADc8AAAAcAAJ&redir_esc=y. Accessed 23 August 2012.

was designed by Freudenthal in 1960 as a "language for cosmic intercourse" (Freudenthal 1960). Freudenthal described the thinking behind the development of the language and also star-to-star communication:

> Of course I do not know whether there is any humanlike being on other celestial bodies, and even if there were millions of planets in the universe inhabited by humanlike beings, it is possible that our nearest neighbour lives at a distance of a million years and, and as a consequence, beyond our reach. On the other hand it is not unthinkable that inhabitants of other planets have anticipated this project. A language for cosmic intercourse might already exist. Messages in that language might unceasingly travel through that universe (Freudenthal 1960:14).

The image below (Figure 22) presents the first two of the 23 slides that form the message. The left slide defines numbers (1, 2, 3 …), the right then how we use the numbers – that is, the basic mathematical operations, e.g. 1+1=2:

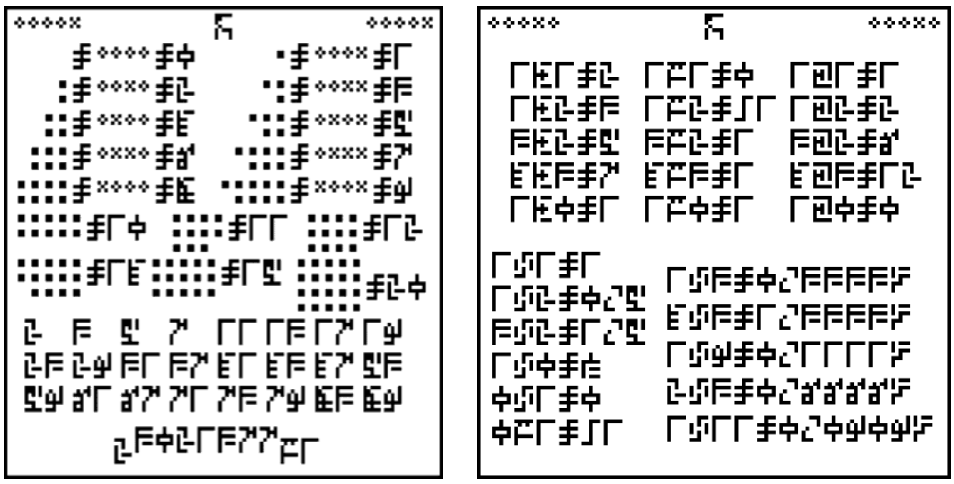

**Figure 22. The opening slides of the Cosmic Call message (1999).**
**Image Credit and Copyright: Yuvan Dutil & Stephane Dumas**

Here we see a conceptual continuation of the 1977 Voyager message. The first lines of the Arecibo message also define the numbers 1 to 10. The two images below (Figure 23) present a similar introduction to the one seen above. On the Golden Record, Drake and Sagan defined the message with the use of mathematics and physics, and based on what they called 'universal concepts':

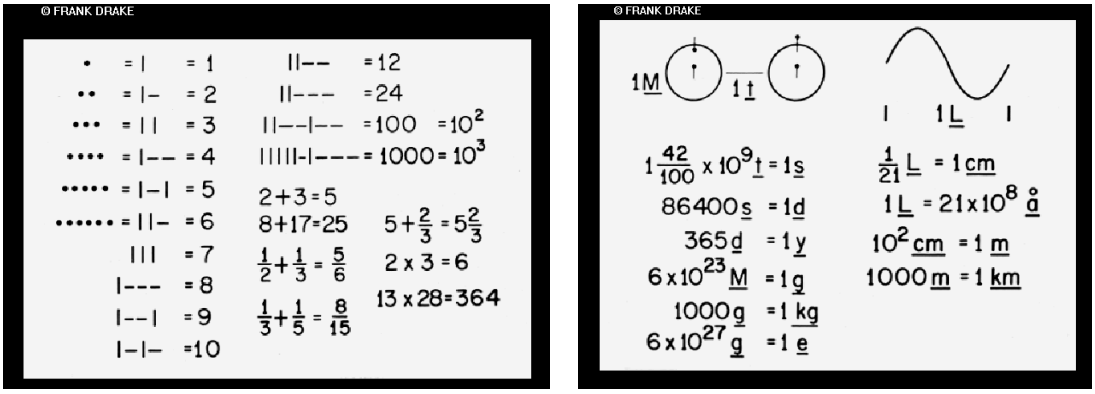


**Figure 23. The Voyager Message (1977). Image Credit and Copyright: Frank Drake.**

Team Encounter also marks a new era of messaging as a joint enterprise based on the ethos of global cooperation.[43] This motive stands out as the feature of a science that expands towards the public. The first example of this is the Teen Age radio message (TAM) from 2001. TAM originates from Russia; the content was selected by Russian teenagers (Figure 24). TAM includes a 15-minute-long musical collection entitled "Theremin concerto to Aliens". The First Musical Interstellar Message was described by the message organiser and Scientific Head of TAM, Russian radio engineer and astronomer Alexander Zaitsev:

> The well-known opinion that it is impossible to understand messages of another intelligence in principle and, hence, that there is no point in transmission of our own messages into space was expressed, for example, by B. Panovkin [2]. On the other hand, there is a thesis that music has a universal nature, which is perceptible by any intellectual being. The most pictorial expression of this thesis was given by the 19th-century German poet B. Auerbach, who said that music is the only universal language, that music does not require a translation, and that souls communicate directly by means of music. Nevertheless, these two theses do not contradict each other if we postulate that the traditional concept of the language of intelligence communications as a system of purely logical constructions is not comprehensive (Zaitsev 2008:1107; 1108).

[43]According to the SpaceRef website, "Team Encounter believes that this mission shows that with the emergence of global cooperation, even amidst international unrest, countries can peacefully join together in offering this unprecedented opportunity to everyone." In: First Major Search for the Existence of Other Intelligent Life in the Universe, Source: Team Encounter. Posted on Tuesday, February 11, 2003. Retrieved from http://www.spaceref.com/news/viewpr.html?pid=10730. Accessed 23 August 2012.

Similar to the Voyager messages, the TAM includes a selection of Western classics including Beethoven's 9th symphony and Gershwin's Summertime. The Teen Age Message also includes the logo of TAM, greetings to aliens both in Russian and English, and an image glossary (70 min). Music as an alternative to other languages seems to have a specific position in the interstellar communication. Similar to written language, musical notation or a music sheet can be reproduced by anyone who knows how to read and interpret the symbols. But mathematics is central to interstellar communication, and is only accompanied by music that clearly represents Western culture. Mathematics is widely used across many scientific disciplines, being a language on its own and often regarded as universal. One of my respondents commented on the use of mathematics and not music:

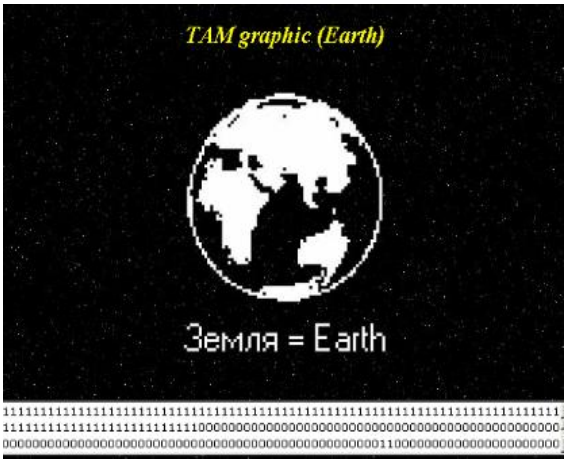


**Figure 24. Graphics of the 23rd slide of the TAM Message (2001). Image Credit: www.seti.housenet.org.**

> I think mathematics has left diversity across the cultures, so our own limited understanding on the earth is that there is a wide variety of music which is all based on the same system. But the diversity is huge, whereas wherever you go in the world and you are taught mathematics, you learn pretty much the same things. So you may be learning music in Africa in a different way to the way you are learning music in England, but if you are learning mathematics, basic mathematics, you will learn it pretty much the same. And there is a fundamental belief that the mathematics of the universe is true wherever you are. And that should also be true in music. But we know that there is more diversity with music (INT3:220).

The first interstellar message to include music was the Voyager one-hour-long compilation of music. The Western playlist included Bach, Mozart, and Beethoven performed by elite musicians. The visual portion of Voyager also presented a production of music (Figure 25): and the writers of the Voyager Messages placed an

image, “Violin with the music score” (Figure 26), which is a musical sheet of Cavatina by Ludwig van Beethoven, to conclude the Voyager pictorial sequence.

**Figure 25. Image 115 of Voyager’s Pictures of Earth String Quartet (1977). Image Credit: NASA.**

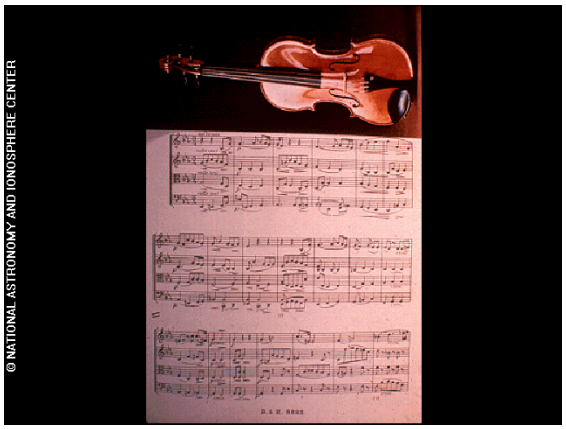


**Figure 26. Closing image of Voyager’s Pictures of Earth (1977). Image Credit: NASA and NAIC.**

Mathematics enables scientists to communicate across nations and even time, but at the same time remains the essential boundary of the culture of science. It should not surprise us then that the colloquial language of interstellar communication produced by the culture of science is clearly mathematics; it cannot be otherwise. The epistemological primacy is held by mathematics, which is regarded as the universal language, the “lingua franca” (Samuels 2005:108) of scientific practice or “universal significance of mathematics” (Macauley 2006). Mathematics presents numerical unity and as discussed above is also used to represent the logic of quantity, the definition of basic numbers and operations (e.g. Havel, Samuels, Sagan and others). Mathematics is the base of communication with the imagined ‘Other’.

## 3.6. Lingua Franca: Bringing the Differences

So far I have presented scientific messages of various complexities and presented mathematics as the common language of interstellar communication. The cultural significance of mathematics for the ‘charming science’ is now clear: it is the presumed lingua franca of communication with other life. I have also shown that the messaging activity was (and is) conducted by a relatively small group within the scientific community based almost exclusively in the USA and Russian Federation, and centred around great radio telescopic facilities (such as Arecibo and Evpatoria)

that enable the conduct of such practice. It is also clear now that the scientific messages are of two species. The first are the material interstellar messages (IMs) that were the dominant species in the 1980s and presented as exclusively American conduct. The second species is the electromagnetic messages (EMs) that prevail in the third millennium and beyond.

Working on the presumption that the messaging mode is a scientific practice that can be interpreted as an "account of science in the making" (Latour 1999:15), it would be useful to review the key elements of the IMs and EMs to see how they have been constructed and to introduce their structural simplicity and ornamental elements. In this subchapter I discuss the commonalities and rational features in scientific messaging.

Firstly, the message is an object: the fact that it is artificial, 'manmade', or, in the case of a signal, 'modulated' means it is not organic to our cosmos. The artificiality of it hence signifies the presence of intelligible beings or a society in an advanced state of technological development – that is, a civilisation. Even the body of the spacecraft itself (Figure 27) signifies it has been manufactured by an intelligent, technological civilisation. The image below shows the Voayger spacecraft, the carrier of the golden disc.

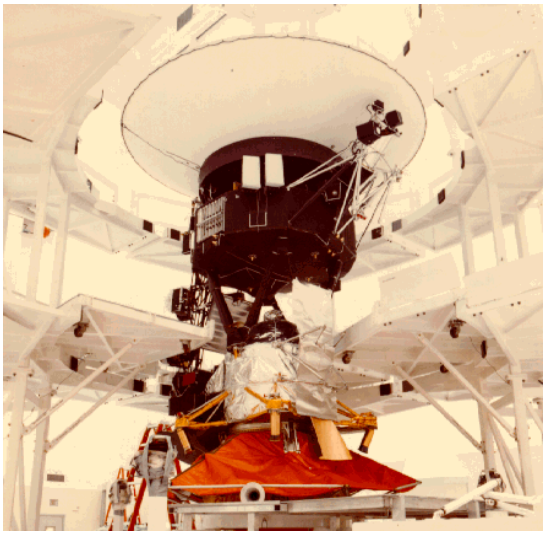

**Figure 27. The Voyager Spacecraft (1977). Image Credit: NASA**

The second feature of interstellar messaging is the time reference, typically symbolised by the hyperfine transition of neutral hydrogen. The time-period measurement is explained using the period associated with the fundamental transition of the hydrogen atom that provides the basic time reference. The time reference symbol is accompanied by the location of earth. The map is created by using the adjacent sky objects, typically pulsars – that is, rotating stars that emit electromagnetic radiation – to locate our planet within the galaxy. The pulsar location map is in fact a new type of audio-visual map that presents a new "scientific frontier" (Chen 2003), at least in a terrestrial context. The images below present the hydrogen clock and pulsar map symbols as presented on the Voyager protective cover (Figure 28) and Pioneer plaque (Figure 29) respectively:

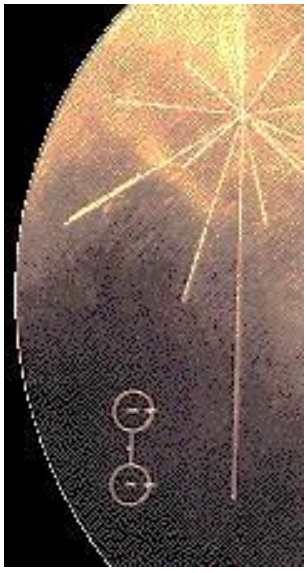

**Figure 28. The Pulsar Map and Hydrogen Symbol. Segment of the Voyager message inscription (1977). Image Credit: NASA**

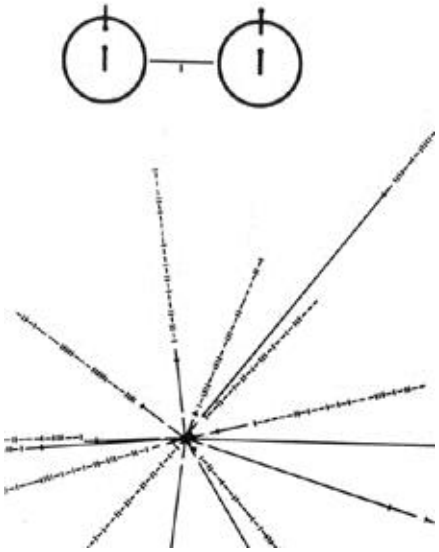

**Figure 29. The Pulsar Map and Hydrogen Symbol (1972&1973). Segment of the Pioneer Plague. Image Credit: NASA.**

Thirdly, one recognises the chemical elements as a commonality of messaging enterprises, in particular the chemical elements that are regarded as the building blocks of life.[44] These chemical elements are: hydrogen (H, the simplest and most abundant element in the universe); carbon (C, occurs in all organic compounds); nitrogen (N, a constituent of all living tissues); and oxygen (O, the most abundant element in the earth's crust and atmosphere). The image below (Figure 30) shows an

[44]The chemical elements that in their combinations constitute all matter demonstrate here the very essence of life.

excerpt from the 1999 and 2003 Cosmic Call messages as explained by the creators of the message.[45] A similar definition, although in a different representation, had been provided in the Arecibo message.

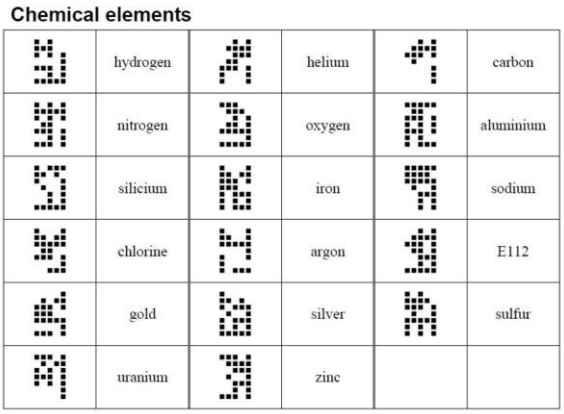


**Figure 30. The 1999 and 2003 messages explained by Stephane. Dumas. Annex A: 2/2.**

The fourth essential concept is the model of DNA (deoxyribonucleic acid), which in terrestrial science is associated with the transmission of genetic information and is also described as the database of life. The DNA concept seems to represent the biological analogy to mathematics. There is a crucial motive emerging from this sequence, and that is the description of humanity as 'carbon-based' life forms; this motive is crucial in astrobiology and will be further analysed in the chapter dedicated to exploring. The images below present portions of the Arecibo (Figure 31), Voyager (Figure 32), and Cosmic Call (Figure 33) messages. The general tag would be 'building block of DNA: the 4 nucleic acids':

**Figure 31. Representation of DNA from Arecibo Message. Image Credit: NAIC**

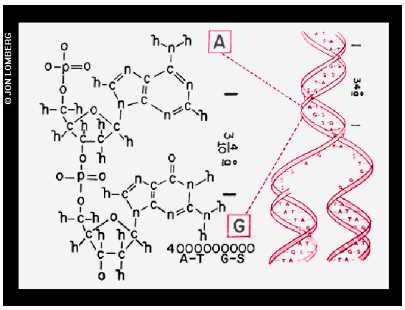


**Figure 32. Representation of DNA from Voyager Message. Image Credit: Jon Lomberg, NASA.**

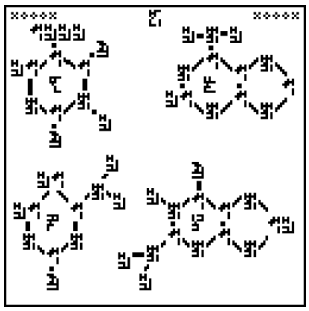

**Figure 33. Representation of DNA from Cosmic Call. Image Credit and Copyright: Yuvan Dutil & Stephane Dumas**

[45] Image retrieved from http://www3.sympatico.ca/stephane_dumas/CETI/messages.pdf. Accessed 25 March 2013.

Finally, the striking feature of interstellar messaging is the combination of media used to convey the message: e.g. images, pictures, sounds, and music. The heavy usage of imagery was described by the Director of Interstellar Message Composition at SETI, Douglas Vakoch, as the "conventionality of pictorial representation in interstellar messages" (Vakoch 2000).

The messaging is nevertheless based on an unavoidable assumption that is embedded within every attempt to communicate with the 'Other', and that is the assumed sensory perception– in other words, the sense of sight that facilitates the visible or 'seeing', and the sense of hearing that facilitates audibility or 'hearing' and 'listening'. The basic condition of interstellar communication is perceptual abilities (Havel 1996). Although (or precisely because) the imagined 'Other' is burdened with the human qualities of the physical body, with a brain producing an intellect, the 'Other' is the milieu of imagination and fantasy.

In correspondence with fantasy, it was interesting to see how astrophysicists I interviewed reflected upon scientific messages and responded to the question of what they would send, while keeping essentially the same assumptions. Some of the representatives of sciences were a bit less descriptive and one would even skip the answer, but one of the suggestions was: "We live on a planet we call earth. It is considered to be 'mostly harmless'" (INT8E:33). Another respondent provided a detailed description:

> If I was to design a message to send to alien civilisations I would probably send most of the information that was sent on the Voyager disks, like the position of earth in the solar system, music, etc. I think I would also send the position of the sun in comparison to stars in the local solar neighbourhood as a 3D map of our galactic region. I would like to show some history of humans on this earth, both the good we do and the bad. I think it would be important at this stage to show humans' flaws along with our good side, as if these beings had the potential to travel to earth, if they were sufficiently far advanced, then I think they should be allowed to make an informed decision on the rulers of the planet they are planning to visit. Even for communication this would be important. I think another thing that is important is to

> communicate our cultural scene, in particular music, art, sport. These three sociological aspects of humans really define us as species and would give another race a real insight into what the human mind is capable of and the value. Finally, in my opinion, we should send some examples of our technological advancement (INT4E:100).

This description illustrates nicely how a message is being constructed in the scientific mind. My respondent similarly factored what he called 'sociological' aspects into the contents, much as can be seen in the larger scientific messages (e.g. Voyager, TAM). Yet the variety is not always an option, as described by another respondent:

> Something very simple, possibly showing our current understanding of science: e.g. our understanding of evolution and how life formed on our planet, our understanding of the origin of the universe and current theories of quantum mechanics, and general relativity (so actually not that simple!). I don't think I would send too much about our culture, as I would assume that this would not make any sense. Therefore our understanding of science in some kind of mathematical form would be a good start (INT5E:87).

Here again we see explicitly the understanding of the use of a presumed universal language of the universe – mathematics. At this point, we can also evaluate the concept of the other life, which is that of an advanced, scientific, extraterrestrial civilisation (Capova 2008:78) that possesses the same "shared codes" (Samuels 2005). "Some kind of mathematical form" (INT5E:69 and 87) is suggested to be used to communicate across extraterrestrial time-space a piece of information without regard to the actual content. It is no surprise that different people would send different information. Yet the fundamental question remains: when we are about to inform other life about humans, what should this particular interpretation of humanity include? This reasoning relates to the broader conception of what is our life form like?

## 3.7. Encapsulated Meanings: The Story of Life

I regard messages as primarily cultural texts. As Berger noted when describing relations between text and reader, the text is "a system of signs to be understood" and for the reader the text is "a site for creation of meaning" (Berger 1997:13). Inspired by Donna Haraway's description of science as a "story-telling practice" (Haraway 1989:4), I consider messaging as a narrative genre of science or scientific storytelling.

While in the Pioneer and Voyager messages the duality of sexes was pointed out, as it facilitates reproduction and as such is inherent to humanity, the majority of interstellar messages seem to operate with a rather generic concept– representing a human life. Berger analysed the symbolism and mythical aspect of the Apple Inc. 1984 commercial and in particular the Apple logo, and argued that the logo "also has an intertextual and in this case mythological significance, because it also alludes to Adam and Eve in the Garden of Eden" (Berger 1997:119). The Pioneer Probe, Voyager Record, and other messages carry an image that can clearly be approached in terms of its intertextual connections and be analysed as a creation story. In this context the mythical aspect of the image below seems to be self-evident.

The images below present the Adam and Eve of the Space Age as portrayed on the original Pioneer Plaque in 1972 (Figure 34, the lines in the background refer to the silhouette of the spacecraft) and Cosmic Call in 1999 (and 2003) (Figure 35). The representation of an earthling couple became somewhat iconic in popular culture, and the significance of this representation is also illustrated by the reuse of the image in other messages. Presented also on Voyager Message in 1977, a variation of the procreation couple, the role-model figures of human procreation, described by Michael Warner in the introduction to the "Fear of Queer Planet" as clear manifestation of "heteronormavity" (Warner, Collective 1993:xxiii):

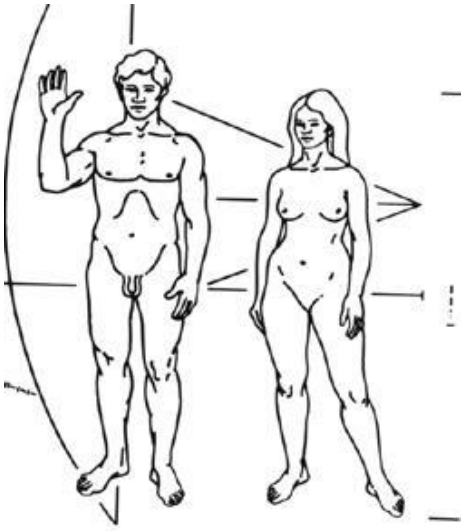

**Figure 34. The greeting couple, Pioneer Plague (1972). Image Credit: NASA.**

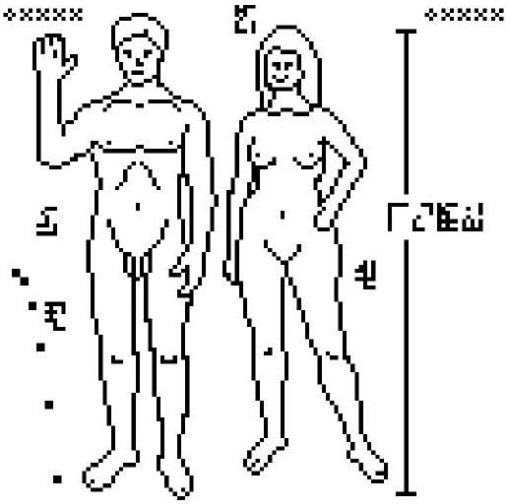

**Figure 35. The greeting couple, Cosmic Call (1999). Image Credit and Copyright: Yuvan Dutil & Stephane Dumas**

I will now give the first example of public reflection on the scientific enterprise and show how the legacy of the Voyager message lives on. Vincent Meertens, who describes himself as graphic designer and visual storyteller, presented a remake of the visual portion of the Golden Record. The artist referred to cultural stereotypes presented on the Golden Record in his online comment:

> The original Golden Record is not a comprehensive scientific view on our planet but a subjective vision from NASA. My Golden Record is a personal reaction to this. But also on how we deal with each other and the Earth.[46]

The following image is set in the context of the Voyager pictorial sequence, where life on earth is presented in terms of the story of a human life, which starts with the presentation of Reproductive organs > Conception > Fertilised ovum > Model of foetus > Heterosexual couple expecting a child > Birth > Nursing mother > Caring father> Group of children > Family. The images below present the image of a procreative couple (Figure 36):

[46]Retrieved from http://www.graphsic.com/Golden-Record-Revisited. Accessed 12 September 2 012. Project website available from http://www.goldenrecordrevisited.org/?hideAbout=true.

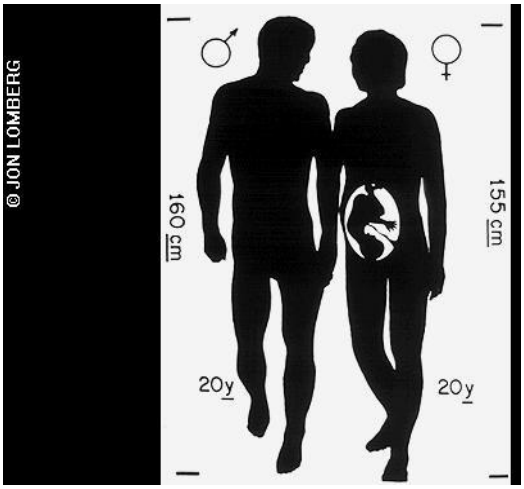


**Figure 36. Diagram of male and female from Voyager Message (1977). Image Credit: Jon Lomberg, NASA.**

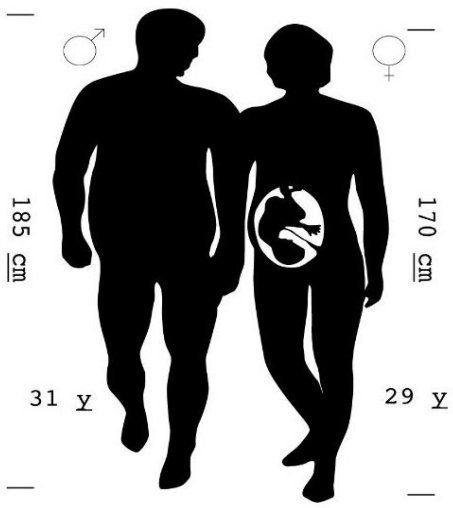


**Figure 37. Contemporary visual paraphrase of Voyager's diagram. Image Credit: Vincent Meertens.**

As compared to the original image, the author pointed to the cultural stereotypes presented in the image (Figure 37). The tags describing the age, gender, and height of the black-and-white figures were updated to fit current Western demographics. A smart, visualised critique of the original "Heterosexual couple expecting a child" diagram (left) as transposed to present days (right) is provided here.

Without any doubt there is one more underlying motive, and that is the common base for life, the science fact that we are hydrogen-carbon-nitrogen-oxygen-based life forms that under evolutionary conditions developed into intelligent beings producing tools and technology. The characteristic of imagined 'Other' again points us to the vocalisation of 'us' rather than the 'Others'. Yet perhaps it is the consciousness of unpredictability of the 'Other' that enables us to experiment and reach beyond disciplinary boundaries.

## 3.8. From All Over the Earth: The Collection of Curiosities

The TeenAge Message can be considered to be the last scientific messaging of its kind and the first sign of the upcoming messaging era that was about to commence following the arrival of the new millennium. Firstly, a group of Russian teenagers were asked to participate in the content selection and creation of the TAM

message.[47] This may indicate the democratisation tendency within science rather than primarily a pragmatic reason to popularise. Nevertheless, messaging since then has become popular as a marketing tool in public relations and a form of promotion – to some scientists clearly just partially scientific or even pseudo-scientific (Zaitsev 2012).

In 2006 the French television channel ARTE F produced a documentary dedicated to the search for extraterrestrial life called "Cosmic Connection" that was later broadcast to both local and exo-local audiences in French.[48] This messaging-like enterprise was described as the "first intergalactic program for Terrestrials and Extraterrestrials" and was transmitted from an antenna in France. Another public message is known as A Message from Earth (AMFE) marks the upcoming of digital era and a way of interaction. AMFE is the first online messaging enterprise, as the message content was collected "democratically via the internet, made up of pictures and words from Bebo users" (A Message from Earth 2012). It was broadcast in 2008 towards the first extrasolar planet found in what is called a habitable zone of its host star, also referred to as the "super-Earth", Gliese 581c. Both messages were recognised by SETI scientists as a message and classified as "other METI transmissions" on the SETI website. The use of Internet in message composition was proposed by Zaitsev in 2002 who suggested the "inversion from SETI@home into METI@home".[49]

In 2008 NASA broadcast the Beatles song "Across the Universe" to celebrate the 50th anniversary of the foundation of the space agency. Although a project run by a high-profile scientific institution, it was later described by Zaitzev, the SETI League's Regional Coordinator for Russia, as "pseudo-METI". Here one can wonder whether the broadcast was likely intended as a clever PR idea that would receive

[47] Available from http://www.cplire.ru/html/ra&sr/irm/teen-age-message.html. Accessed 18 September 2012.
[48] More available from: http://translate.googleusercontent.com/translate_c?depth=1&hl=en&prev=/search%3Fq%3DCosmic%2BConnexion%26hl%3Den%26rlz%3D1C1CHNU_enCZ349%26prmd%3Dimvns&rurl=translate.google.com&sl=fr&twu=1&u=http://www.cargofilms.com/_fr/fiches/docu.php%3Fid%3D9&usg=ALkJrhhiNkLA6NKN2aNKcLMFVawra5FeBw. Accessed 25 August 2012.
[49] Information retrieved from the Institute of Radio-engineering and Electronics of the Russian Academy of Science. Available from http://www.cplire.ru/html/ra&sr/irm/METI@home.html. Accessed 01 April 2013.

great media coverage because the messages to the 'E.T.' have been gaining increasing popularity in the past decade, rather than as an actual greeting to extraterrestrial intelligence. The broadcast was later being commented on by Sir Paul McCartney who said "Amazing! Well done, NASA! Send my love to the aliens."[50] Here comes into sight the popularisation tendency within science, or at least an outreach towards the public. A shining example of public engagement with scientific enterprise is the SETI Institute (listening mode), which will be discussed in greater detail in the following chapter.

For now, a good example of science engaging with the public is the project known as "Name in Space" or simply the Kepler DVD. In 2009 the Kepler probe was launched from the Kennedy Space Center on a mission to detect extrasolar planets and to search for other planetary systems in the galaxy. Especially relevant here is its search for habitable planets, the mission that will be introduced in detail in Mode 3: Exploring. The Kepler spacecraft keeps surveying a little portion of the night sky near the Swan (Cygnus) constellation, and to date it has discovered 21 planets with another 1,200 to be confirmed.[51] The photograph (Figure 38) shows the Kepler mission Deputy Principal Investigator with the thousands of names burned onto the DVD as attached to the Kepler vehicle.

**Figure 38. "Name in Space" or Kepler DVD (2008). Image Credit: NASA**

[50] Information retrieved from NASA News Release 08-032. Available from http://www.nasa.gov/home/hqnews/2008/jan/HQ_08032_NASA_Beatles.html Accessed 01 April 2013.
[51] Valid as of 16/09/2011.

As the technology advances, so do the tools used to convey our messages. In 1972 a simple metallic plaque was used to inform about human life of Earth; in 1977 the tool was a golden 'LP' with a phonograph attached to it, to be assembled; and in 2009 we used an optical disc, a 'DVD'. Nearly 60,000 people submitted their names, country, and optionally a short statement – a personal message, all of it to be placed on the DVD and attached to the Kepler spacecraft.

In the same year, a public message entitled "Hello from Earth Message" was broadcast from the NASA/CSIRO Canberra Deep Space Communication Complex located in Australia towards the newly discovered extraterrestrial planet Gliese581d. Not only does this involve a new continent entering the until recently exclusively Euro-American undertaking, but the utilisation of a social platform to collect messages from people all over the world represents an innovation and development within the field. More than 25,000 messages were collected via the website after agreeing with the terms and conditions for the submission, part of which is quoted below:

> What we will do with your Hello from Earth message: If accepted, your Hello from Earth Message will be:
>
> - published on the Hello from Earth website for an indefinite period;
> - broadcast beyond planet Earth by radio dish or other means;
>
> You acknowledge that your Hello from Earth Message may be read on our website by people from planet Earth, but may also be intercepted in space or be received by the target planet to which it is beamed, Gliese 581d, or other planets in the Gliese 581 star system.

The terms & conditions to be agreed on before submitting a message via the online interface are a fascinating read that elevate Cosgrove's description of "the expansion of a specific socio-economic order across space" (Cosgrove 1994:289) to a new level.

## 3.9. Where No Science Has Gone Before

In 2010 Penguin Books announced a competition to mark the anniversary of Paul Davies's book "The Eerie Silence" and the 50th anniversary of SETI.[52] Penguin's readers were encouraged to submit a message and top five to win a free book. Approximately a thousand messages were selected and beamed out from Cornwall, UK.[53] On the project website, Paul Davies, a renowned physicist, cosmologist, and astrobiologist working at Arizona State University, said:

> From time to time, humans have deliberately beamed powerful messages into space to attract the attention of any cosmic company. (...) But the purpose of the exercise is not so much to establish a dialogue with ET. Rather, it is to get young people to reflect on some deep issues, such as whether or not we are alone in the vastness of space, what is mankind's place in the universe, and why after 50 years of patient listening SETI astronomers are greeted by only an eerie silence? What is more, it is a bit of fun.

Apparently Davies here describes the popularisation of science and public engagement with scientific projects.[54] As one can see here, the aim of message sending is no longer to contact or communicate. In this case, the messaging is motivated by science popularisation and public engagement.

The most recent "Wow" message is essentially a response to the so-called "Wow" signal that was detected in 1977 by the Big Ear radio observatory, Ohio State

[52]Retrieved from http://www.penguin.co.uk/static/cs/uk/0/competition/0210/eerie_silence/index.html. Accessed 23 August 2012.
[53]Goonhilly Satellite Earth Station, Cornwall, UK.
[54]Top 50 available from http://www.penguin.co.uk/static/cs/uk/0/competition/0210/eerie_silence/top50.html. Accessed 23 August 2012. Below we can read a selected sample of five winning entries, representing the public contribution towards the SETI search:
"If you've been watching our television broadcasts, I'd like to apologise for everything before and after Carl Sagan's Cosmos." By Andrew, Manchester
"Two thousand years ago, we had a very enlightening visit from the Creator's Son. Has he been to visit you yet?" By John, Preston
"Hello! If you're planning to visit our planet, please know you will need to remove all metal from your person, take your shoes off and submit to a full body scan, carry all liquids/gels/aerosols in clear plastic bottles no bigger than 3.4 oz, surrender all cigarette lighters and batteries, pack all jams and jellies (but pies can be carried on) ...oh yes, Welcome to the Earth!" By Seema, Elgin
"For sale or trade: Several billion tonnes of carbon dioxide. All reasonable offers considered! Must pick up, can not ship." By Andrew, Canmore, Alberta
"Did you think YOU were alone in the universe?!" By Mrs Munro, Nottingham

University. The signal was believed to be a candidate for the detection of extraterrestrial intelligence, but this has never been proved. Nowadays in the age of social media, however, the Wow signal is interpreted as (potentially) like a tweet from outer space. The message scheduled for 2012 as a response to that signal from outer space, "The Wow! Reply", is a part of the National Geographic channel series called "Chasing UFOs".[55] The Wow message as an idea of making a message is important for two reasons. We see here that to a popular mind, mind that is on a regular basis exposed to countless science fiction stories, fabricated news about alien abductions, and science fantasies, the conceptual difference between UFO and intelligent life is not what matters. The second reason is the marketing idea and the utilisation of social media, namely the microblogging tool Twitter, through which people engage with the TV show, the channel, etc. using #chasingufos. On the promotional video, excited presenters encourage people to submit a 160-character-long message in the form of a Tweet with a hash tag:

> 35 years ago, we received a signal from space. It came to be known as the Wow Signal. Many believe it was a short message from another intelligence. Isn't it about time we sent a reply?

Also worth noting here is the controversial message entitled Poetica Vaginal. In 1986, the artist Joe Davis recorded vaginal contractions of ballerinas and beamed this interpretation of 'human conception' to distant star systems using the Massachusetts Institute of Technology's (MIT) radar facility.[56] This is how Joe Davis described the message construction process:

> In 1986, I organized an artistic project to transmit vaginal contractions into space to communicate with extraterrestrial intelligence. The project, called Poetica Vaginal, involved artists, mechanical and electrical engineers, biologists, astronomers, professional dancers, architects, linguists and philosophers.[57]

[55]The video advert promoting the show is available at: www.youtube.com/watch?v=vWxBTjuuwiU&feature. Accessed 23 August 2012.
[56]Orbiting space sculptures, another project proposed by Joe Davis, was, according to Medienkunstnetz, "banned by the International Astronomical Union as contributing to the proliferation of space junk".
[57]And further continues describing the message construction: "a 'vaginal detector' was built in a laboratory of mechanical engineering and consisted of a water-filled polyallomer centrifuge tube mounted on a hard nylon base that contained a very sensitive pressure transducer. Dancers and other

It is necessary at this point to distinguish between scientific entrepreneurship seeking to secure funding for a research project using public support, such as the SETI Institute (which will be discussed in the following chapter), and the business activity that translates science into a commercial undertaking or even artistic project. Since the early ages of the SETI search in the 1960s, the messaging to extraterrestrials has crossed the disciplinary boundaries of science and the public sphere. This development is enabled through access to the technology and know-how (and funding) needed to conduct such an enterprise.

The commerce in the Space Age goes where no scientist has gone before, and this subchapter is intended to give some examples of a Space Age-derived business opportunity. There is a new, fast-growing multimillion-pound industry derived from the space programme. The obvious example is space tourism in the form of Richard Branson's Virgin Group company Virgin Galactic, which has been widely discussed throughout the media, especially after the first bookings were made available to purchase online.

To paraphrase Cosgrove, in the context of the marketability of outer space, the emergent business start-ups signify the commercial conquest of interstellar places (Cosgrove 1994), but on a new level outer space has become a target of our sentiments and rituals and a place where the new cultural imaginations are being expressed. The Houston-based company Celestis provides memorial spaceflight services which enable a symbolic portion of cremated remains to be placed into orbit, onto the lunar surface, and into deep space. The Earth Rise Service, for example, starting at a base fare of $995, will lift 1 gram of cremated remains into orbit and bring them back to earth. Note that there is the offer of a discount of 10% provided to veterans. A creative approach towards product branding introduces burial services and products named after famous space missions. There is the Gemini Module Option, which includes two participants at 7g each. The Voyager Service

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female volunteers (unsolicited) hygienically invaginated the detector in order to characterize vaginal contractions (the fastest was clocked at 0.8 Hz). The embedded pressure transducer was sensitive enough to detect voice, heartbeat, and respiration as well as voluntary and involuntary vaginal contractions (...) Thus, three forms of the message were simultaneously generated: 1) an analog signal directly generated by vaginal contractions; 2) a digital map of same and 3) voice (English phonetic maps of vaginal contractions)".

was to be launched in 2012, which would send one's remains on a voyage into deep space. As announced on the website, Majel Roddenberry is to fly with her husband, Star Trek™ creator Gene, on a Celestis Voyager deep space mission.[58] Priced at $12,500 for one gram of cremated remains, the posthumous space travel is considerably cheaper than space tourism and also offers a budget planning option for "families who wish to secure a reservation before the time of need".[59]

Andrew Cutting in his paper "Ashes in Orbit: Celestis Spaceflights and the Invention of Post-cremationist Afterlives" (2009) described this as "American way of death" and analysed the role of Celestis and similar business ventures as a new arena of commercial enterprise and consumer spirituality. Interpreting "posthumous tourism" the within the tradition of ash-scattering, Cutting concludes that the Celestis space memorial services remain a religious act yet "reveal fundamental tensions in the cultural imaginary of technoscience: as bringer of transcendence and personal fulfilment, and as bringer of death and failure." (2009:367)

Another brilliant example of laissez-faire policy in outer space occurs just half a century after the Message to Venus. The year 2008 opened a new era in METI as well as in marketing: a Doritos commercial was broadcast toward the Big Dipper constellation and became the first advertisement ever transmitted to the universe, making "one small step for man, one giant leap for advertising". According to the Leicester University press release:

> Today Doritos makes history, taking the UK's first step in communicating with aliens as they broadcast the first ever advert directed towards potential extra terrestrial life […] The transmission is being undertaken as part of the Doritos Broadcast Project, which invited the UK public to create a 30 second video clip that could be beamed out to the universe offering a snap shot of life on earth to anyone 'out there'. 61% of the UK public believe this is just the start of communication

[58]Memorial Spaceflight Services, Source: http://www.celestis.com/services.asp. Accessed 18 August 2012.
[59]Retrieved from http://www.celestis.com/services_voyager.asp. Accessed 18 September 2012.

with ET life and that we will enter into regular communication with an alien species at some stage in the future.[60]

While pushing the boundaries of marketing across the distance of 42 light years, the boundaries of terrestrial efforts to communicate with aliens had been pushed and made it onto the pages of the Guinness Book of Records. The advertisement obviously caused an impact in the commercial sphere and the history of marketing practices. The reaction of the professional community was rather ambivalent. The online press announced: "First space ad targets hungry aliens" (Colin Barras 2008 in New Scientist) and "How to make a bad first impression" (Jeremy McGovern 2008 in CS Astronomy online). Yet the Doritos ad is now listed on the list of messages sent to the universe, although it is classified by Alexander Zaitsev as "pseudo-METI" (Zaitsev 2012).

The messaging seems to be growing in popularity and it almost seems that sending a message to the ETs is now something less extraordinary than it was a few decades ago. The Deep Space Communication Network transmits messages submitted by their clients to outer space, in total up to two minutes of audio or 50 words or five images with proved ownership for copyrighted material which makes five minutes of broadcasting.[61] Maybe we send out too many messages, which also raises awareness of our detectability (e.g. Hawking). The cartoon on the right (Figure 39) satirises the large number of messaging activities. In connection with the concepts of other life introduced above, we can see here that the alien is actually the Grey Alien, usually a key actor of UFO abduction stories. The


**Figure 39. Alien Cartoon by Close Encounters Studios. Image Credit: CES 2012.**

[60]Available from http://www2.le.ac.uk/ebulletin/news/press-releases/2000-2009/2008/06/nparticle.2008-06-12.7228690325/. Accessed 16 August 2012.

[61]There is a whole new industry attached to the space programme and it is a fast-growing one. StarDateCards (TM) enable the customer to design a card that is then converted to light waves and transmitted into space using a laser-fitted telescope. Looking for a perfect gift? Why don't you name a star at www.nameastarlive.com.

alien is demanding we stop sending unsolicited messages to them.

## 3.10. The Inscribed – Tattooed – Scientific Knowledge

I presented above public messages as well as commercial entrepreneurship in outer space enabled by the development and availability of space technologies that are utilised in business. Rather than looking at the public understanding of science, here I present the third kind of reflection on the messaging phenomenon I encountered during fieldwork, and that is the cultural forms of the messaging as appeared among members of the public.

The first obvious example is science fiction. In the closing scene of "Star Trek: The Motion Picture" (1979), the audience can observe the mirror image of the scientific messaging. The movie was released in December 1979; two years after the Voyager probes were launched. At the end of the film, Admiral Kirk finds out that a superior extraterrestrial being returns the V-GER probe to its home planet with its message unread. More than to explore the origins of the sci-fi genre, our intention is to show that science fiction and science go hand in hand with each other (Kirby 2003a).

A peculiar example of scientific messaging transformed into a lived culture is the online collection known as the Science Tattoos Emporium, a part of the Discovery Magazine run by Carl Zimmer, which presents a geeky tattoo of the Arecibo Message (Figure 40).[62] Macaulay described the process of creating Pioneer and Voyager messages as "inscribing scientific knowledge" (2012); here we observe the scientific knowledge of basic concepts of the interstellar communication inscribed in human body. Zimmer recently published a book called "Science Ink" that is basically inspired by asking what "if scientists had tattoos of their science". The online Emporium continues to grow, and the scientists are encouraged to submit a photo of their tattoo online. The picture on the right (Figure 41) presents Niles's tattoo of the Pioneer Plaque.[63]

[62]Homepage http://blogs.discovermagazine.com/loom/science-tattoo-emporium/. Accessed 16 August 2012. Image retrieved from http://www.geekytattoos.com/the-arecibo-message/. Accessed 18 August 2012.
[63]Retrieved from http://blogs.discovermagazine.com/loom/science-tattoo-emporium/?nggpage=14&pid=125. Accessed 18 August 2012.

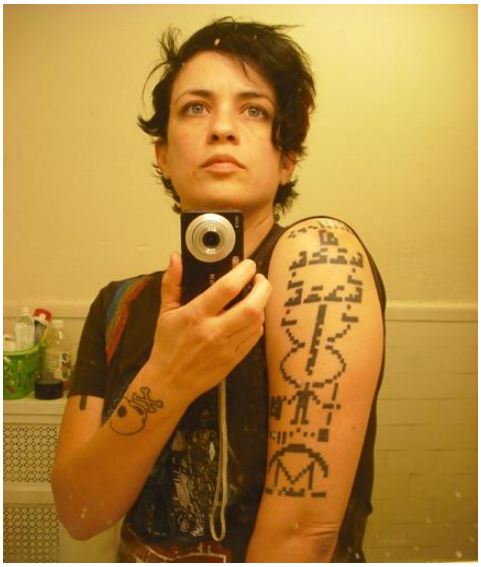

**Figure 40. Tattoo of the Arecibo Message. Image Credit: Geeky Tattoos.**

**Figure 41. Niles's tattoo of the Pioneer Plaque. Image Credit: Geeky Tattoos.**

Bob, a software architect, writes about his tattoo (presented on Figure 42) as one of the signature symbols the 'charming science' has provided:

> The diagram is part of the key used on the Pioneer 10 and 11 plaques and the Voyager 1 and 2 records. It represents the spin-flip transition of neutral atomic hydrogen, and so provides a universal physical constant, a measure of length and of time, by virtue of the photon it emits. These are the base units on those plaques and records, where we attempt to communicate very precise information without any shared language or other common assumptions. This diagram is part of the ultimate "message in a bottle."[64]

This is precisely the time-reference diagram, a symbol common for the two scientific messages. Not the only emblem of science, the collection of tattoos includes representations of other notable scientific achievements: RNA molecules, hydrothermal vent endemic gastropods[65], a carbon 60 molecule[66], and not surprisingly also a representation of a double helix[67].

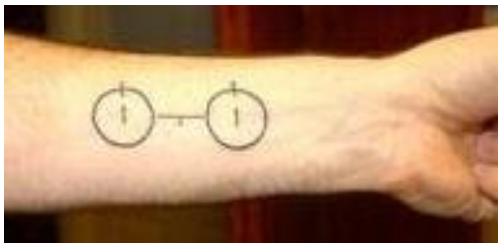

**Figure 42: Tattoo of the Pioneer Plaque's time reference diagram (hydrogen symbol). Image Credit: Geeky Tattoos.**

[64]Retrieved from http://blogs.discovermagazine.com/loom/science-tattoo-emporium/?nggpage=7&pid=203. Accessed 16 August 2012

[65]Available from http://blogs.discovermagazine.com/loom/science-tattoo-emporium/?nggpage=7&pid=188. Accessed 16 August 2012.

## 3.11. Concluding Remarks

Introduced as a means of communication, scientific messages are at root cultural artefacts: man-made objects designed to keep and pass on the indigenous wisdom and knowledge by a specific culture of science. Todorov's study of the conquest of America as a universal victory of Christianity (Todorov 1992) inspired the idea of recognising messaging as a symbolic conquest of interstellar space. The conquest of extraterrestrial places in the context of terrestrial socio-political circumstances represents a victory of American or alternatively Soviet science. In this sense we deal with the "imperialist expansion" (Cosgrove 1994) into the interstellar domain. Although message sending signifies the conquest of extraterrestrial space in the context of the Cold War, the stronger emphasis of messaging as a form of colonialism or socioeconomic conquest of extraterrestrial places stands out in the context of commerce and business.

What Harding calls the "European expansionism" (Harding 1992) when referring to science could now be paraphrased as a kind of 'commercial expansionism', where science and technology have made it possible for commerce to enter and use outer space for such conduct. It became increasingly apparent that there is a scientific sentiment present in messaging, an idea communicated particularly well by Sagan. The notion of the cosmic loneliness of messengers that travel into infinity is clearly expressed in Sagan's famous quote:

> A billion years from now, when everything on Earth we've ever made has crumbled into dust, when the continents are changed beyond recognition and our species is unimaginably altered or extinct, the Voyager record will still speak for us.

In order to maximise the probability of detection, the direction of the transmission has been carefully chosen to include stars similar to our sun. The motive of similarity to a familiar celestial object, the sun, explicitly emerges for the first time. The

[66] Available from http://blogs.discovermagazine.com/loom/science-tattoo-emporium/?nggpage=7&pid=177. Accessed 16 August 2012.
[67] Available from http://blogs.discovermagazine.com/loom/science-tattoo-emporium/?nggpage=7&pid=175. Accessed 16 August 2012.

efficiency of messaging as a contact or detection method seems to be futile and is often questioned by scientists themselves (as seen in interviews). The key note of the messaging seems to be simple: it is worth the try. Figure 43 presents an overview of messaging attempts as reflected in popular art.


**Figure 43: The messaging attempts reflected in popular art. Image Credit: Sam Pratt.**

Interestingly enough, messages are not just intentionally sent towards distant planets and later stars. In popular description, the space around earth is surrounded by signals/noise originating from earth, the radio pollution of outer space generated by human activities. Unavoidably we are making our position and presence in the cosmos known simply by using telecommunication technology:

> The presence of humans is announced through the expanding "bubble" of artificially created patterns of electromagnetic radiation that we produce (and have produced). We cannot hide (INT8E:20).

# Chapter 4: Listening to the Sounds of Silence

In this chapter I introduce the listening mode as a controversial culture of science in search of the 'Other'. I recognise listening as mainly activities of the SETI Institute based in California, USA, dedicated to the search for extraterrestrial intelligence. The appearance of the extraterrestrial 'Other' here, the "thing" (Marcus 1995:109) that I follow throughout the three scientific practices, is being imagined as an intelligent, technological civilisation. The meaning is embedded in the title itself: SETI stands for Search for Extra-Terrestrial Intelligence (from now on referred to as SETI). The engagement with general public is an outstanding feature of SETI Institute and this interaction with and openness to the public also produces new public understanding of the science (PUS), and hence I will address the position of what I call the SETI science and explore it as a "science in the making" (Latour 1999:15). The impact of SETI Institute has been analysed by Thomas Pierson in his paper "SETI Institute as a model for managing interdisciplinary science" where Pierson addressed how SETI manage science, education, public outreach, media, policy, and societal issues. The work of SETI Institute has also been reflected in science fiction, namely the film "Contact" (USA 1997) that likely influenced the Western imagination of the 'Other' and public understanding of SETI activities.

By 'listening' I refer to the act of hearing attentively as well as to paying attention to the sounds. As opposed to message sending, the listening mode is an attempt to detect signs of presumed extraterrestrial intelligence (ETI). The difference between what I describe as 'messaging' and 'listening' then lies in the methodological approach and technologies employed for the search, although both assume the 'Other' to exist. Like messaging, listening is also a technoscientific practice; that means that it is situated in a historical context and is made possible through technology. On a sociocultural level, listening constitutes new ways of understanding the universe, now presented as a sound generating environment that can be perceived via the auditory sense.

The SETI cornerstone was laid in 1959 by Cocconi and Morrison, who advocated for the SETI search and concluded in their paper published in "Nature" that a

"discriminating search for signals deserves a considerable effort. The probability of success is difficult to estimate: but if we never search, the chance of success is zero" (Cocconi and Morrison 1959). The future SETI mission was possibly best envisioned by American philosopher Lewis W. Beck in his presidential address to the American Philosophical Association (APA):

> "Space travel, or even the sending of instrumental probes, to other solar systems is so far beyond human reach that it is not worthwhile discussing at a sober philosophical cocktail party" and further moves the SETI search onto solid ground by saying that: "The only even moderately realistic hope for evidence lies in receiving and interpreting signals from extraterrestrial societies" (Beck 1971).

In essence, at the time of its creation in the 1960s, the listening method embodied a brand-new scientific discipline: the scientific search for extraterrestrial intelligence using radio astronomy. The search programmes signify the shift from active messaging to signal recording and analysis in search of a pattern that would prove the artificial source of the signal. As opposed to messaging that consists of more or less random projects, the 'listening' activities are systematic and organised: "We believe we are conducting the most profound search in human history – to know our beginnings and our place among the stars." This is how the SETI Institute describes its activities on the information network and microblogging tool Twitter.[68] At this point, it may be useful to review the conceptual background of SETI and to discuss how the search for ETI (extraterrestrial intelligence) and especially the SETI Institute came about.[69] Conceptually, the messaging and listening modes present two component parts which are methodologically different. Both rely on mathematics as a universal protocol of interstellar communication and are based on the work of Carl Sagan and Frank Drake.

[68]Valid as of 30 June 2011.Retrieved from http://twitter.com/SETIInstitute. Last accessed 19 September & 30 October 2012.

[69]S. J. Dick (2006), the former Chief Historian and Director of the NASA History Division, described the historical background of the SETI programme in his contribution published in Anthropology Today. The search for ET life is according to Dick the result of three important historical events: the Cocconi and Morrison article, the OZMA project, and the Green Bank Symposium in 1961. These events are the base for the formation of the SETI project in the sixties.

## 4.1. A Brief History of SETI

The history of listening, and hence inevitably of messaging, can be traced back to the late nineteenth century, to the pioneering time of wireless transmission. As mentioned previously, Nikola Tesla detected a signal in 1899 that he thought had originated in outer space. Three decades later, in 1935, Tesla described his experiment and testified that he supposed the signal originated from Mars and "seemed to suggest a numerical code, one – two – three – four" (Corum and Corum 2003).[70] Tesla's point contributes to the debate on the role of mathematics but also points us to Mars as the first possible target likely to harbour life. Not surprisingly, the early proposals for interplanetary radio communication emerged at the beginning of the twentieth century, and almost simultaneously numbers were proposed as a language suitable for interplanetary and later interstellar communication, or as Samuels described it: "a lingua franca for this communication" (Samuels 2005). These are the historical processes that inevitably produced a definition of other life as an extraterrestrial intelligence; or, in other words, the extraterrestrial culture of science that embraces the numerical comprehension of the world.

As previously noted, the organised and institutionalised scientific search had been substantiated in the work of renowned scientists Cocconi and Morrison, who "made this undertaking scientifically respectable" (Bryld and Lykke 2000:176) when they published their breakthrough paper "Searching for Interstellar Communication" in "Nature" (Cocconi and Morrison 1959). The frequently noted statement on the communication frequency that "corresponds to the time period of the hyperfine transition of neutral atomic hydrogen" (Cocconi and Morrison) has been recognised as a historical base for the formation of the SETI programme (originally run by NASA) by both social scientists (Samuels 2005) and historians of science (Dick 2006).

The second memorable moment in SETI prehistory occurred in 1960 when Frank Drake performed his legendary experiment, now known as the Ozma Project. Drake pointed the radio telescope towards two celestial targets and recorded his observations in his search for a signal. Although no extraterrestrial activity was

[70]Quote originates from Nikola Tesla and the Planetary Radio Signals by Corum and Corum. Full text is available from http://www.teslasociety.com/mars.pdf. Accessed 3 March 2012.

detected, the pioneering experiment marks the beginnings of the SETI project and the organised, scientific search for extraterrestrial intelligence as such. Later that year, Drake formulated an equation estimating the number of advanced civilisations in the cosmos, now known as the Drake equation:

$$N = R^* \, fp \, ne \, fl \, fi \, fc \, L$$ [71]

Using variables such as the 'fraction of communicative planets', 'fraction of life sites', and 'lifetime of communicating civilisations', the equation estimates the final 'N' that is the number of communicative civilisations in the galaxy. I will show later that the variables 'the number of Earth-like worlds' and 'lifesites' incorporated into the equation also play a central role in the third mode of the search for life elsewhere: exploring.

Not surprisingly, 'communicative' here implies an 'intelligent' – that is, scientific – society. This is to show that SETI's subject is a derivate from the Drake equation– a communicative civilisation. The Drake equation not only represented the core thesis of SETI activities but also provided the conceptual background for the detectability of extraterrestrial life, making it to cinema screens. The popular narrative written by the prominent astronomer, science populariser, and SETI advocate Carl Sagan was brought to audiences worldwide in the film "Contact" (USA 1997). In the film, the SETI activities are represented through the life story of the central character, Dr Ellie Arroway (Jodie Foster), who detects the message from an advanced civilisation.[72]

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[71] where,
N = The number of communicative civilizations
R* = The rate of formation of suitable stars (stars such as our Sun)
fp = The fraction of those stars with planets. (Current evidence indicates that planetary systems may be common for stars like the Sun.)
ne = The number of Earth-like worlds per planetary system
fl = The fraction of those Earth-like planets where life actually develops
fi = The fraction of life sites where intelligence develops
fc = The fraction of communicative planets (those on which electromagnetic communications technology develops)
L = The "lifetime" of communicating civilizations
Quoted from SETI League, http://www.setileague.org/general/drake.htm.Accessed 11 July 2012.

[72]The extraterrestrial civilisation received an early TV transmission from 1936, from the opening ceremony of the Olympic Games in Berlin. Alien intelligence, obviously unaware of the socio-political context and moral impact the recording of Adolf Hitler greeting the masses may have upon the American science adviser of the president, simply sent back the image with a message attached to it. The value-neutral scientific ethos removes attached historical meaning from the message and

The motion picture has already drawn attention of social scientists. Geoff King in his paper "The scientist as pioneer hero: Hollywood's mythological reconciliations in Twister and Contact" described the hero as "dedicated rationalist" and "pioneer scientist" (1999:371). One year later, Bryld and Lykke in their cultural study of science described Ellie Arroway as "astronomer Carl Sagan's alter ego" (Bryld and Lykke 2000:173).

The story of Contact provides an illustrative yet romanticised description of SETI activities, the prediction of what would follow the discovery, the scenario of a first contact, and perhaps the best-known explanation of the Drake equation. In popularising SETI science, the Drake equation is introduced as a tale made up of conditional clauses: "There are 400 billion stars out there, just in our galaxy alone. If just one out of a million of those had planets, and just one in a million of those had life, and just one out of a million of those had intelligent life, there would be literally millions of civilizations out there." Despite the miscalculation in the film script noted by a few science fiction fans, the film made it to its audiences worldwide. This was clearly illustrated during one of the interviews, when my respondent, an astrophysicist, commented on the role played by the film in the promotion of the SETI programme:

> I don't think SETI is that generally known. Of course it became better known because of a movie like Contact and so on recently and that's why it suddenly became known, but if you go back before that movie, very few people would have known about it (INT2:69).

I use this example to show that science fiction is recognised as an apparent channel of popularisation that also refers to cultural assumptions and scientific stereotypes that are diffused via this channel. It was noted by Kirby, who outlined the science-popularising tendencies in "Contact" and said that "Sagan (1995) felt that accurate scientific depictions in the media would facilitate a better public understanding of

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recognises the peaceful intentions of the extraterrestrial scientists (even extraterrestrial science is for the good of its originators – the scientists can communicate across the universe in their language).

science" (Kirby 2003a). This brings us to the works of the SETI Institute as a central scientific centre of the search for extraterrestrial intelligence.

## 4.2. SETI Institute@work

The SETI Institute is a non-profit organisation founded in 1984, based in California, USA. The Institute consists of three parts: the Center for SETI Research, the Carl Sagan Center for the Study of Life in the Universe, and the Center for Education and Public Outreach.[73] According to SETI Institute website, the majority of SETI's staff has university degrees in electrical engineering or computer science, including PhDs in astronomy or physics. The number of SETI scientists was described by Peter Backus, working as Observing Programs Manager at SETI Institute, in the guest editorial on the SETI League website in 2006:

> "World-wide, there are about 30 scientists and engineers working more or less full time in SETI. The largest SETI research group, roughly a dozen people, is at the SETI Institute."[74]

The SETI search also includes the online SETI@home project established in 1999.[75] When John Billingham, the chairman of the SETI committee in 1996, drafted the SETI post-detection protocol, he described the science of SETI in the following way:

> The central hypothesis of SETI is that we have the means to detect evidence of extraterrestrial civilizations, particularly the electromagnetic signals they may emit.[76]

Jill Tarter, the (outgoing) director of the Center for SETI Research, described what SETI is about and the new trends in SETI in an interview on the National Public Radio in 2012:

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[73]Retrieved from http://www.seti.org/about-us. Accessed 19 September 2012.
[74] Retrieved from http://www.setileague.org/editor/myths.htm. Accessed 01 April 2013.
[75]SERENDIP is a SETI programme originated at the University of California, Berkeley. SERENDIP is an acronym for the Search for Extraterrestrial Radio Emissions from Nearby Developed Intelligent Populations. More information available from http://seti.berkeley.edu/SERENDIP. Accessed 20 August 2012.
[76]Available from: http://www.coseti.org/setiprot.htm. Accessed 7 July 2012.

> Pragmatically, to date, we're using radio telescopes to listen for signals that are generated either for their own purposes or they're beacons, intended to attract the attention of us on emerging, young technology in the galaxy. And at optical wavelengths, instead of looking for signals that occupy only narrow range of frequency, we look for signals that are broadband — flashes of light — that last for a billionth of a second or less. And we're constantly thinking about what's the next new technology that we might innovate which in turn could be a better way of looking for extraterrestrial technologies. We do reserve the right to get smarter and we certainly don't think we know all there is to know.[77]

Throughout the 50 years of the SETI Institute's history, radio astronomy represents the key scientific method used for SETI activities, a search that one of the SETI representatives Seth Shostack, at the SETI meeting in London (2010), described as "low-probability, high-impact research". In Tarter's words, "SETI is a discipline. The SETI Institute is one practitioner of that particular discipline".[78]

For the SETI apologetics, the topic that comes up first is usually targeted towards the scientific validity of SETI as a scientific discipline. For almost two decades the SETI activities have been supported by NASA; however, NASA's SETI programme was cancelled and removed from the NASA budget in 1993 as Garber reported in his paper "Searching for good science: the cancellation of NASA's SETI program" (1999). The complex dialectics between the 'missing' subject of the SETI search and the need for funding is the midpoint of the many SETI funding strategies that have been developed to sustain the search for 'ET'. It is exactly the need of self-subsistence that has led to the creation of innovative strategies and shaped a unique and complex ecology.

[77] Jill Tarter: A Scientist Searching For Alien Life, July 23, 2012. Available from http://www.npr.org/2012/07/23/156366055/jill-tarter-a-scientist-searching-for-alien-life. Accessed 18 August 2012.
[78] Described in an interview for "The Naked Scientist" Group in June 2012. Available from http://www.thenakedscientists.com/HTML/content/interviews/interview/2129/. Accessed 30 March 2013.

**Figure 44. The Allen Telescope Array site. Image Credit: SETI Institute, ATA Gallery.**

SETI's struggle for survival and shortage of funding eventually forced SETI to shut down the Allen Telescope Array (ATA) research facilities in 2011. The Allen Array site portrayed in the image above (Figure 44) is named after its sponsor Paul Allen, the co-founder of Microsoft, who in 2001 funded the development and construction of 42 antennas.[79] Along with the Arecibo Telescope that I introduce in the following section, the ATA radio telescope array pointing towards the stars is the grand symbol of the scientific search for life beyond earth.

## 4.3. Meeting the SETI

In this subchapter I present themes drawn from fieldnotes collected during two key events that took place in the UK. Firstly Jill Tarter's 2011 Grubb-Parsons Lecture held in Durham, and secondly the 2nd SETI Conference held by the Royal Society in London. During the 2011 Grubb-Parsons Lecture sponsored by the Royal Astronomical Society and held in Durham, Jill Tarter, the former Director of the Center for SETI research at the SETI Institute, gave a talk about SETI. The lecture theatre was full of people, and on the screen at the front one could see the title of Tarter's presentation: "Are We Alone?" During the talk it became obvious and explicit that SETI coordinates its recent activities with data received from a recent project that discovered extrasolar planets.[80] The discovery of Gliese 581d, the first "officially" habitable extrasolar planet, with potentially liquid water on its surface,

[79]SETI Institute. The Allen Telescope Array by Senior Scientist: Jill Tarter. Available from http://www.seti.org/ata. Accessed 25 August 2012. Image retrieved from: www.seti.org/seti-institute/project/details/ata-image-gallery.
[80]18 May 2011, Appleby Lecture Theatre, Science Site, Durham.

was confirmed by the European Southern Observatory (ESO) in 2007.[81] This is also suggested in the press release, where one of the members of the scientific team, astronomer Xavier Delfosse, said: "[the] planet will most probably be a very important target of the future space missions dedicated to the search for extraterrestrial life".

The SETI project and astrophysicists now share one research field and subject matter (Tarter 2004), and SETI deliberately uses the data available to substantiate SETI's quest and future. Because the potentially habitable planetary systems might have enabled the life of our type – or life as we know it – or life as we expect it to be – to evolve, SETI logically targets those systems in their search.

In 2010 the Royal Society held the 2nd SETI Conference in London, dedicated to Searching for Life Signatures. The satellite meeting on "Towards a scientific and societal agenda on extra-terrestrial life" covered a wide range of topics including astrobiology, SETI search strategies, political issues (UN Agenda), and social questions raised by the detection of ET life.[82] The scientific elite from various countries arrived, mostly from the US (SETI & NASA) and UK. UN representatives from Vienna and METI scientists from Russia and France were also present at the conference.

It became obvious to me that the SETI group does not only consist of the SETI Institute but that the activities are conducted independently on various locations by several specialists; at least by people that I would describe as the first generation of SETI scientists. While the policy making and protocol development is regulated by the UN, the SETI search and METI activities are a matter of international collaboration and SETI research is a networked science. The international nature of current SETI conduct was described by Jill Tarter in her interview for a group of physicians and researchers from Cambridge University named "The Naked Scientists" in June 2012.

[81]eso0722 — Science Release: Astronomers Find First Earth-like Planet in Habitable Zone. Retrieved from http://www.eso.org/public/news/eso0722/. Accessed 7 July 2012.
[82]The meeting was held on 4 and 5 October 2010 in the Kavli Royal Society International Centre, Chicheley Hall, Buckinghamshire, and organised by Dr Martin Dominic and Professor John Zarnecki. The organisers encouraged researchers from other disciplines, namely social scientists, to participate in the debate. One anthropologist and a few astrobiology postgraduate students were present.

> "Other SETI organisations use telescopes in Italy, some in Australia, in Argentina. There's been a little work in Japan, LOFAR in the Netherlands and northern Europe and the UK - it's coming online with a low frequency radio search. And then there are other observatories, primarily university based, that look for bright optical flashes with metre-class visible telescopes. That is the scope of SETI today. It's not at all monolithic. We try to organise collegially, but there are a number of groups doing their own thing."[83]

As I mentioned in the methodology chapter, the fieldwork sites were constructed as opposed to the 'organic' sites of traditional sites of fieldwork (e.g. geographically distinct areas). Given the nature of the two fields, the culture of science and scientific culture, the sites of my research are simply everywhere and anywhere, for which reason it was necessary to employ multiple data sources and move within "multiply situated" (Marcus 1995:102) sites. My participation in scientific meetings was not viewed as a participant observation but rather as supplementary data gathering and getting to know the field. But as the research process continued, I decided to use some of the observations I had made to illustrate the SETI science.

The observations made and described below do not attempt to offer an ethnography of the group at this point but aim to provide first-hand insights into a high-profile scientific meeting and to illustrate the history and conceptual background of the SETI project. Rather unexpectedly for me, taking part in a scientific conference felt like being part of a tribal gathering where everyone important was present and those who were not were officially excused, giving good reasons for not being there. The atmosphere was welcoming, the meeting venue outstanding. The typical structure of a scientific conference: opening, session, break, session, lunch, session, break, session, summary, dinner – networking, introducing, discussing, hand-shaking, coffees, small talks, cards during the breaks.

The sessions and debates were organised around the current conduct and future of SETI activities, including astrobiology and policy developments. Another strong

[83] Available from http://www.thenakedscientists.com/HTML/content/interviews/interview/2129/. Accessed 29 March 2013.

programme point was to invite scientists from other disciplines, including social sciences and social anthropology, to discuss in particular detection and post-detection scenarios and the societal response to the discovery of ET life. To an outsider (such as I was) there was a contradiction between the rhetoric of high-level scientific knowledge and the science fiction, like concepts of interstellar beacons facilitating the interstellar communication. Despite my confusion I could observe those two seemingly unmergeable fields coexist and be vividly discussed throughout the sessions. The SETI science appeared to me a discipline where possibility meets fantasy, the process substantiated by the ethos of intellectual curiosity, scientific passion, the hunt for the truth and the necessity of seeking answers. On account of the characteristics of SETI science I would like to point out three observations I made during that meeting in 2010.

First, SETI is a 'Science with Emotions', as I noted in my field diary and later described as the 'sense and sensibility of the SETI search'. During the great panel debate, one of the high-profile SETI scientists, Seth Shostack, opened by saying that his talk might be a bit emotional, but stressed that "this is about emotions and passion". Later, when describing SETI as a field that has no subject matter, Shostack mentioned that although SETI is not going through a bad phase, "the Enlightenment process will guide us through", and he also pointed out the need for alternative thinking (also known as Gedanken Experiment). At this point the fascinating process of discovery and persistence in seeking the answers was presented as a key scientific value, the very driving force of the SETI search, of the "low-probability, high-impact" field. Defending the SETI quest and answering the ever-present question on the improbability of the detection of or contact with ETI, he said: "fifteen years ago we had no extraterrestrial planets detected, and now?"

The second notable moment was the appearance of the Starchild Project Representative. At the satellite meeting in which I was taking part, during the panel debate in the morning session, a lady stood up from the audience and informed the surprised scientific community that the aliens were on earth and that biologic relics – the Starchild Skull – were discovered in a rural part of Mexico in the 1930s. Finding an analogy with the SETI search, she informed the rather surprised but attentive scientists that their group also seeks the answers and needs funding for the genetic

research in order to prove that the skull is of extraterrestrial origin. The artefact is supposedly a skull-bone of a human–alien hybrid dated as 900 years old. One of the key speakers explained to the lady in a very professional manner that they were a marginal community and that they do struggle for the funding themselves, but if she wanted she could distribute the leaflets with more information, and then undisturbed continued the panel session and moved to another question. During the lunch break a briefing prepared by the Starchild Project UK for the delegates to the conference, which explained the background of the Starchild Project, was distributed amongst the participants. I spoke with one of the event organisers later that day, and I was told they had been contacted by this group prior to the conference. After the lunch break, during another panel the lady asked another question concerning the movements on the disclosure of classified information on UFOs. This time the reaction was not so welcoming.

One of the scientists said he did receive an email lately regarding this topic, and he responded that he couldn't imagine how the US government would manage to keep the presence of UFOs in the USA secret. This statement was followed by applause: a few people were clapping, some others just laughing. Later the scientist admitted his email was followed by threatening emails. End of the story ... and the debate on extraterrestrial life continued. One can see here a clear conceptual confusion and the 'Other' entangled with UFOs, Starchild ancestor and a conspiracy theory. Pierson noted that "popular media can sometimes confuse bad science, or even pseudoscience, with the real thing" (Pierson 2006:481) Similarily, Peter Backus, SETI Observing Programs Manager reported:

> I once talked with a man who is convinced that the rest of radio astronomy is just the "cover story" and that we are already communicating with many civilizations.[84]

Yet in case of a Startchild representative entering the scientific conference held by the Royal Society, one can wonder this seems to be also the case of public opinion – and as Pierson argued, SETI Institute worked to increase its scientific credibility and amend public image.

[84] Retrieved from http://www.setileague.org/editor/myths.htm. Accessed 01 April 2013.

Thirdly, I would like to note the specific phrases used by SETI scientists. As Kvale and Brinkmann suggested, to detect the linguistic expressions and characteristic use of language is one of the key parts of qualitative analysis (Kvale and Brinkmann 2009). Given the limited amount of data gathered at this point, the list below only highlights three important linguistic expressions typical for this field that I collected during the participation in scientific meetings as well as by reading the scientific collateral. The first phrase is grey aliens, or "little grey men". In popular understanding the phrase "little grey men", sometimes also referred to as greys or grey aliens, describes alien entities originating from a spaceship that crashed in the Roswell area, known as the Roswell UFO incident. The grey aliens are usually associated with abduction stories and play a key part in conspiracy plots. The use of this expression is usually followed by cheerful laughter, as within a scientific framework this expression seems to say: this is exactly what our search is not about. Similarly, during one of the astronomy lectures on the detection of extrasolar, potentially habitable planets, one of the scientists had brought a plastic figure of a grey alien to show what it is he does not really study, which again was followed by applause. The term is now embedded in the community-specific humour, and only those who understand can laugh, as well as those who laugh, understand. To "find a fish in the cosmic ocean" is an expression used to symbolise SETI's quest for ETI, which was used by Jill Tarter during the video conference at the SETI Conference in London. To search for ET life is like looking for a fish in the cosmic ocean. The idea behind the expression is that it is indeed difficult because the ocean is vast; it may seem impossible for the very same reason, but we have to keep trying and keep asking the question, "Are there any fish in the ocean?" The very important terms of "extraterrestrials" and "earthlings", ergo "them and us", were used to describe the others, e.g. "all earthlings need to be included in the debate" (Jill Tarter).

## 4.5. Engaging Public: SETI@home

SETI@home is a well-known online coordinated computing project. SETI launched the programme in 1999 with the aim of using the idle computing power of millions of users to analyse the narrow-bandwidth radio signals collected through radio telescopes such as the Arecibo Observatory in search of signs of extraterrestrial life.

SETI@home is funded by grants from the National Science Foundation, NASA, and donations from SETI@home volunteers.

Sharing the enthusiasm, the SETI@home project participants are organised into groups or national and corporate teams, some of them counting thousands of users worldwide (Figure 45). A whole online community has developed around SETI@home that may use the SETI website to discuss or chat, get support, or virtually socialise. The SETI@home user can create a profile that is eventually featured as the user of the day. New, online cyber communities have emerged, and established organisations are taking part in the project, too. And so the US Navy and US Air Force work along with Team China, BOINC SETI@home Russia and Microsoft Corporation. The pioneering SETI@home programme became widely famous and as a global enterprise engages over 3 million users all over the world. Two of my respondents commented on the idea and principle of SETI@home. Here my respondent refers to the public engagement with science:


**Figure 45. SETI@home project logo. Image Credit: SETI@home.**

> All you have to do is to leave your computer switched on and load a tiny bit of software which then when you're asleep will do the analysis. So I think it's absolutely wonderful. And I mean the chance again of an individual being successful is probably much less than winning a lottery. But they feel they are doing something useful, it engages people with science and I'm very keen on engaging people with any area of science (INT2:62).

The science-in-the-making@home, to paraphrase Latour's "science-in-the-making" (Latour 1999), here developed into other online projects such as Einstein@home ("catch a wave from space" used the same software), which utilised the idle time of participants' computers in search of neutron stars.[85] So-called volunteer computing and grid computing is now being used in various research projects including mathematics, chemistry, cryptography, and climate studies.[86] The image below (Figure 46) shows the SETI@home screensaver, the visualisation of sounds of outer

[85]Available from http://einstein.phys.uwm.edu/. Accessed 20 September 2012.
[86]Available from http://boinc.berkeley.edu/projects.php. Accessed 20 September 2012.

space that are displayed on the user's PC screen while their computer is analysing the data streams.[87]

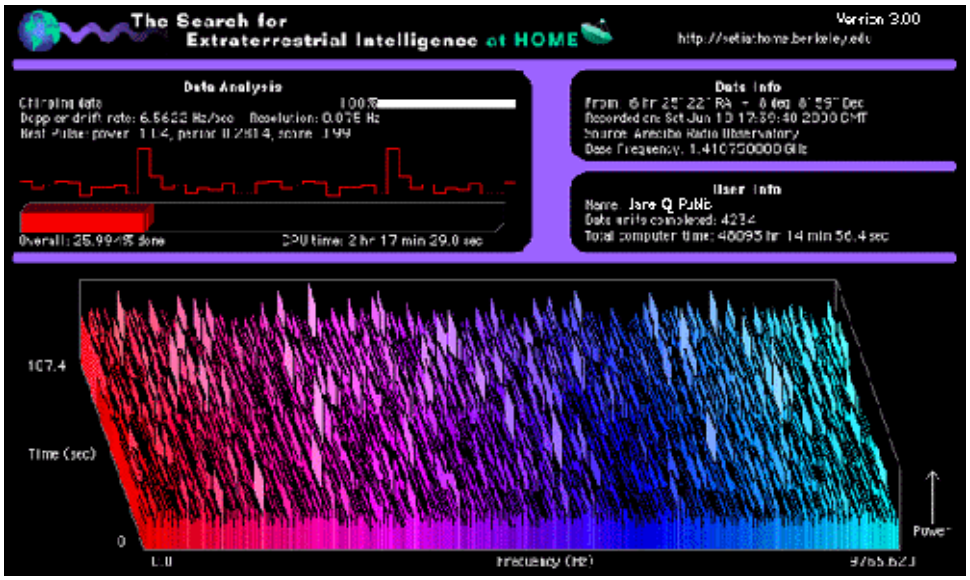


**Figure 46. Screenshot of the SETI@home screen-saver. Image Credit: BOINC Client Software Wikipedia.**

What we see here is the creation of a virtually new technospace formed inside the new media, precisely defined by Sally Munt as a "temporal realm where technology meets human practice" in the introduction to the volume dedicated to cultural studies of human/machine interaction (Munt 2001:11). If a discovery is being made through their computer, the volunteer is credited for it. The works of the community of BOINC volunteers also present a whole new strategy of public engagement with science and also a new generation of amateur scientists.[88]

Outer space, until very recently a silent domain, is now generating soundscapes that are distributed among the scientific community and, via the SETI@home project, to public audiences. To demonstrate these developments I introduce the two global icons of SETI search: radio telescopes and motion picture "Contact" (USA 1997) as the channels through which the ideas about SETI were broadcasted towards millions of people.

[87]Image source: Boing Wiki http://www.boinc-wiki.info/Screen_Saver_%26_Graphics_Display_-_SETI@Home_Classic_(Emulation). Accessed 19 September 2012.
[88]According to the BOINC statistics, the projects in total have: 263,239 volunteers, 422,726 computers.

## 4.4. The Big Ear of the Arecibo Radio Telescope

Built in 1963, the Arecibo Observatory located in Puerto Rico is part of the National Astronomy and Ionosphere Center (NAIC). The world's largest radio telescope is the centre of SETI activities. A photograph of the staggering diameter of the 305-metre telescope was included in the visual portion of the Voyager message (Figure 45 on the left); in outline it can be found in the Arecibo Message which was sent out from this location (Figure 46 on the right).

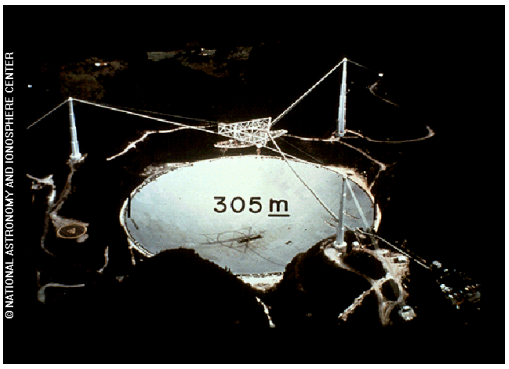


**Figure 47. Arecibo Telescope as presented on the Golden Record (1977). Image Credit: NASA and NAIC.**

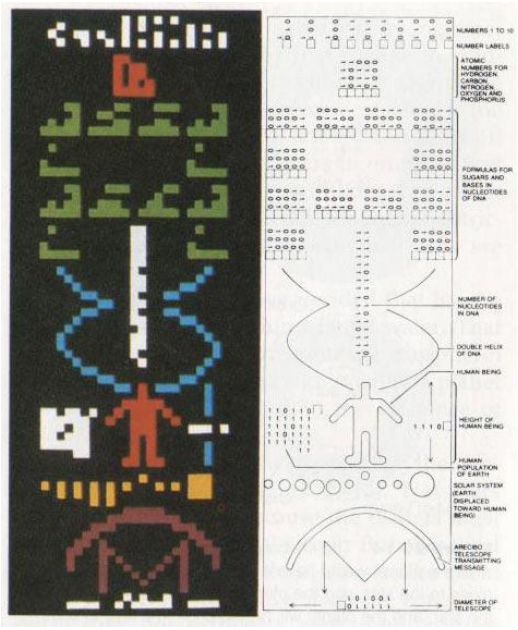

**Figure 48. Arecibo Broadcast explained. Image Credit: F. Drake (UCSC) et al., Arecibo Observatory (Cornell, NAIC)**

The icon of the SETI search became popularly known as the symbol of the search for other life (e.g. Cosmos, USA 1997). The Russian sibling of Arecibo is the Evpatoria radio telescope located in Ukraine, which was used to transmit the TAM and Cosmic Call scientific messages as well as some public messages. Functioning as both a transmitter and a receiver, the Arecibo Observatory is a technoscientific instrument that enables messaging and listening as well.

The radio telescope and earphones are used as a powerful narrative vehicle. This is illustrated in "Contact" (USA 1997) where the earpieces, carried by the main character Dr Arroway, who hears the signal from the skies, play the central role.[89] Dr Arroway hears the extraterrestrial signal 'in her own ears'– that is, "on the headphones", as shown on the film poster of "Contact" (USA 1997) (Figure 49), which features radio telescopes pointed to the stars. Yet another interesting point in the film which should be addressed is when the SETI group receives a cut in funding and Dr Arroway makes several attempts to secure finance, visiting various committees.


**Figure 49. Film poster for "Contact" (1997, film). Copyright: Warner Bros.**

The dialogue takes place in a meeting room, just after yet another presentation of SETI activities Dr Arroway has made in trying to persuade a committee to donate money to the institute:

> Executive: We must confess that your proposal seems less like science and more like science fiction.
>
> Ellie Arroway: Science fiction. Well you're right, it's crazy. In fact, it's even worse than that, nuts. [Angrily slams down her briefcase and marches up to the desk.] You wanna hear something really nutty? I heard of a couple guys who wanna build something called an "airplane," you know you get people to go in, and fly around like birds, it's ridiculous, right? And what about breaking the sound barrier, or rockets to the moon, or atomic energy, or a mission to Mars? Science fiction, right? Look, all I'm asking is for you to just have the tiniest bit of vision. You know, to just sit back for one minute and look at the big picture. To take a chance on something that just might end up being the most profoundly impact-full moment for humanity, for the history... of history (USA 1997, [29:30]).[90]

[89]It can be speculated that Dr Jill Tarter, director of the Center for SETI Research, was the inspiration for Dr Arroway.

[90]Full quote also available from IMDB, Memorable Quotes from the movie "Contact". Available from http://www.imdb.com/title/tt0118884/quotes. Accessed 25 August 2012.

The script refers back to the books of Jules Verne, to technological imaginings that were made possible through science. In a fictional world, we are presented with a story of scientific progress and development used to justify the SETI project as a progressive development of science. Throughout the film, the soft variant of the Drake equation is embodied in a sentence saying that the absence of other life in the vast universe would seem an "awful waste of space". During one of the above-mentioned interviews, my respondent expanded on the science-popularising contribution of "Contact":

> Particularly SETI allows you to explore both scientific methodology and questions of what it means to be human within story form, within narrative, which is actually very helpful and has some parallels of course to the stories we are told within our civilisation in many different contexts. Because similar things and stories about the gods in ancient mythology were partly exploring our place in the universe and who we are as human beings and SETI becomes also a way of exploring. So the science fiction stories about SETI are the way of exploring who we are in the universe and our place in it (INT3:72).

To global audiences the film "Contact" introduced the works of the SETI Institute; and the SETI scientists were introduced as those who listen to the voices coming from the sky (Bryld and Lykke 2000) and also manifested the opposites of rationality and emotions as well as struggle between seeing and believing. The film Contact was also studied from gender perspective. Jocelyn Steinke in "Women Scientist Role Models on Screen. A Case Study of Contact" (1999) analysed the portrayal of a woman scientist as a factor that may influence woman's career choices and to pursue career in science; yet Steinke concluded that motion picture portrays stereotypical images.

At the end of the film, Dr Arroway upon her return cannot give proof that contact with extraterrestrial intelligence had been made, being "left with only her own belief in the reality of the experience" King (1999:371). But terrestrial science does not rely on the fictional scenario and has prepared detection protocols: institutionalised agreements on what will follow the detection of extraterrestrial intelligence.

## 4.6. SETI Post-Detection Protocols

Emanuel Adler and Peter Haas in their paper "Introduction: Epistemic Communities and International Policy Coordination" argued in favour of the study of epistemic communities (Adler and Hass 1992) and their impact on policy making. Hass's definition of epistemic communities as "networks of knowledge-based experts" (Haas 1992:2) is especially useful here, because it explains the involvement of multinational and multidisciplinary teams of experts in SETI policy development. Correspondingly, the emergence of epistemic communities employed in space policy making, or cosmopolitics (Stengers 2010), marked the early phase of the Space Age, as did the establishment of the UN Office for Outer Space Affairs (UNOOSA) and the production of one of its first documents: "Resolution 1472 XIV – International co-operation in the peaceful uses of outer space" (UN 1959).[91] This process was also demonstrated in Jill Tarter's comment during a lecture in the UK (2011) where she described the potential discovery of extraterrestrial life as follows: "the information is the property of all humankind".

In reaction to SETI activities and the probability that some other life may be detected, it became necessary to consider also the political and ethical context of the discovery. Subsequently, questions have been raised over whether there should be a global control and coordination over the conduct of SETI activities. Similarly, should there be some sort of control over the content of messages we send to the universe (Atri, DeMarines et al. 2011)? Although there are draft policies available, those present a set of recommendations, and in fact there is no global control over active SETI projects, in other words over messaging activities.

Nonetheless, the Post-Detection SETI Protocol (PDP) has been developed by the International Academy of Astronautics (IAA) and the International Institute of Space Law, which state procedures following the detection of extraterrestrial intelligence worldwide. The SETI post-detection protocol has been designed to ensure access to the information and to coordinate the post-detection activities, now known as the "Declaration of principles following the detection of extraterrestrial intelligence"

[91]Retrieved from: http://www.oosa.unvienna.org/oosa/SpaceLaw/gares/html/gares_14_1472.html. Accessed 19 September 2012. Another UN space treaties include Agreement governing the activities of States on the moon and other celestial bodies. Also the Planetary Protection is being looked after by UN.

(Billingham, Michaud et al. 1991). One of the functions of international policies is to prevent false alarms and to eliminate a potential detection error, which also means not to disclose the unverified information to the public. The false alarm problem seems to follow the 1977 discovery of what is now known as the "WOW" signal (Figure 50). The signal was detected by Ohio State University, which was taking part in the SETI project at the time, and it was believed to originate from an artificial, extraterrestrial source.

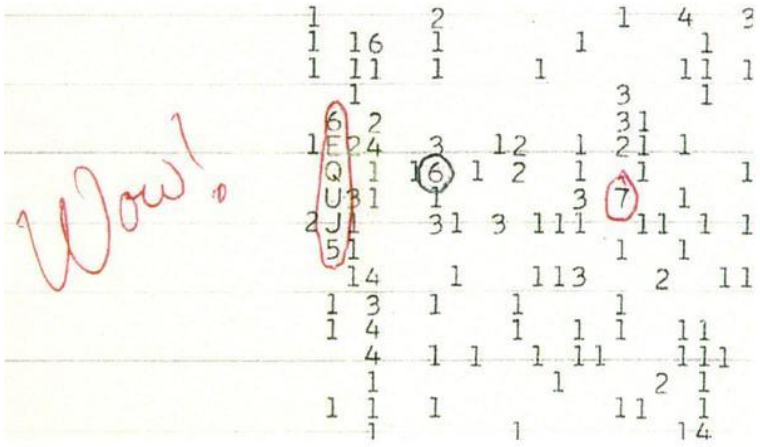


**Figure 50. The WOW Signal (1977). Image Credit: The Ohio State University Radio Observatory and the North American AstroPhysical Observatory.**

Jill Tarter (NPR 2012) described the process of reviewing candidate radio signals, events that may have led to creating protocols as a code of conduct for SETI activity:

> Early on in my career in France, I stayed awake for three days to prove a signal was a distant airport rather than something we were interested in because I thought my French colleague was going to call up Le Monde and tell them we found it. And another instance, I was at Green Bank, W.Va., and we had a second telescope in Georgia that helped us discriminate against our own technology. Unfortunately, this telescope got hit by lightning and we had three days to observe without it. And during that time, of course, we got a signal that was really interesting and we followed it for almost a whole day before we convinced ourselves that indeed, it was not coming from the star we had been tracking. It was a signal coming in from the

side lobes of the telescope. And this was a spacecraft that was orbiting the sun, and so was the planet Earth.[92]

As one can read, detecting a signal does not necessarily mean that contact with an alien civilisation has been made, which is the first reason behind developing the international policies. The SETI PDP is not the only policy related to human activities in outer space with implications for the SETI search. In 1960, NASA published a set of recommendations called "Proposed studies on the implications of peaceful space activities for human affairs". Globally, space exploration is regulated by the United Nations Office for Outer Space Affairs.[93] Despite the 2010 hoax message that the head of the UN Office for Outer Space Affairs (UNOOSA) and former director of the Malaysian Space Agency Dr Mazlan Othman had been appointed as an official contactee, the designated contact person is renowned physicist, cosmologist and astrobiologist Paul Davies, the chair of the SETI Post-Detection Task Group of the International Academy of Astronautics. The IAA established the permanent committee for SETI science to "examine all aspects of possible future contact with extraterrestrial civilizations, with special reference to international issues and activities", this includes production of post-detection protocols and other policy documents and educational activities.[94]

Recently, SETI invited social scientists to participate in the ET debate, especially with regard to predicting the societal impact of ET life detection. The key debates include estimates of a first contact situation and societal reaction to the close encounter, religious implications of the discovery of alien life for Western society, as well as the potential impact of extraterrestrial life discovery on Third World societies (volume to be published in April this year). Unlike the messaging mode, where only scientists were involved in the message-creation process, SETI has invited vox populi in the debate. The Earth Speaks was launched in 2009 and is one of the projects run by the institute. By making this step towards public, SETI scientist are trying to achieve a better understanding of how a message could be produced and by

[92]National Public Radio. Available from http://m.npr.org/news/front/156366055?textSize=medium. Accessed 2 November 2012.
[93]Retrieved from http://www.oosa.unvienna.org/. Accessed 15 July 2012.
[94] More information about the group available from the IAA website http://www.setileague.org/iaaseti/. Accessed 30 March 2013.

identifying "commonalities and differences in message content that are related to such factors as nationality, age, and gender."[95]

The Earth Speaks project encourages people to submit their messages to ET (pictures, music, and text) via the project website.[96] The rationale is "to foster a dialogue about what we should say to extraterrestrial intelligence, as well as whether or not we should be sending intentional messages". This not only signifies that the limitations of previous messages have been realised but also but is a sign of another essential feature of SETI science - the democratisation tendencies within SETI science and scientific entrepreneurship. The Earth Speaks project uses online environment to interact with people globally and collect responses.

## 4.7. SETI Funding Strategies and Public Outreach

The entrepreneurial behaviour is to be recognised as a very important funding strategy for the SETI Institute, as it is solely funded from private resources and need to secure funding to ensure the continuity of the search. Within the narrow context of the continuous need for funding that is applicable to any research area, the scientific activities related to the search for other life benefit from commercialisation and popularisation. The need for financial support in the case of SETI resulted in adaptive strategies to engage the public domain in scientific activities. Having the status of a non-profit organisation, the sustainability of SETI activities became an important issue, particularly after SETI had been cut from the NASA budget. As Kerr explained:

> The U.S. Congress forced NASA to wash its hands of SETI in 1993 after some congressmen mocked the whole idea of spending federal money to look for "little green men with misshapen heads", as one of them put it (Kerr 2005).

SETI Institute seems to excel at generating marketing ideas and makes the most of the Internet, with the website as a central point of interaction and commerce which enables visitors to connect and even engage with the SETI programme worldwide.

[95] Retrieved from http://earthspeaks.seti.org/pages/About. Accessed 30 March 2013.
[96] Available from http://earthspeaks.seti.org/. Accessed 7 July 2012.

Not only can you donate an amount online and join the SETI team for a fee; you can also shop in a gift shop, give someone a gift of membership, or even secure a place among immortals and have your name engraved on the Monument to the Discovery of Intelligent Life in the Universe. Priced at $100, the date of discovery and location of the monument are to be confirmed.

The SETI Institute had been running a peculiar programme called Adopt a Scientist (now archived). For a $25,000–$100,000 contribution, the customer could fund a Principal Investigator; this service included becoming "a member of a very rare group which has the opportunity to participate in an expedition", including invitations to private events, receiving an "annual written report from your scientist", and one's name published in any project publication. The programme website claimed that "Anyone can adopt a SETI scientist and become part of the adventure".[97]

It is scientific entrepreneurship rather than scientific knowledge that is being produced here. The gap between pure research-based science and pure commerce seems to be bridged by the ever present need for funding (Rossiter 1985). In order to sustain the search and supply it with public support, or simply to popularise it, the SETI science needs to market itself and seek new innovative ways to engage with the public or to establish a relationship and communication with the outside world. By utilising the Internet, creating net cyberspace as a public touch point, and engaging with the online community via social networks, SETI is a case study of engaged science – and, in terms of public engagement, also a pioneering one.[98]

The SETI search is perhaps conceptually independent but remains financially dependent on donations and contributions and hence the need to secure the funding stands out as a key moment in group's ecology. The image below shows the latest Donate page from the SETI website (Figure 51).[99]

[97]Retrieved from http://archive.seti.org/AdoptAScientist/levels.php. Accessed 16 July 2012.
[98]Nowadays more science institutions use social media and online platforms to reach public spaces. The Royal Society holds regular public events and uses social media such as an e-newsletter, Twitter, Facebook and YouTube to keep in touch. Public relations seem to be an integral part of most governmental, commercial, and private organisations. PR strategy such as the use of the Internet and lately social media has become increasingly popular globally.
[99]Retrieved from http://www.seti.org/node/564. Accessed 20 September 2012.


**Figure 51. Screenshot of SETI Institute's Donate page. 'Ensure the Future of SETI Institute' presents one of the SETI's funding raising strategies that also engage the public with science. Image Credit: SETI Institute.**

The introductory text describes in principle the SETI subsistence: "we rely on generous support from people like you to help us push the boundaries of our knowledge of the universe. Your support, when combined with others', can truly make a difference in the search for life beyond Earth."

In terms of the group's ecology and subsistence, SETI projects have demonstrated the ability to sustain their activities despite criticism, as well as their ability to develop innovative strategies in fundraising. Notably, the SETI@home project described above presents an enormous effort and creative thinking that enabled thousands of people worldwide to be engaged, and possibly enhanced the public interest in scientific enterprises by allowing people to directly participate in a scientific project. The art of public relations and the ability to market the project and the overall public outreach is an outstanding feature of the SETI project.

Another specific feature of SETI is the outreach. Although the scientific community engaging with SETI activities is rather small, its importance within science should not be underestimated. The SETI community involves people from a wide range of disciplines and breaks down into two main categories: the SETI Institute, as described in this chapter as passive SETI; and METI (Messaging the Extra-Terrestrial Intelligence) – that is, active SETI. The activities of these two groups overlap and are based on the very same concept. The group is networked and has two key centres symbolised by two artefacts: the Arecibo Telescope (SETI) and the Evpatoria Radio Telescope located in Ukraine (the centre of METI).

The scientific community is not a localised group but has developed into an international network of scientists and consultants. The internationalisation of SETI efforts represents a very interesting point, particularly after the Cold War era. We have seen above that the international cooperation in message construction brought fruitful cooperation, and so the international cooperation and coordination of the SETI project continues. The SETI search represents local knowledge shared within the group, but its activities have global consequences and public policy implications. We have seen above that SETI activities are managed on an international level, due to the unforeseen impact of discovery.

But the times are changing. Below is a screenshot of the Arecibo Observatory Facebook page, with the "little green men with misshapen heads" (Kerr 2005) as a mascot inviting people to visit the observatory. There are two narrative vehicles present in this image: Arecibo Observatory and aliens (Figure 52). The strategy of 'turning a weakness into strength' seems to be useful in engaging the public in scientific research (the observatory carries out the astronomical research).


**Figure 52. Screenshot of the NAIC's Arecibo Observatory. Image Credit: NAIC.**

Interestingly enough, the Arecibo Observatory that carries out the astronomical research but received a lot of attention and recognition thanks to SETI@home project uses the misinterpreted SETI subject presented in a witty graphics to promote their activities. Here I recall Berger's definition of a joke as a fictional narrative intended to amuse (Berger 1997) or in this case also convey a populist message.

## 4.8. The Missing Subject of SETI Science

Although the boundaries of the discipline and scientific method are being kept – at least from an outsider point of view – the SETI science shows differences to mainstream science (or science in general). SETI science is not a traditional one in terms of the subject matter. From the rigid scientific point of view, SETI is based on an assumption or the possibility of other life existing at best. The "subject matter" is missing; hence the search as such is not substantiated as a science. The 'missing subject' of course is an element defining all three search modes, and it is the very task of the SETI search to find that missing subject.

The concept of other life here bears a striking resemblance to the one presented above, in the chapter about messaging. Indeed, the listening mode stems from the work of the same scientific team (Sagan, Drake), and there is no doubt about what concept of life the SETI search presumes: extraterrestrial science. Yet another question remained unanswered. Does the SETI search represent general assumptions about the extraterrestrial in Western mass culture, or, more likely, have SETI activities influenced the imagining of the 'Other'? The case of the Starchild Skull may indicate that there is a certain confusion between the scientific concept of other life and the popular imagining of the same, but this distinction is brought to a new level by including marginal ufology movements in the debate.

During my fieldwork I noticed the clear conceptual distinction in the ETL notions within the scientific community. Arguably, the attitude towards other life oscillates around 50%, while the other life definition in the survey design is not explicit and includes 'extraterrestrial life', 'aliens', or the generic term 'alien beings' (YouGov 2010a; YouGov 2010b). Overlapping from one field to another, the two key concepts we could present separately as 'scientific' and 'popular' coexist and co-develop as two valid cultural categories with a long tradition, and as such should not be omitted from any study dedicated to extraterrestrial life.

In the rhetoric of science, however, we can clearly identify two fundamental concepts. The first one stems from the tradition of SETI search: an intelligent,

detectable, and inherently peaceful (scientific) civilisation that initialises contact or responds to our messages. The second concept, which will be discussed in the following chapter, is the most recent one: microbiological life, which is the subject matter of astrobiology. The line is clear. One of my respondents distinguished the two categories of the scientific search for other life as follows:

> Well, I think that splits up into two broad categories. One of which is very different from the other one. So there is the search for extraterrestrial life via the radio, which is of course done with big radio telescopes. SETI is the example. ... What you are researching for is intelligent life, because they have to develop radio technology and also they have to wish to communicate and they have to exist, which is an important aspect of it. So that's what has been going on for a long time. [...] The other category which is relatively new and probably only goes back a decade or a bit more than a decade is the finding of extrasolar planets outside of our solar system [INT2:3].

Very recently, however, the situation has changed, and SETI is moving towards new search strategies. Focusing on habitable planets and correlating their work with astrobiology (the exploring model), the SETI Institute solved the problem of "looking everywhere for anything" (Edmondson 2010:1412).

Although the Drake equation announces that our cosmos is populated by a considerable number of intelligent civilisations and the contrary would mean an "awful waste of space" (Contact, USA 1997), there is no proof that life beyond the earth exists. A considerable amount of literature has been published on SETI activities, originating from Acta Astronautica and Space Policy journals, mostly written by SETI scientists dealing with methodological (Tarter 2001; Maccone 2009) as well as strategic and policy matters (Tarter 1992; DeVore, Tarter et al. 2003; Landfester, Remuss et al. 2011). Edmondson provided a witty description of SETI efforts as "looking everywhere for anything" (Edmondson 2010), which also addresses the 'missing subject' or conceptual discrepancies that are of central interest for the cultural analysis of science in this work.

Out of many scientific arguments against the SETI search, I choose to discuss the one frequently mentioned by my respondents in order to demonstrate the scientific

search for other life, and that is the big 'if'.[100] The main argument against SETI is the Fermi paradox.[101] The key idea of the argument can be expressed in a simple question: "Where is everybody?"[102] The Drake equation estimates that there is a high probability of other intelligent civilisations existing, which is in contradiction with the lack of evidence of the existence of such civilisations. SETI had been facing the so-called "eerie silence" problem, the term used by the chair of the SETI Post-Detection Task Group, renowned physicist and science writer Paul Davies (Davies 2011).

After 50 years of SETI searches, no traces of other life have been detected. Hence the question has emerged of whether it is worth SETI continuing? Generally we can divide the debate into two groups: SETI optimists and SETI pessimists. SETI optimists think it is worth trying, as demonstrated for example by Cocconi and Morrison, while SETI pessimists think SETI is a waste of time and a potentially dangerous enterprise, as Stephen Hawking made clear in 2010.[103]

In addressing the missing subject of SETI I aim to introduce a culture of science that is defined by not having a subject matter at its disposal to study and yet still searching to find it, be that conceptually or factually. Handling the SETI science in this way enables a cultural analysis of this culture of science to be presented in comparison to the mainstream or "big science" (Price 1986). The following subchapter introduces the SETI science as a "normal", "controversial", and "deviant" science of listening to outer space.

[100]Such as the concept of Rare Earth introduced by Peter D. Ward, who in his book argued Why Complex Life is Uncommon in the Universe (Ward 2000).
[101] According to most of the popular science readings available online, the Fermi paradox is the "apparent contradiction between the high probability extraterrestrial civilizations' existence and the lack of contact with such civilizations" suggested by physicist Enrico Fermi in 1950. Retrieved from http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Fermi_paradox.html Accessed 25 September 2013.
[102]Retrieved from http://www.seti.org/seti-institute/project/details/fermi-paradox. Accessed 30 October 2012.
[103]Retrieved from http://news.bbc.co.uk/1/hi/8642558.stm. Accessed 10 July 2012. On a similar note, a famous science fiction writer, Arthur C. Clark, said: "Two possibilities exist: Either we are alone in the Universe or we are not. Both are equally terrifying."

## 4.9. The Status of SETI Science: Three Scenarios

It is hard to imagine another major question that would affect man's place in the universe, other than the other life idea. And the SETI search pinned the extraterrestrials into the popular culture and science itself by making them its subject matter. The missing subject matter, the "anything" (Edmondson 2010), has profound implications for the SETI science as a scientific practice and vocalises the specifics of SETI as a culture of science par excellence. In this subchapter I explore to what degree SETI can be regarded as a science and what is extra-scientific about this particular culture of science.

The deviant nature of SETI science has always had implications for access to funding resources. Richard A. Kerr, senior writer at "Science", pointed out that "The technology may well be available in coming decades, but SETI will also need money.[104] That's no easy task in a field with as high a 'giggle factor' as SETI has" (Kerr 2005:88). The following diagrams discuss and summarise, with three different levels of disciplinary attachment or detachment, contrasting views on SETI as scientific conduct. The models were drawn during the analysis of the interviews with scientists unrelated to SETI who are active in space exploration and related disciplines and were combined with fieldnotes that I made while participating in the SETI meeting (London 2010).

I have developed the three models following and the notion of 'charming science' to address the role and status of the SETI science is the most prominent example. I have described earlier that each of the search modes is a scientific method that as such also has a structural relationship with the totality of science.

### 4.9.a. Fully Integrated Science Model

The fully integrated model introduces the SETI science as a normal science that resides within the landscape of mainstream science. In this model, the SETI search is widely accepted as a standard scientific practice and discipline. SETI as presented below is a fully recognised and acknowledged discipline of science: a part of the "big science" (Price 1986). Figure 53 presents SETI as a normal science:

[104]Retrieved from http://www.aaas.org/news/releases/2006/0818kerr.shtml. Accessed 31 October 2012.

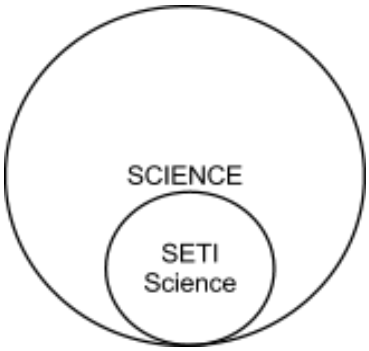


**Figure 53. Fully integrated science model (2012). Image Credit: Author.**

### 4.9.b. Marginal Science Model

The marginal-science model shows that SETI is regarded as a peripheral scientific practice that entails controversy and has so far made only a small contribution to science, and hence won't receive much public funding. It has not been excluded because of the potential contribution to science and the impact of the discovery, which always seems to be an (unpredictable) option. Figure 54 presents SETI as a controversial science:

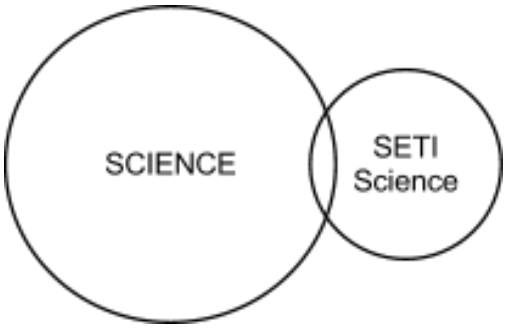


**Figure 54. Marginal science model (2012). Image Credit: Author.**

The second model seems to be suitable to describe average thinking about the SETI search. There is no doubt that the discovery of extraterrestrial intelligence would have an impact on society, yet is it possible to be realistic in the estimates and still subscribe to the SETI doctrine, especially when any estimate is based on a personal opinion or, at best, on an educated guess that is in contradiction with the description of science as what Merton called "organised scepticism" (1938:327). The scientists

themselves seem to relate SETI to the "big science" (Price 1986), and one of my respondents described SETI as being related to science:

> To be honest, my knowledge of SETI projects etc. is very basic ... I also started looking online to find out more about these projects, and I was interested to see that nearly all of them are privately funded in the main. I think this relates to the above question on the importance of science; while the question of alien life seems very important, trying to answer it would seem to probably have very few immediate benefits to science, unless we were to get lucky and detect and make contact with other intelligent life. This is possibly why the projects receive little public funding (INT5E:53).

Another interview continues along the same lines, but the respondent is more explicit about the amount of resources that should be used to conduct SETI searches. To my question on the value of SETI within science, the interviewed scientist responded:

> Hmmm … That is a difficult one, but it might be that it is impossible to quantify the chances of success because this is the one-off thing. You know, you either discover it or you don't discover it, so it's kind of a binary decision about if you're going to be successful or not. But I do think it is worth it, providing it doesn't eat up research time on the big facilities that could be used for other things, more than a fraction (INT2:49).

Here the SETI science is located in the periphery of the scientific metropolis, as a peripheral scientific practice conducted by a minority with restricted access to resources such as 'observing time'. Backus reported that SETI only uses 5% of the telescope time at the Arecibo Observatory.[105] This is even less than the exact fraction referring to observing time dedicated to the search, which was mentioned during one of the interviews. My responded suggested this could be: "10% or something like that – a small fraction of time to go on with these searches as well as 90% being used for research" (INT2:52). Despite the potential high societal impact of the discovery of intelligent life elsewhere, the SETI search remains on a margin of the 'big

[105] Retrieved from http://www.setileague.org/editor/myths.htm. Accessed 01 April 2013.

science' and is solely funded from private resources as described in section dedicated to SETI funding strategies.

### 4.9.c. Black Sheep Science Model

The Black Sheep Model presents SETI as an outcast science and clearly denotes SETI as a disreputable member of the big science group. Here we see the SETI search located outside the scientific community, and in extreme forms the SETI science is regarded as a pseudoscience. Figure 55 presents SETI as a deviant- or pseudo-science:

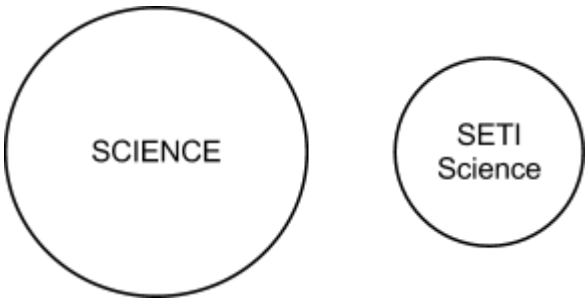


**Figure 55. The black sheep science model (2012). Image Credit: Author.**

Rather than seeing it as marginal or peripheral, extreme opinion regards SETI as not being science at all and hence as detrimental to a scientific career and scientific reputation. This was illustrated by one of my respondents, an astrophysicist who said during a personal conversation prior to the interview that to dedicate one's time to the search for aliens (particularly in the 1980s) equalled a "scientific suicide". Similarly, Kerr mentioned the "giggle factor" of SETI (Kerr 2005). But the times are changing. In the paper "SETI - A Scientific Critique and a Proposal for Further Observational Modes" published by the Journal of the British Interplanetary Society in 2003, authors classified SETI as follows: "It falls under the banner of scientific research (unlike UFOlogy which must be classed as "pseudo-science") but it is not clear that it follows the scientific method. Like astrobiology (also known as exobiology), it lacks a well-defined subject-matter in the form of physical evidence." (Ellery, Tough, and Darling 2003)

In context with the scientific legitimacy and reputation, Pierson has shown, how this tension motivated the Institute to communicate the right image to broader public:

> The continuing need to distinguish the legitimate science of SETI from the lucrative and sensational pseudoscience of our popular culture has been a very strong motivation for the SETI Institute to develop an aggressive public outreach and education mission. (Pierson 2006:479)

Quite obviously, the three models can be applied to all three search modes and basically illustrate three ways in which scientists conceptualise and classify the SETI science. As seen in recent studies (Ellery, Tough, and Darling 2003; Pierson 2006:479) the status of SETI science is being negotiated and SETI Institute works on profiling and presenting itself as a legitimate science.

## 4.10. The Brave New Science of the Extraterrestrial

The popular magazines and news websites frequently publicise extraterrestrial life, typically confusing popular 'alien' life and scientific SETI concepts. The June 2010 online issue of the Scientific American provided an interactive presentation, '12 Events That Will Change Everything', that listed 12 anticipated scientific revolutions (Figure 56). The Detection of Extraterrestrial Intelligence was, in the opinion of the author(s), unlikely.[106]

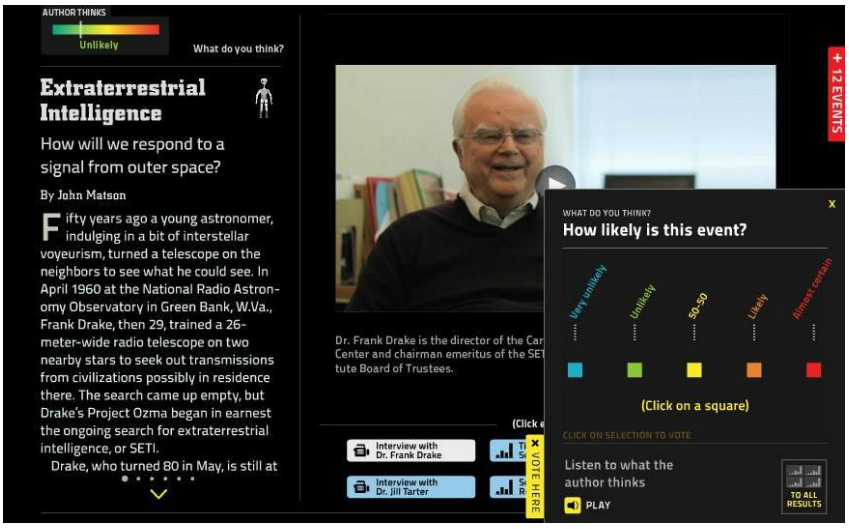


**Figure 56. Screenshot of the third of the "12 Events That Will Change Everything" of the online interactive presentation (2010). Image Credit: The Scientific American.**

[106] Available from http://www.scientificamerican.com/article.cfm?id=interactive-12-events. Accessed 22 August 2012.

Despite the decades of "eerie silence" (Davies 2011), the SETI search continues. Adapting Merton's notion of science as "organised scepticism" (1938:327), I believe the phrase "organised optimism" should be used to describe SETI science. In Merton's interpretation, the organised scepticism is a sentiment "embodied in the ethos of science-characterized by such terms as intellectual honesty, integrity, organized scepticism, disinterestedness, impersonality" (Merton 1938:327). By paraphrasing Merton's notion I do not aim to discount the credibility of the search but to address the optimism as a general disposition and outstanding feature of SETI science.

There is an opinion that despite the lack of actual benefits of the SETI search to 'real' science, the SETI search is worth the pursuit:

> My personal opinion is that I think we should definitely be doing these projects, but again I am not sure how much these searches bring to the rest of science. I suppose a key point is that we really do not have any idea how successful any of these projects will be. A question may be that if we knew that the chance of any of these message sending experiments were going to be successful was vanishingly small, is it still worth sending the message and spending money/time on the projects? I would probably still say yes, but I think it is a hard question to answer (INT5E:61).

SETI is also perceived as a way of increasing the success of detection, and new strategies are being developed, such as Optical SETI. One of my respondents said:

> I think the SETI project is a very smart way to go about searching the universe for intelligent life given our current resources and level of technology, particularly now they have begun the optical SETI project to look for direct laser light. The radio SETI project will struggle to detect life since it is only 50 or so years old, which means only stars within 50 light years have been searched, which is a very small number. Also, even if any/all of these stars have planets with intelligent life on them, they must be still using radio transmissions or have a radio beacon of some sort, which is rather unlikely. However, we can never know the mind of another intelligent creature so it is still a worthwhile project (INT4E:40).

Even if the scientists succeeded in detecting the signal or getting their signal detected, which would consist of more than "just a sort of few blips that we decide they couldn't be from a natural cause" (INT2:321),and even if they were able to initiate successful communication, such a conversation would be a long-distance and likely fragmentary one. Another astrophysicist described a somehow standard realistic scenario based on scientific thinking about interstellar communication:

> But if we really did get information and it wouldn't be a static conversation because let's say they were ten light years away, which is very close, then "hello" is ten years, "we are here" is another ten years, and then back of course, so it doesn't give you much of the chance to have a chat (INT2:323).

In the grand, cosmic scale of things, a human life is merely a "blip" and SETI scientists are naturally aware of this problem. Hence another concept emerged – a cross-generational SETI activity planning to ensure the continuity of the search. Tarter, during the video conference in the SETI meeting in 2010, reflected upon this tendency by pointing out the necessity of educating new people and building the SETI Quest community. As a community, SETI relates to the future of itself along with the prospects of humankind. Jill Tarter described how finding a signal from an extraterrestrial being relates to earth's future:

> If we detect a signal, even if there's no information — even if it's just a cosmic dial tone — we learn that it's possible for us to have a future — a long future. And that's because we couldn't possibly be successful with SETI unless technologies, on average, survive for a long time so that they can be lined up not just in three-dimensional space — close enough for us to find them — but in the fourth dimension, in time — so that they're transmitting as we're emerging.

Another interesting point to note is the development of SETI merchandise and new funding strategies, mostly accessible via the website as a point of interaction and commerce. The SETI@home project and the SETI Institute website enable people to access the information about the search and participate in the "science-in-the-making" that is at the same time beneficial for SETI itself. One of my respondents said that:

> SETI also has the added bonus of being exciting for the public as they can easily understand what they are trying to do and what the impact of a positive signal would be (INT4E:48).

Although SETI science is merely value neutral; rather, it is value charged – unsubstantiated, persistent, and talked about - I did not aim to offer a critique of the scientific quest for aliens as a non-valid science. On the contrary, the fact that SETI science works with the alien-life hypothesis and indeed operates without a valid subject matter presents a very interesting point for the study of science.

The SETI Institute here presents a specific group within mainstream science, a group that has been heavily criticised but, despite that, by pursuing their goals has had a transforming effect on society. In the search for the extraterrestrial, is SETI inherently an extra-scientific activity? This brings us back to the question I have asked in the introduction where I mentioned the four key domains of community life (ecology, social organisation, developmental cycle, and cosmology) as described by Traweek (1988).

The SETI search, here represented by the works of the SETI Institute, operates on the rational base and is driven by an ethos and a specific set of values. We cannot relate the SETI community to the "culture of no culture", as Traweek (1988:162) described the practice of physicists. Contrary to the emotional neutrality of mainstream science, the SETI science presents the emotions of cosmic loneliness. SETI science is a science with emotions, with vision and endurance; which is exemplary moment of scientific ethos. Here I recall Shostack's description of his talk "about emotions and passion" (2010) in context with what King described as "passionate rationalism". King in his study of Contact writes about the main character Dr Arroway and the motion picture: "Her search for extraterrestrial life is driven by passions. Scientific endeavour is humanized - not to say sentimentalized - in a typical Hollywood manner through scenes of childhood and the death of the father who introduced her to the stars." (1999:377). Perhaps also this passion was transmitted by Sagan to the Hollywood production of his popularising novel Contact.

The SETI search seems to operate with a slightly different set of values. More importantly, the SETI optimism is rather driven by personal belief and a possibly educated guess that stands opposite to scientific data. The group is driven by shared enthusiasm and scientific values drawn from the heritage of positivism (Schech and Haggis 2000), in particular the idea of scientific spirit and technological progress presented as a core value. During our interview, one of my respondents (a physicist) pointed to the ethos of the SETI search as a value and responded to my question of whether SETI can be regarded as an example of the scientific spirit:

> Yes, and you know, you have to have a lot of endurance to keep looking after 50 years and not seeing anything (INT3:188).

In the end, can be SETI regarded as an emancipated science? This seems to be suggested by Graham Howard in his paper "Pseudoscience and Selection" when he used SETI as an example of a pseudoscience that become science. Howard concluded that:

> "There are still astronomers who think that SETI is a waste of time, but it is no longer generally regarded as pseudoscience. Thus in the space of a few years SETI went from the realm of pseudoscience to science proper" (Howard 2004:48)

## 4.11. Concluding Remarks

After introducing the messaging as 'images of science', we proceeded to 'listening' as 'sounds of science' (Moody 2005). This chapter introduced the SETI project as a specific culture of science that is inherently cultural and scientific despite the fact that the scientific evidence central to the science, as highlighted by Woolgar (1988) amongst others, is still missing. Due to recent developments in astrobiology and space exploration, particularly during the past decade, SETI is moving towards a more reasonable and (scientifically) valid concept of other life, making use of the data originating from the search for potentially habitable extrasolar planets, such as the Kepler Mission and the NASA Origins programme.[107] We can observe the conceptual shift related to the latest developments within planetary science in the

[107]More information available from http://kepler.nasa.gov/ and http://origins.stsci.edu/. Accessed 15 July 2012.

updated description of the institute's activities as available from the SETI website. The mission of the Institute is to "explore, understand and explain the origin, nature and prevalence of life in the universe".[108] In this shift we can see the formation of optical SETI as the next stage of SETI activities.

The SETI search is a Western narrative about an extraterrestrial civilisation that has developed to build machines and communicate over space-time, and is likely to wonder if there is life elsewhere. While the astrobiology searches for bio-signatures, SETI is a search for techno-signatures; as Tarter pointed out, that means that SETI keeps operating on the premise that technology is a sign of intelligence. Each discipline dominates one of the distinctive and dichotomous domains of nature and culture.

The SETI search is a story with a Western plot; it is science fiction as an idea, detective story as a search method, but also a soap opera about one lonely race that seeks company in the vast universe. The past six decades have seen a rapid development of the scientific search for life beyond earth, challenging the grand question of our cosmic solitude. The work of scientific groups engaged with SETI activities is the key inhibitor and facilitator of such a scientific search. If we were to compare the two modes structurally, we could say that listening is basically the search for ET intelligence institutionalised, while exploring, which will be examined in the following chapter, is the search for ET life institutionalised. The difference between the two is the other life concept and subsequently the search strategies and methods.

As such, the 'charming science' of the 'Other' is theoretical. Sharing one vision and representing the 'cosmology in the making', they keep listening to the skies. Indeed, up there, there are many things to be curious about and that are worth exploring, as I will show in the following chapter.

[108] Available from http://www.seti.org/. Valid as of 7 July 2012.

# Chapter 5: The Hard Science of Exploring

"The nitrogen in our DNA, the calcium in our teeth, the iron in our blood, the carbon in our apple pies were made in the interiors of collapsing stars. We are made of starstuff." This is a famous sentence from Sagan's popular science book "Cosmos" (1985:233). As a matter of fact, Sagan here implies that the "starstuff" is our common ancestry, and hence offers a new concept of the common kinship of all humans. Similarly to this description, or perhaps precisely according to this description, astrobiology as a scientific field deals also with our cosmic origins. The key argument of this chapter revolves around the scientific interpretations of where we come from and who we are. I introduce scientific hypotheses about the origins of life and how scientists approached the great outstanding mystery of science. The settings of this mode of search for 'Other' life are conforming to the principles or methods used in science; exploring is strictly a scientific search.

My reason for naming the third mode of the ETL search 'exploring' is to imply this conceptual shift and draw an analogy with such phrases as "to search out", "seek to ascertain" and "examine into" in order to etymologically strengthen the meaning of exploring as the last search mode.[109] Exploring as such is bonded with two collateral scientific practices: the detection of extrasolar systems and astrobiology. I use the colloquial term hard science to underline the conceptual shift and address the methodological rigor and conceptual legitimacy of astrobiology and new branch of astronomy devoted to searching and characterising extrasolar planets as two emergent scientific disciplines.

The detection of extrasolar planetary systems is a new and rapidly growing field of astrophysics. Looking to find another earth outside our solar system, the search enjoys great support and attention in the media. Seemingly alongside the scientific 'planet hunt', the idea of other life being able to evolve on an extrasolar planet has also emerged.[110] I have shown above that the search for other life has proceeded

[109]The Concise Oxford Dictionary of English Etymology. Edited by T. F. Hoad. Publisher: Oxford University Press, 1996.
[110]Planet Hunters website available from http://www.planethunters.org/. Accessed 11 November 2012.

progressively from the near to the distant. The remote worlds and realms of 'Otherness' have been explored fictionally and factually. In the early science fiction stories the nearby planets were the first ones to be thought about as potential sites of other life, most notably the red planet Mars as presented in H.G. Wells's "War of the Worlds". Not surprisingly, to science as well, the very first planets considered as candidates for being inhabited were objects in our solar neighbourhood – that is the moon, Venus, and Mars. And some still are. Helmreich in his study "Alien Ocean" found an analogy between terrestrial life in extreme environments, such as extremeophiles inhabiting deep sea vents, and hostile extraterrestrial environments that may potentially be a habitat for a life. By doing so Helmreich also recorded the conceptual shift within the scientific search for life beyond earth (Helmreich 2009).

Hence the recent scientific practice astrobiology– or exobiology – is by definition a branch of biology that deals with both the effect of outer space on living organisms and the search for extraterrestrial life or an environment capable of supporting extraterrestrial life.[111] As far as the conceptual background is concerned, astrobiology studies the very beginnings of life, seeking answers for how life on earth has begun. In the very beginning of his paper "Astrobiology, space and the future age of discovery" in the Discussion Meeting Issue "The detection of extra-terrestrial life and the consequences for science and society", the publication that followed the 2011 SETI meeting in London, the Nobel Prize Laureate Baruch S. Blumberg (2011) defines astrobiology as "the study of the origins, evolution, distribution and future of life in the Universe, [which] specifically seeks to understand the origin of life and to test the hypothesis that life exists elsewhere than on Earth" (Blumberg 2011:508).

The Encyclopaedia Britannica describes astrobiology as a multidisciplinary field that deals with nature, existence and the search for life beyond earth, but also as a science that lacks a subject matter.[112] This presents a very interesting point, addressing a fact that applies to the SETI search, as we have seen in the previous chapter. This is not

[111]Author's Note: Despite my best attempts to comprehend the vast field of astrobiology, my knowledge of chemical concepts remains on the elementary level. The description provided in this chapter is therefore a result of study of the key readings and self-study.
[112]Retrieved from http://www.britannica.com/EBchecked/topic/198184/astrobiology. Accessed 21 July 2012.

the only commonality of the two search modes. The SETI Institute, although not usually placed within the astrobiology perspective, and certainly not claiming that intelligent life exists, nevertheless currently targets the extrasolar planets. The Italian space scientist Claudio Maccone described the new SETI strategy and suggested that SETI should focus on the (back then) 200 known exoplanets for signals (Maccone 2009). For astrobiology, the latest discoveries of extrasolar planets, and extrasolar planetary systems, have enhanced the growing visibility of this rather new field of knowledge and are redefining the way these research fields are perceived. This seems to be a plausible strategy as seen by a scientific mind. One of my respondents, on a similar note, commented:

> I think that it (searching for water on extrasolar planets) is more hopeful in terms of being something that we can have some hope of success. That the general expectations are there may be an intelligent message that was sent to us by scanning the heavens for a radio message. And I think the important thought of searching for water in liquid form around extrasolar planets is a) achievable and b) would give us a good handle first of all on where likely the potential life might be (INT3:26).

The science question has been reformulated and shifted to the solid ground of exact science. Even for explorers, the earth as a home planet is obviously a good starting point to start testing the detectability of life. I will start the chapter dedicated to the search for another earth paradoxically on the orbit of our planet looking down on the surface.

## 5.1. Is There Life on Earth and Mars?

When we look at earth from the outside, "one-world" (Cosgrove 1994) beyond the boundaries of human experience but bounded with scientific understanding, what do we see? How do we recognise there is life on earth? In exploring the 'Other' conceptualised as signs of life, the somewhat mysterious term biosignatures is used to denote any substance, be it element or molecule. A biosignature can also refer to a measurable attribute of a living thing that provides evidence of life, both past and present.

In 1990 a unique opportunity arose to examine whether there is life present on planet earth. The instruments of NASA's Galileo spacecraft were pointed towards earth and scientists – including Carl Sagan – were getting information about the environment and physical properties of a terrestrial atmosphere. During this controlled experiment the key data were collected on life on earth: the local biosignatures. The final report is a fascinating read that was published in "Nature" under the title: "A search for life on Earth from the Galileo spacecraft". The paper summarised the observations and also stated the criteria for life, which are both biological and technological were considered as supporting evidence of life on earth, while only the last one suggests the presence of intelligent life.[113] As Sagan et al. concluded:

> From the Galileo fly-by, an observer otherwise unfamiliar with the Earth would be able to draw the following conclusions: The planet is covered with large amounts of water present in vapour, as snow and ice, and as oceans. If any biota exists, it is plausibly water based ... The identification of molecules profoundly out of thermodynamic equilibrium, unexplained by any non-biological process; widespread pigments that cannot be understood by geochemical processes; and modulated radio emission are together evidence of life on Earth without any a priori assumptions about its chemistry (Sagan et al. 1993:720).

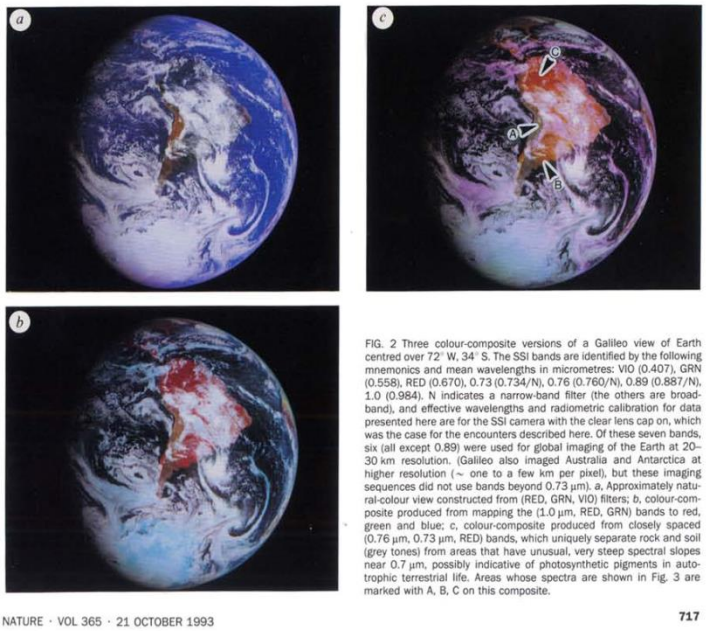

FIG. 2 Three colour-composite versions of a Galileo view of Earth centred over 72° W, 34° S. The SSI bands are identified by the following mnemonics and mean wavelengths in micrometres: VIO (0.407), GRN (0.558), RED (0.670), 0.73 (0.734/N), 0.76 (0.760/N), 0.89 (0.887/N), 1.0 (0.984). N indicates a narrow-band filter (the others are broad-band), and effective wavelengths and radiometric calibration for data presented here are for the SSI camera with the clear lens cap on, which was the case for the encounters described here. Of these seven bands, six (all except 0.89) were used for global imaging of the Earth at 20–30 km resolution. (Galileo also imaged Australia and Antarctica at higher resolution (~ one to a few km per pixel), but these imaging sequences did not use bands beyond 0.73 μm). *a*, Approximately natural-colour view constructed from (RED, GRN, VIO) filters; *b*, colour-composite produced from mapping the (1.0 μm, RED, GRN) bands to red, green and blue; *c*, colour-composite produced from closely spaced (0.76 μm, 0.73 μm, RED) bands, which uniquely separate rock and soil (grey tones) from areas that have unusual, very steep spectral slopes near 0.7 μm, possibly indicative of photosynthetic pigments in autotrophic terrestrial life. Areas whose spectra are shown in Fig. 3 are marked with A, B, C on this composite.

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**Figure 57. Three different Earth's view taken by Galileo probe (Sagan et al. 1993:717). Image Credit: Nature.**

[113]In language of science the three criteria are "evidence of abundant gaseous oxygen", "atmospheric methane in extreme thermodynamic disequilibrium" and last but not least the "presence of amplitude-modulated radio transmission" (Sagan et al. 1993:715).

The above shows how life on earth had been detected and described by a terrestrial scientist: as the blue marble (Figure 57). In 1964 NASA published a conference proceedings volume Origins of Life listing concepts for the detection of extraterrestrial life (first chapter written by Sagan), describing the tools and methods of extraterrestrial-life detection. At the time, the search was targeted to explore celestial bodies of our solar system. The red planet had been captured by human imagination as the first planet of the solar system. Edmund Ferrier, in his 1913 paper "What is life on Mars like", assumed there were forms inhabiting Mars's surface, as he believed that:

> it is likely that on Mars, as on the earth, the highest organic forms must be beings like our human species. It is improbable that they have acquired wings, for by that they would have had to lose their hands, which are essential organs of control, without which no certain knowledge could have been furnished to them by the other organs of sense (Ferrier 1913:111).

Every now and then mass media is fed by a story from Mars. Recently, searching for life on Mars became a topical issue again. We can see the search for Martian life highlighted on the SETI homepage alongside other SETI stories.[114] One of the scientists I interviewed described what would follow the detection of extraterrestrial life:

> Next to nothing (apart from a fairly big media story lasting for about a day or so) ... I meet plenty of people who seem to think that there is life on Mars, not because of any great conviction, but just because they have confused memories of media stories. Being told that we currently don't have any evidence to support this doesn't seem to affect their worldview the slightest (INT8E:24).

The recent landing of NASA's Curiosity rover on Mars (August 2012) received great coverage in the media. The titles described the landing operation as "7 minutes of terror" and the mission was talked about across social media platforms, including Twitter and Facebook.[115] One Flickr user shared his experience of Curiosity landing

[114]Retrieved from http://www.seti.org/. Accessed 18 August 2012, information valid as of this date.
[115]The international journal of science the Nature informed about "7 minutes of terror - The Curiosity rover prepares to plunge down to Mars" on 01 August 2012. Full article retrieved from

as broadcast at Times Square, New York, and uploaded the following description onto his online profile.[116]

> Tonight thousands gathered in Times Square to watch the Mars Curiosity rover safely land on Mars after a 352-million mile, 8.5 month journey. Seeing so many people gathered on a late and rainy Sunday night was truly awesome to experience. People were captivated by the images being displayed on the Toshiba screen at Times Square and listened closely to the audio broadcast over their phones. When the rover landed, Times Square erupted in a loud cheer followed by chants of "Science! Science! Science!" and "NASA! NASA! NASA!" It was really incredible to see so many people collectively captivated by science and exploration.[117]

This is a first-hand description of the "Mars Curiosity Rover Landing Broadcast at Times Square, Earth", recorded and retold by one of the participants. Another societal reaction has been recorded in a witty context as something that is joked about. For example, an online article, "NASA's rover Curious sparks new wave of space memes", explains how humorous responses to the landing spread across the Internet and eventually made it to the TV news (such as Czech television).[118] The photo-shopped image, which went viral on social networks, presents the Martians welcoming the Curiosity rover to the Red Planet.

As we can see (Figure 58), public imagination has a clear conception of how the other life on Mars would look– the Martians, the 'greys', protesting against their planet being contested, providing an eloquent reflection of public attitudes towards US policies and processes of globalisation.

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http://www.nature.com/news/7-minutes-of-terror-1.11089. Accessed 13 November 2012. NASA's Curiosity Twitter profile: https://twitter.com/MarsCuriosity. The description says: NASA's latest mission to Mars. I arrived at the Red Planet, Aug. 5, 2012 PDT (Aug.6 UTC).

[116]Flick is an online photo management and sharing application. Retrieved from: http://www.flickr.com/photos/vwmang/7723844458/. Accessed 13 November 2012.Many thanks to Navid Baraty for agreeing to one of his photographs and his description of the event being included in this dissertation to illustrate the immediate societal context of the Mars landing.

[117]Available from http://www.flickr.com/photos/vwmang/7724074220/in/photostream/. Accessed 6 August 2012.

[118]Available from http://www.news.com.au/national/nasas-rover-curious-sparks-new-wave-of-space-memes/story-fndo4eg9-1226444653461. Accessed 18 August 2012.


**Figure 58. Martians protesting against the Mars Rover landing (2012). Image source: Twitter/@inti.**

The scientists are now (at the time of writing up this dissertation) receiving data from the Curiosity rover, which is being propelled across the surface of Mars, analysing its rocks and sands. The search continues on other objects of our solar system. Very recent news came from Titan, one of Saturn's moons, and was delivered by NASA's Cassini spacecraft.[119] The search for life within our solar system has been described as follows:

> Saturn's moon Titan has many of the components for life without liquid water. But the orange hydrocarbon haze that shrouds the planet's largest moon could be creating the molecules that make up DNA without the help of water – an ingredient widely thought to be necessary for the molecules formation according to a 2011 international study. Paul Davies, a leading authority in astrobiology, director of BEYOND: Center for Fundamental Concepts in Science and co-director of the ASU Cosmology Initiative, says: "To the best of our knowledge, the original chemicals chosen by known life on Earth do not constitute a unique set; other choices could have been made, and maybe were made if life started elsewhere many times.[120]

[119]In 2011, NASA's Cassini spacecraft discovered the best evidence yet for a large-scale saltwater reservoir beneath the icy crust of Saturn's moon Enceladus. The data came from the spacecraft's direct analysis of salt-rich ice grains close to the jets ejected from the moon. "This finding is a crucial new piece of evidence showing that environmental conditions favorable to the emergence of life can be sustained on icy bodies orbiting gas giant planets," according to Nicolas Altobelli, the European Space Agency's project scientist for Cassini. Retrieved from http://www.dailygalaxy.com/my_weblog/2012/07/will-alien-life-be-first-discovered-on-saturns-enceladus-weekend-feature.html#more. Accessed 29 January 2013.

[120]Retrieved from "Saturn's Titan is Capable of Creating the Molecules that Make Up DNA". Available from http://www.dailygalaxy.com/my_weblog/2012/08/is-saturns-titan-capable-of-creating-the-molecules-that-make-up-dna-todays-most-popular.html#more. Accessed 24 August 2012.

Maybe life started elsewhere, on another planet. The story of life presented in the following section brings us to the fourth planet from the sun: Mars. The main actor in this plot is not the one of Wells's science fiction story; it is an extraterrestrial piece of rock known as ALH 84001.

## 5.2. There is Life on Mars: The Case of ALH 84001

ALH 84001 is a meteorite originating from Mars that was found in Antarctica in 1984 (Figure 59). When subjected to electron microscope examination, chain structures in the meteorite were revealed, suggesting that the rock contains traces of past life. In a paper entitled "Search for Past Life on Mars: Possible Relic Biogenic Activity in Martian Meteorite ALH 84001" by David S. McKay, published in "Nature" in 1996, the scientific team, despite the non-conclusive evidence, were quoted as summing up as follows:

> Although there are alternative explanations for each of these phenomena taken individually, when they are considered collectively, particularly in view of their spatial association, we conclude that they are evidence for primitive life on early Mars (McKay, Everett et al. 1996:929).

The media coverage of the discovery was huge. CNN in America stated that "NASA announced Wednesday that a primitive form of microscopic life may have existed on Mars about 4 billion years ago".[121] The discovery was commented on by former US president Bill Clinton. The White House press release from August 1996 says:

> Today, rock 84001 speaks to us across all those billions of years and millions of miles. It speaks of the possibility of life. If this discovery is confirmed, it will surely be one of the most stunning insights into our universe that science has ever uncovered. Its implications are as far-reaching and awe-inspiring as can be imagined. Even as it promises answers to some of our oldest questions, it poses still others even more fundamental.[122]

[121]Retrieved from http://edition.cnn.com/TECH/9608/06/mars.life/. Accessed 15 August 2012.
[122]President Clinton Statement Regarding Mars Meteorite Discovery, THE WHITE HOUSE Office of the Press Secretary, For Immediate Release; August 7, 1996. Retrieved from http://www2.jpl.nasa.gov/snc/clinton.html. Accessed 19 September 2012.


**Figure 59. ALH84001 alias Marian meteorite. Image Credit: NASA.**

Needless to say, the specialist public are aware of this event. One of my respondents recalled the discovery, in a different context. During the interview we talked about the response of the general public to the discovery of extraterrestrial life, especially after years of being bombarded with media stories about aliens:

> There may be a possibility, although I think –because it has been such a big scientific question for 50 years, I think if there would be evidence that would be quite significant. And we saw that in 1996 with the NASA claim of primitive life on Mars and that provoked a huge interest around the world (INT3:304).

Similarly, Sadava et al. (2009:61) state there were traces of water found below the Martian meteorite surface. Other projects have been undertaken in astrobiology that have studied various meteorites in search of traces of microbiological life (e.g. Open University). But does this piece of rock symbolise the end of life as we know it? Certainly it symbolises the forthcoming concept of other life, the one that will accommodate the search disciplines and comply with the claim on the scientific discipline. In some respect this extraterrestrial rock can be considered proof of other life evolving elsewhere in the universe, although found nearer than one would assume.

During one of the interviews we were talking about the astrobiology meeting held by the Pontifical Academy of Sciences in the Vatican. In 2009, the Pontifical Academy

of Sciences 2009 organised a Study Week on Astrobiology, invited high profile scientists (astronomers, astrobiologists) – including Paul Davies and Jill Tarter, the to "to bring together leading scientists in these diverse fields, to share the latest results of their own research and provide a broader perspective of how these results impact other areas of astrobiology."[123] The theological and philosophical implication of extraterrestrial life is now a serious topic that deserves consideration by the Holly Seat

Later during the interview also the evidence of past life on Mars when a question came up related to the reaction of the general public to the discovery of primitive life as opposed to the SETI signal detection. My respondent commented:

> Oh yes, I think that would be very different. I think some of the questions about who we are would be very different; I think some of the religious questions would be very different. So for example from a Christian point of view if there is lots of bacteria in the universe, well I mean Christians for a long time have been quite happy with the concept that God made lots of non-human life we see in the world around us, so bacteria would be fine. But there would be more of a challenge if there was self-conscious intelligent life elsewhere in the universe. [...] And of course the public popular mind is all about intelligent life; it is not too worried about bacteria elsewhere. That's interesting –SETI is always about intelligent life (INT3:278).

Similarly to what my respondent said, the Catholic News Agency in 2008 published findings from the Religious Crisis Survey conducted in the USA and reported that the majority of religious respondents believe that the confirmed discovery of extraterrestrial intelligence would threaten their religious tradition.[124]

While there is no general agreement on what 'life' in life sciences means– and the SETI sciences operate with various definitions– we can only say that this discovery established one way of confirming or refuting the hypotheses of an extraterrestrial

[123] Available from http://www.casinapioiv.va/content/accademia/en/events/2009/astrobiology.html. Accessed 02 April 2013.
[124] Retrieved from http://www.catholicnewsagency.com/news/most_religious_believers_dont_think_discovery_of_alien_life_would_threaten_their_faith/ Accessed 02 April 2013.

origin of life and the likely existence of primitive life elsewhere. In the end, the origins of life are something that has been written in a stone.

## 5.3. What is Life and What Do We Need to Know to Find It?

The chapter "How did life on Earth begin" in the compelling book "Life: The science of biology" (Sadava, Hillis et al. 2009) starts with a simple statement presenting two prevailing scientific theories for the origin of life. Sadava defined the two concepts as a) the extraterrestrial origin of life: "the molecules of life arrived on Earth from extraterrestrial sources" and b) the terrestrial origin of life– that is, "life is the result of chemical evolution on Earth" (Sadava, Hillis et al. 2009:61). The answer is not known, yet the direct link between the origin of life on earth and other life elsewhere was recognised and described in a NASA publication: "The question of extraterrestrial life and the question of the origin of life are interwoven. Discovery of the first may very well unlock the riddle of the second" (NASA 1964).

Helmreich in "What Was Life? Answers from Three Limit Biologies" described astrobiology as "life forms at limits of definition" (2011:689) introduced three concepts of life in three different scientific disciplines, namely artificial life, marine microbiology, and astrobiology, and discussed the variety of concepts in each discipline. While there seems to be a broad and ongoing debate on what life is, or was as interpreted within sciences (e.g. Schrödinger 1944), the popular knowledge seems to have adapted a 'working' definition or concept of what life is. The study of encyclopaedic knowledge clearly cannot provide a plausible definition of life, but the snapshots of definitions may enable us to address the level of scientific literacy, as Harding calls it, of the scientific culture.

Starting with the Encyclopaedia Britannica, life is defined as "living matter and, as such, matter that shows certain attributes that include responsiveness, growth, metabolism, energy transformation, and reproduction".[125] Wikipedia.org says that

[125]Retrieved from http://www.britannica.com/EBchecked/topic/340003/life. Accessed 15 August 2012. The definition continues with: "Life comprises individuals, living beings, assignable to groups (taxa). Each individual is composed of one or more minimal living units, called cells, and is capable of transformation of carbon-based and other compounds (metabolism), growth, and participation in reproductive acts. Life-forms present on Earth today have evolved from ancient common ancestors through the generation of hereditary variation and natural selection".

life is "a characteristic that distinguishes objects that have signalling and self-sustaining processes from those that do not, either because such functions have ceased (death), or else because they lack such functions and are classified as inanimate".[126] Another online resource, Reference.com, states: "although there is no universal agreement as to a definition of life, its biological manifestations are generally considered to be organization, metabolism, growth, irritability, adaptation, and reproduction ... The attributes of life are inherent in such minute structures as viruses, bacteria, and genes, just as they are in the whale and the giant sequoia".[127]

It is no surprise that the Catholic encyclopaedia New Advent provides a different perspective by acknowledging that "The enigma of life is still one of the two or three most difficult problems that face both scientist and philosopher, and notwithstanding the progress of knowledge during the past twenty-three hundred years we do not seem to have advanced appreciably beyond the position of Aristotle in regard to the main issue."[128]

To summarise, it is mostly the biological manifestation and Cartesian attributes of a living thing that distinguish a life from a non-living thing. To live is to evolve, to move, to replicate. In search of an operational definition, philosopher Carol E. Cleland and astrophysicist Christopher F. Chyba dedicated their joint article to providing a lead definition that would be broadly accepted. They describe the Darwinian tradition, according to which life could be described as a "chemical system capable of Darwinian evolution", as an insufficient one, because it cannot be applied to early cellular life on earth in the pre-replication phase (Cleland and Chyba 2002:388). As little is known about the early phases of life development, Cleland and Chyba summarised:

> Indeed, it is hard to imagine what could better help us to understand the nature of life than the synthesis of candidate living systems in the laboratory or discovery of independent extraterrestrial biologies (2002:391).

[126]Retrieved from http://en.wikipedia.org/wiki/Life. Accessed 15 August 2012.
[127]Retrieved from http://www.reference.com/browse/life?s=t. Accessed 15 August 2012.
[128]Retrieved from http://www.newadvent.org/cathen/09238c.htm. Accessed 15 August 2012.

The analogy between terrestrial and extraterrestrial biology of course here presents a valid scientific point. In relation to this, one of my respondents answered my question about the importance of the other life idea within science. Firstly, they mentioned the process of learning as "acquiring knowledge by investigation of context and comparison", which is obviously defining based on similarities and differences, and later continued as follows:

> Still, as of today, planet earth is the only place in the universe known to be home to life forms. This poses a substantial limit to our understanding. We are now being given unprecedented opportunities to learn more about ourselves. Fascinatingly, this is not only about deep philosophical questions, but could get quite practical. For example, realise that microbial cells hold the majority over human cells in our body. How much might we be able to learn about microbes should we discover another tree of life? (INT9E:18).

Similarly, another respondent described:

> I would say that most life forms in the universe will likely be very primitive life, something like amoebas or bacterial life. I guess this question really relies on whether we believe Darwin's theory of evolution is a universal concept of life, and since we only have one data point in earth then we can only at this point believe that it is (INT4E:6).

Finding an answer to the question my respondent raised would indeed change the ways scientists think about life and possibly create another scientific myth about human origins. However, because there is no conceptual unity regarding what life actually is, and also because there is an ongoing philosophical dispute, the sciences seem to operate with a working definition of what 'life' is, and the definition of it varies from discipline to discipline. Cleland and Chyba recognise the re-creation or detection of life as being the key to our understanding of life, but there is another method of operation as suggested by another of my respondents:

> Whether other life in the universe will be intelligent is another question, and I think we probably need to understand in more detail how life arose on earth to be able to speculate further on that (INT5E:14).

In her contribution to the publication that followed the 2011 SETI meeting, the social anthropologist Katherine Denning, who specialises in the social aspects of space exploration, the evolution of intelligence, and SETI debate, asked: "Is life what we make of it?" (Denning 2011). As opposed to the messaging and listening modes, where the comprehension of the 'Otherness' was clear, the exploring mode offers a number of understandings of 'what life is' with no answer provided. Notwithstanding the potential variety, the exploring mode focuses on the elementary level – that is, a precondition for sentient life to evolve and the building blocks of such life, also known as seeds of life.

The search for other life as based on the doctrines of astrobiology refers to the ancient concept of panspermia (Temple 2007), stemming from the Pre-Socratic philosophy of Anaxagoras. The original philosophical idea suggests that life is– or, more precisely, 'seeds' of life (spermata) are– present and distributed throughout the universe. When applied to modern science, the panspermic idea implies there is therefore a higher likelihood for other life to occur and evolve elsewhere. In this understanding, it is a property of the cosmos to hold rudiments of living things, to entail building blocks of life, and hence where conditions apply a new, other life emerges.

We are presented with a new inhabited cosmos, a universe that is "teeming with life" (INT2:159). Necessarily, then, this idea encompasses the concept of exogenesis– that is, the extraterrestrial origin of life on earth. This does not imply human beings are descendants of aliens coming to the earth in a spaceship, although the popular understanding would favour this interpretation of exogenesis. Yet the scientific theory claims that the building blocks of life were brought to earth, typically by a comet or meteorite. The genesis of our life started elsewhere, as life was transferred to earth from outside. In accordance with the principle of biogenesis, where living things come from other living things, which also involves biochemical processes of production in living organisms, the 'seeds' of life further evolved into complex life

forms such as animals and humans, life that adapted to this particular environment.[129]

What is interesting about this field is the alliance of small- and large-scale thinking in imagining micro- and macroscopic levels. While the so-called fundamental building blocks of life are microscopic, the context in which such elements are created and distributed is cosmic scaled. The works of astrobiology, embodied in this chapter as the third mode of the search for other life, is also a grand science story of life, highlighting at least two ideas. Firstly, life is introduced as a physical property of the cosmos, and living things are thought about and presented as something that can evolve as soon as the conditions essential to life are present. Secondly, there is an underlying assumption that the evolutionary process as described by Darwin might apply throughout the universe. Evolution here is presented as a biological analogy to mathematics, as something that is universal. While the evolutionary processes that gave rise to our species have been (and are) studied, there is much more to the very beginning and biochemistry of life to be revealed.

## 5.4. Bacilius Infernus and the Extreme Environments

Life is tough. "Life in Extreme Environments" is a study of extreme conditions on earth, e.g. deep sea vents and desert areas, and the microbiological life forms that have evolved under such conditions[130]. The terrestrial life that evolved in extreme conditions has received attention from astrobiologists. Rothschild in "The Universe May Be More Habitable Than We Thought" concluded that:

> Earth provides us with a wondrous array of life's adaptations. Indeed, by studying the extremeophiles here on Earth, we may get the first clear indication of what ET could be like — or at least the range of things they might eat and breathe (Rothschild 2002).

[129]Opposed to exogenesis stands the theory of the geocentric origin of life, which states that life originated from earth and has developed without extraterrestrial intervention.
[130]Stefan Helmreich in the study "Alien Ocean: anthropological voyages in microbial seas" (2009) provided an ethnographical account of deep sea biologists.

The trinity of essentials to life – energy, chemical material, and the right conditions – make it possible for life as we know it to begin and evolve further. It is not only the deep sea vents in the oceans that are teeming with life, as Helmreich (2009) noted, but other extreme environments.

An analogy to another contested life suggests itself at this place as it is presented in the following screenshot. Originating from an interactive presentation as available from the NASA website "Planet Quest: Search for Another Earth", the image presents the Alien Safari (Figure 60).[131] The Alien Safari presents candidates / a terrestrial template for extraterrestrial life as it is defined nowadays.

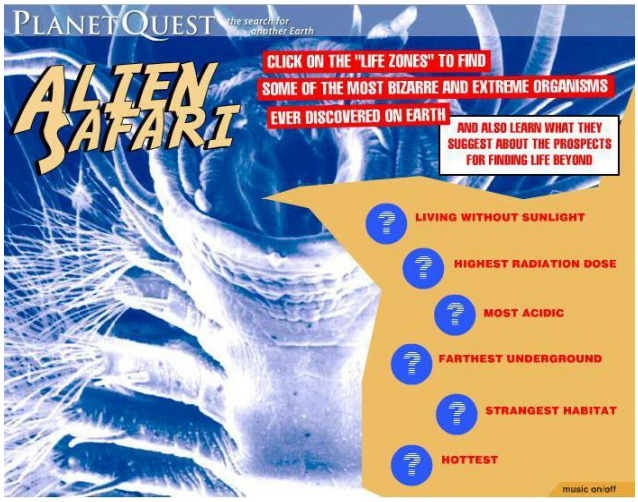


**Figure 60. Screenshot of the online interactive presentation Alien Safari (2012). Image Credit: NASA JPL.**

The idea of an Alien Safari, presented by the Planet Quest team as an interactive story, conceptually collides with one of the key debates of the SETI search, the so-called 'zoo hypothesis'. According to this hypothesis, the alien beings exist but avoid contact with us. The alien, like the zookeeper who observes animals in a zoo, is simply keeping a safe distance – that of a non-participatory observer of human life in its natural habitat; the extraterrestrials "have set us aside as part of a wilderness area or zoo" (Ball 1973).

Although the 'Other' here presented as a particular subjects of exploring, it could be perceived as an analogy to life as we know it. One of my respondents described:

[131]Available from http://planetquest.jpl.nasa.gov/system/interactable/3/index.html. Accessed 14 September 2012. Alien Safari http://planetquest.jpl.nasa.gov/system/interactable/3/index.html. Accessed 14 September 2012.

> It is quite possible that alien life could be very different from our own and even non-carbon based, although without evidence or knowledge that other forms of life exist (or that they could exist), I think it is perhaps fantasy to think that way over thinking it would be very similar to life on earth (INT5E:24).

## 5.5. Re-creating God's Work

There is an underlying notion of cosmic unity expressed in the concept of the common chemical model for life in the universe, philosophically based in panspermia. Benner (2004) stated that "a review of organic chemistry suggests that life, a chemical system capable of Darwinian evolution, may exist in a wide range of environments" and hence this enables us to speculate about the "synthesis of organic compounds during the early history of Mars" (Cleaves, Chalmers et al. 2008:114). We are presented here with two grand questions: the genesis and the composition of life. Although there is no agreement on the definition of life, the question is inseparable from the elementary composites of life. The life on earth is structurally based on carbon, hydrogen, nitrogen, and other elements and uses water as its interaction medium. The substance of life is water: water is the nutrient environment for life of our type to evolve. These facts substantiate the search for other life and the current trend in astrobiology, described by Edmondson as the "follow the water paradigm" (Edmondson 2010).

In 1953, the University of Chicago chemists Stanley Miller and Harold Urey performed an experiment attempting to synthesise prebiotic molecules in an experimental atmosphere. The experiment, now known as the Miller–Urey experiment, simulated the potential early earth atmosphere using organic compounds and electric discharges. The research, later published in "Science" (Miller 1953), had an impact on the discipline, and the experimental reinvention of life was successful and marks the beginnings of the scientific field of prebiotic chemistry (e.g. Lazcano 2003).

According to an interactive presentation that appeared in the June 2010 online issue of the Scientific American, the "Re-creating of Life" is shortlisted in the "12 Events

That Will Change Everything" (Figure 61).[132] It should be noted that as opposed to alien-life discovery, in the author's opinion it is almost certain that science will succeed in re-creating life.

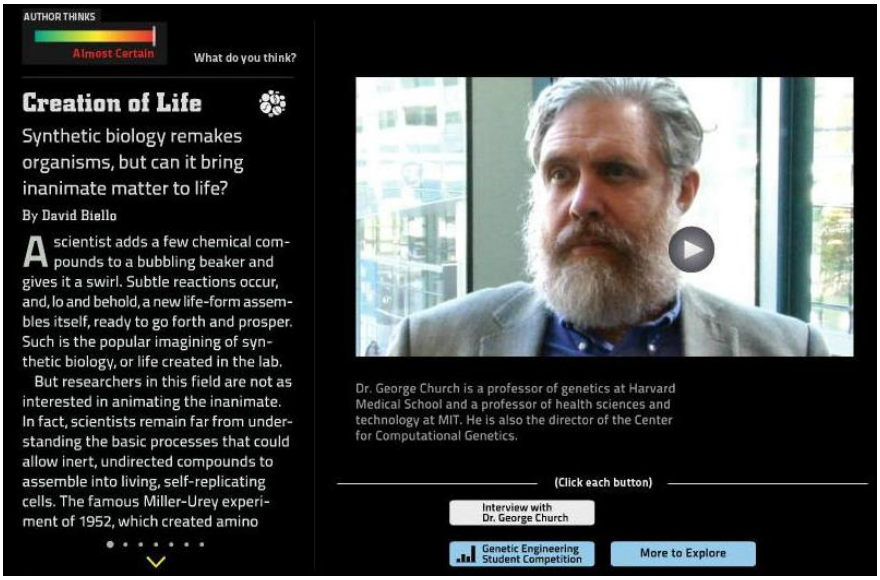


**Figure 61. Screenshot of the fifth of the "12 Events That Will Change Everything" of the online interactive presentation (2010). Image Credit: The Scientific American.**

But is it possible to re-create life without knowing what it is? Astrobiology goes into the realm of elements and the very beginnings of life. This is nicely illustrated by the concept of LUCA, the "last universal common ancestor". The Nobel Prize-winning biologist Christian De Duve (2011) stated that "all known living beings, including prokaryotes, protists, plants, fungi, animals and humans, are descendants from a single ancestral form of life". The kinship presented here is not genetic, but elementary (biogenetic). This foreshadows a vision of cosmic totality where all galaxies, stars, planets, humans, and other humans are all essentially made from the same matter. This brings us back to Carl Sagan and what he called the starstuff.

## 5.6. The Scientific Story – We are Made of Starstuff

Sagan's quote "made of starstuff" (Sagan 1985:233) suggests the presence of a cosmic connection, a notion of familiarity or even kinship. Jill Tarter in one of her

[132]Available from http://www.scientificamerican.com/article.cfm?id=interactive-12-events. Accessed 22 August 2012.

public presentations (Tarter 2012) elaborated on Sagan's quote and described our connection to the cosmos in the following way:

> We are made out of stardust. The iron in the hemoglobin molecules in the blood in your right hand came from a star that blew up 8 billion years ago. The iron in your left hand came from another star. We are the laws of chemistry and physics as they have played out here on Earth and we are now learning that planets are as common as stars. Most stars, as it turns out now, will have planets.[133]

This is a description of chemical processes that preceded the emergence and evolution of life. What both Sagan and subsequently Tarter present here is an origin story, a narrative about the origin and connection of living things but one that also argues that human life is a result of the physical configurations of the cosmos. The dying stars, supernovas, produce the stardust or "starstuff" (Sagan 1985:233) we are made of. The above is not only an exhibit of scientific reasoning showing off a "bigger picture" of an interrelated cosmos. This is a catchy story. One of my respondents, an astrophysicist, described how a similar text is used to open up a public talk:

> Indeed in my own research on the stars that eventually explode as supernovae, I nearly always have a bullet point in the introduction to any talk I give saying that supernovae are the places where heavy elements are produced that are needed for life as we know it to evolve. However, this point has absolutely no influence on the immediate aims of my research (INT5E:41).

Naturally, this is a central question in the context of SETI's search for the origin of elements of life hydrogen, oxygen, nitrogen, and carbon, the most abundant elements in our galaxy. Carbon occurs in all organic compounds and the latest technoscientific stories as well as the next subchapter diverts from the culture of science towards public spaces of scientific culture.

[133]Jill Tarter: A Scientist Searching For Alien Life, 23 July 2012. Available from http://www.npr.org/2012/07/23/156366055/jill-tarter-a-scientist-searching-for-alien-life. Accessed 18 August 2012.

## 5.7. You Are Carbon, and Unto Carbon You Shall Return

Carbon, C, is a chemical element, by definition an "abundant non-metallic tetravalent element occurring in three allotropic forms: amorphous carbon and graphite and diamond; occurs in all organic compounds"– we are carbon-based life forms.[134] Carbon is the "starstuff" that Sagan said we find in our apple pies (1985:233). If we were to select only one element that presents 'life', it would be carbon.[135] Carbon is the most common element in the universe and one of the basic elements that constitute life forms. Not only human but all life forms on earth – and presumably also non-earth life forms – are carbon based. Human life is essentially a carbon-based life form, or, as one of my respondents put it, a "carbon based [life-form] which is what we are" (INT2:267, also INT4:16 and INT5:25). Edmondson described this as a "widely shared assumption – only sometimes explicitly shared – is that we Earthlings know of biology (that it is water/carbon based, and evolution operates) is sensibly thought of as being universal." (Edmondson 2010:1411)

The terrestrial consequence of this thinking mirrors what I call 'ashes to ashes ad absurdum', here presented in the LifeGem® Memorial Diamonds, with the sentimental tagline "because love lives on". LifeGem®, a registered trademark, is a new "ashes to diamond burial service" that uses the carbon present in cremated ashes and turns those remains into a diamond; that is, it creates a different structural modification (allotrope) of the carbon present in the ashes.[136]

The memorial diamonds, as "a way to embrace your loved one's memory day by day", are available in a selection of colours and cuts. The image below (Figure 62) shows the homepage of LifeGem with a bereaved individual's testimonial and the final product:

[134]Retrieved from http://www.wordwebonline.com/search.pl?w=carbon. Accessed 14 September.
[135] Some scientists suggest to focus on different types of life, e.g. a non-carbon based life forms. As one of my respondents described: "Another interesting concept is to think of life forms that are not carbon based, but maybe something else like silicon based, or they are carbon based but have different DNA-based molecules, like the recent arsenic-based DNA bacterium announced by NASA. However, an even more likely scenario is that there could be robotic life forms in the universe. Since the vast majority of stars in the universe are proposed to be older than the sun, then it could be that intelligence has developed many times but they have long since disappeared and the remains are robotic artificial intelligences that they once developed, still thriving in the universe" (INT4E:16).
[136]Website: http://www.lifegem.com/. Accessed 14 September 2012.

> The high-quality diamond created from a lock of hair, or the cremated ashes of your loved one as a memorial to their unique life ... LifeGem diamonds are molecularly identical to natural diamonds found at any high-end jeweller. They have the exact same brilliance, fire, and hardness as diamonds from the earth.[137]

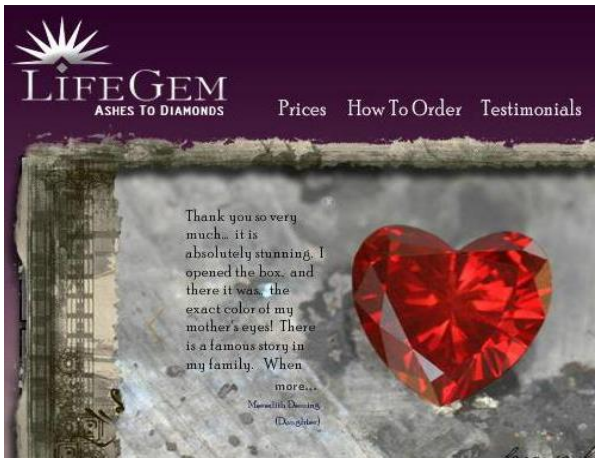


**Figure 62: Screenshot of the LifeGem corporate website (2012). Image Credit and Copyright: LifeGem.**

Technoscience has entered the afterlife. Only about 200 grams of cremated remains is needed to create the diamond. The service is available also for pets if you wish to "memorialize pets as LifeGems".[138] The marketing message appeals to human sentiment:

> Sometimes I miss my girl so much it hurts to breathe, but our memories will never fade. Even through the tears, she finds a way to bring a smile to my face every day. Nothing will ever replace our special bond, but my LifeGem does provide comfort through an everlasting connection to the one I have lost. I hope it will do the same for you and your wonderful pet. Sincerely, [name], LifeGem CEO.

To regard the LifeGem® as a means of remembrance of loved ones and regeneration after a loss is correct, but it is only the surface of the problem, as the LifeGem service is not a lone voice in the wilderness of cultural formations of this type. In the Messaging chapter I described the memorial spaceflight services of Celestis where

[137]Retrieved from http://www.lifegem.com/secondary/whatisLG2006.aspx. Accessed 14 September 2012.
[138]Retrieved from http://www.lifegem.com/secondary/beloved_pets_main2006.aspx. Accessed 14 September 2012.

the cremated remains are sent to space on their eternal journey.[139] Here I point to the social and cultural implications of death and suggest to examine what makes it possible to amend the mortuary rituals in a rather secular way and introduce the glamorous molecular afterlife. The ashes and the diamond are both allotropes – that is, variant forms of the one element: carbon. This can be interpreted as a grief reaction in the new cultural context (Palgi and Abramowitch 1984:400), in the broader context of the scientific culture and its socioeconomic settings that enable the formation of such business. This of course addresses the formation of a defined or more precisely not yet precisely defined set of values.

In search of a new ethics, the LifeGem case should be understood in the context of other post-mortem scientific procedures. One of the most extreme and controversial ones is known as the cryopreservation of human bodies (e.g. Alcor Life Extension Organisation[140]). During what is called the vitrification procedure, the blood of the "patient" is replaced with a chemical solution that enables deep cooling, after which the "patient" is placed into an individual container, not dead yet not alive, awaiting the miracles of future medicine.[141] This can be also interpreted as the production of a brand-new breed of post-mortem encapsulated zombie cyborgs.

Another way of looking at cryonic suspension was proposed by Cutting, who included also human cloning and uploading of consciousness into computers into the same category and concluded:

> These projects proceed, under the auspices of scientific plausibility, by redefining life as unique patterns of information - DNA code, synaptic states, and so on - and then by trying to rescue these patterns from the usual process of decay occurring at death. (2009:357)

In the second chapter I discussed contested lives and planets, but here we have encountered also contested deaths. LifeGem symbolises the elementarisation of

[139]Memorial Spaceflight Services website. Source: http://www.celestis.com/services.asp. Accessed 18 August 2012.
[140]Alcor Life Extension Organisation provides cryonics services. Retrieved from project website: http://www.alcor.org/Library/html/newtechnology.html. More information available also from http://cryonics.org. Accessed 14 September 2012.
[141]More available from http://www.alcor.org/AtWork/index.html. Accessed 14 September 2012.

human life or "redefining life" as Cutting suggested, or more precisely utilises the constituent of physical existence – carbon - as a mediator of transformation. The post-mortem transformation could be what Victor Turner described as a rite of passage (1987) of a scientific nature, a superstructure of death rituals that proceeds in two phases. The first phase is the cremation, the transformation from human to ashes; and the second phase is the transformation from ashes to diamond, a new level of post human life, a gem that is certified by the Geological Institute of America. Tears and grieving have been enhanced by heat and pressure; a critical mind has to recognise an emergent canonical reading: "Remember, man, you are carbon, and unto carbon you shall return."[142]

## 5.8. Science's Hunt for Planet Around Other Stars

> "We would all like to know if we are truly alone in this vast Universe.
> The search for extrasolar planets, the quest for other Earths
> and the possibility of finding extraterrestrial neighbours
> are all within humankind's grasp. I, for one, feel lucky
> at being alive to witness these momentous discoveries!"
> (Clark 1998:209)

The most recent searches for life beyond earth that are currently on NASA's budget are known as the Origins programme. Along with the study of stars and galaxies, the Origins programme includes two developmental branches: the search for planets around other stars, and the search for life elsewhere in the universe. These seem to have merged in the current NASA Origins programme's rationale, which is to study (prove) cosmic biological evolution. As long ago as1980 the NASA History Office published "A Design Study of a System for Detecting Extrasolar Planets". The opening chapter shows the search for extrasolar planets in the context of broader history:

[142]In Latin the original text reads: "pulvis es, et in pulverem reverteris".

> Speculation concerning the origin of the solar system is as old as man himself. The "modern" era of such speculation is generally considered to have begun with Copernicus, who showed that Earth is not the center of the universe.

The quest for other planets is presented as a continuation of the medieval story. Here I recall the BBC documentary devoted to scientific answers to questions that have "haunted us since the dawn of humanity" (BBC 2010). Current projects present the big networked science. The international teams of scientists are located in various research centres globally, and NASA is the key actor and leading centre of joint research. NASA's Astrobiology website provides the most up-to-date description of the field.[143]

> "The intellectual scope of astrobiology is breathtaking, from understanding how our planet went from lifeless to living, to understanding how life has adapted to Earth's harshest environments, to exploring other worlds with the most advanced technologies to search for signs of life," said Carl Pilcher, Director of the NAI.

In 2008 NASA's Exoplanet Science Institute, in honouring the legacy of a "visionary", announced the Carl Sagan Exoplanet Fellowship, which would be given to postdoctoral researches to discover earth-like planets.[144] In search of another earth, and hence potentially also other life, NASA's coverage of the topic also merges the NASA JPL Exoplanet Exploration Program and the NASA JPL Planet Quest: Search for Another Earth, as shown in Figure 63.[145]

[143] Retrieved from http://astrobiology.nasa.gov/. Accessed 12 September 2012.
[144] Retrieved from http://nexsci.caltech.edu/sagan/. Accessed 22 August 2012.
[145]Retrieved from http://exep.jpl.nasa.gov/. Accessed 15 September 2012. Source http://planetquest.jpl.nasa.gov/. Accessed 15 September 2012.


**Figure 63. Screenshot of the Planet Quest website (2012). Image Credit: NASA JPL.**

What is so special about extrasolar planets? According to the project webpage, the "challenge now is to find terrestrial planets, especially those in the habitable zone of their stars where liquid water and possibly life might exist", a recent description that extends what Sagan called "plausibly water based biota" (Sagan et al. 1993:120).[146] The institutionalised search for extraterrestrial worlds is positively perceived by scientists as a valid scientific search, removed from problematic boundaries of SETI science. This is how the Kepler Mission was described to me by one of my respondents, an astrophysicist:

> [It is] designed specifically to try to find earth-like planets, so rocky planets that might be in the right as we call it habitable zone, the right region from its host star. They have not found one yet but it's only been going for a relatively short time, so what I know so far is that SETI has not found any signal that they believe from intelligent life and obviously we haven't found the earth-like planet yet. If we did find an earth-like planet, the question would arise and that is: does it have an intelligent life or even life at all? (INT2:26)

The information provided by my respondent was correct at the time of this interview, in early 2010.[147] Just a few months later the first earth-size candidates were detected

[146]Retrieved from http://kepler.nasa.gov/Mission/QuickGuide/. Accessed 14 August 2012.
[147]According to the Mission's Facebook Page, the Mission Objective is as follows: The centuries-old quest for other worlds like our Earth has been rejuvenated by the intense excitement and popular

and officially proclaimed as being extrasolar planets. Not a small step but a giant leap has been made within the discipline. Another astrophysicist later commented:

> It is the amazing diversity of planets that is most fascinating, and the discovery record of planets is full of surprises. We can start sorting our own role within the cosmos. Moreover we realise that we are being provided with unprecedented opportunities to explore. Any planet population statistics of habitability study however does not provide us with any better guess on life being out there. In order to know, we need to find out (INT9E:41).

The below reaction of my respondent to the very same question I asked addresses another motive present in science that I have noted before. I would describe it as getting accustomed to the excitement of discovery, or, in my respondent's words:

> The first one was amazing, as was the second one. The third one was slightly less so, and by the fifth I was bored. The really fun time was prior to any discoveries where naked speculation was allowed to run riot. Clearly we now know for certain that there are extrasolar planets, and that's that. The task now is one that Eddington would have referred to as "stamp collecting" (INT8E:36).

The image on the right was presented during Jill Tarter's presentation in Durham, 2011, and nicely illustrates this "stamp collecting". Here are the planets collected with the use of the Kepler Orrery, organised into an album (Figure 64).

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interest surrounding the discovery of hundreds of planets orbiting other stars. Astronomers have discovered sizable numbers of gas and ice giants like Jupiter and Neptune and even super-earth-size planets in short-period orbits around their parent star. The following websites track the day-by-day increase in new discoveries and provide information on the characteristics of the planets as well as those of the stars they orbit: Extrasolar Planets Encyclopedia, Exoplanet Data Explorer, New Worlds Atlas, and Current Planet Count Widget. The challenge now is to find terrestrial planets (i.e., those one half to twice the size of the Earth), especially those in the habitable zone of their stars where liquid water and possibly life might exist. Retrieved from http://www.facebook.com/NASAsKeplerMission?CFID=8444249&CFTOKEN=12501229. Accessed 13 August

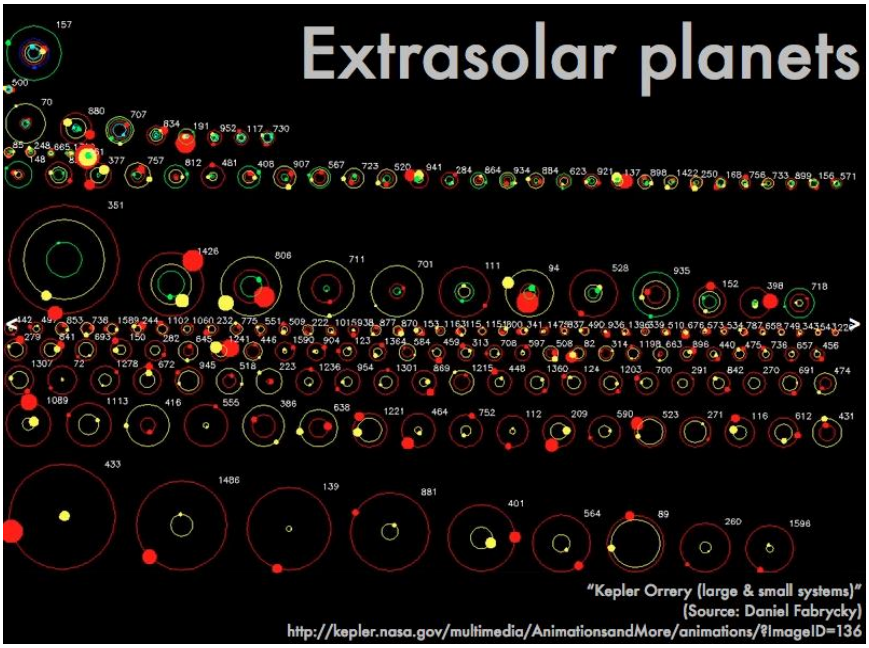


**Figure 64. The image shows all the multiple extrasolar planetary systems discovered by Kepler (as of 2 February 2011). Image Credit: Daniel Fabrycky.**

In another interview that Jill Tarter made for the website Space.com, she described the importance of Kepler to the SETI project.[148]

> "The Kepler worlds are really legitimizing SETI," Tarter said. "All of us that are even peripherally involved with that are looking and saying, 'You know, Earth 2.0 — that's just right around the corner. We can almost taste it.'"

This gives an example par excellence of how the search modes are merging but also how SETI substantiates its search and fills in the gap of the missing subject. To be able to present evidence is a core value to science, again embedded into what one of my respondents said to my question of whether there is other life in the universe:

> Indeed, I am almost certain there is life elsewhere in the universe, at least as certain as I can be without hard evidence. However, given the number of planets it seems are in the habitable zones around stars like the sun, then it seems almost inevitable that there are many other life forms elsewhere in the universe (INT4E:2).

[148]Retrieved from http://www.space.com/15801-jill-tarter-seti-search-retirement.html. Accessed 16 September 2012.

## 5.9. Imagined Worlds: The Gliese Family

A distant star, Gliese, got a lot of attention in 2007 as the first stellar candidate to be an earth-like planet. The discovery of the extrasolar planet (or exoplanet) Gliese 581c was presented on the BBC News in April 2007: "Astronomers have found the most Earth-like planet outside our Solar System to date, a world which could have water running on its surface." Not only is the planet of the right size, but the distance from its parent star indicated that water may be in a liquid form on its surface. Following the water paradigm, this discovery was immediately followed by the fundamental question: is there "life anywhere else?" (Alison Boyle, London Science Museum).

The image below shows an artist's impression of the "most Earth-like planet outside our Solar System to date" – the imagined or projected distant extrasolar system of a sun and earth-like planet, Gliese 581c.To maintain the link with science fiction, I would like to draw a line to the Star Trek Wikipedia page. The main story of the Star Trek TV episodes and full-length films is that humanity in the future crosses the terrestrial boundaries and sets off to explore the galaxy. Outer space is inhabited by fictional humanoid races. In the search for other life, the Star Trek characters explore "strange new worlds" and in doing so they visit other – understood in the most up-to-date phrase of science – extrasolar planets. The Star Trek Wikipedia page also classifies such planets:

> In the Federation standard system of planetary classification a Class M planet, moon, or planetoid was considered to be suitable for humanoid life. By the mid-24th century, thousands of Class M planets had been charted by the Federation. These worlds were the first choice for colonization.[149]

The real science works with the concept of a "Goldilocks Planet", which is a planet that falls within a star's habitable zone; the name is often used for planets close to the size of earth. In other words, the planet is 'just right', in the phrase borrowed from the "Goldilocks and the three bears" story. The habitable zone in fact signifies the distance from a star an earth-like planet can maintain liquid water as a solvent and can therefore potentially sustain earth-like life. This is where a "habitat", as a

[149]Available from http://en.memory-alpha.org/wiki/Class_M. Accessed 20 September 2012.

type of environment in which an organism normally lives, might develop. The internet is populated with what Latour would call "fabricated" (2002:10) images of extrasolar planets that represent imagined extrasolar worlds.[150]

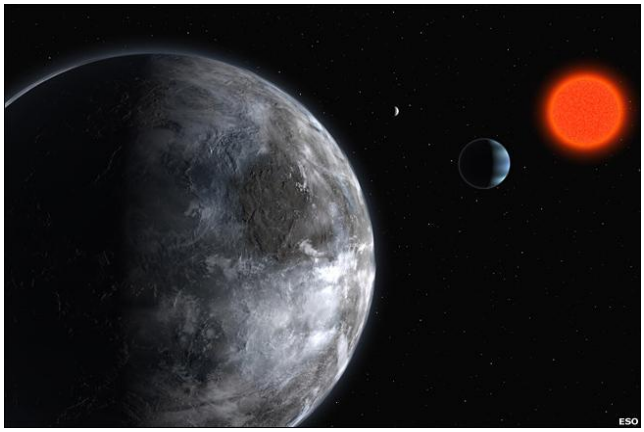


**Figure 65. Artist's impression of planetary system Gliese 581 (2009). Image Credit: ESO/L. Calçada**

Situated in the context of modern art and popular culture, of extrasolar planets can be described as a visualisation strategies that fuse the artificial and the natural into a simulation (Daston and Galison 2007:413).

Gliese 581 is a star that hosts a planetary system, one of the millions of worlds estimated by the Drake equation (Figure 65). Soon after its discovery, the Gliese family became a personification of the search for other worlds and a favourite destination of recent interstellar – or what can now be redefined as planet-to-planet (P2P) – messages: "A message from Earth" in 2008, and "Hello from Earth" in 2009.In 2009, just two years after its discovery, National Geographic published an article titled "Most Earthlike Planet Yet Found May Have Liquid Oceans". The prognoses are optimistic:

> "I think it is only a matter of time," Norton said. "If life really does exist elsewhere in the universe, then within the next 10 to 15 years I expect we may see the first signs of life, via spectroscopic signals from exoplanets."

[150]Latour (2002:10): "To begin with, for most people, they are not even images, but the world itself. There is nothing to say about them except learning their message. To call them image, inscription, representation, to have them exposed in an exhibition side by side with religious icons, is already an iconoclastic gesture. If those are mere representations of galaxies, atoms, light, genes, then one could say indignantly, they are not real, they have been fabricated."

## 5.10. Concluding Remarks

The exploring mode has framed a new working definition of life (Helmreich 2009), that of living matter related on the elementary level, and also expresses a belief in the symmetry of evolution. The concept of life that is embedded into the exploring mode is one of life as a diagnosis, the identification of the building blocks of life as something that naturally occur in nature. If we take the meaning of the anthropic principle– that is, the emergence of sentient consciousness capable of conceiving the universe– and transfer this meaning into astrobiology, we could speculate and develop an astrobiologic principle.

This chapter was to conclude on the scientific search for life beyond earth and to show how this search has conceptually changed and developed into a new branch of scientific knowledge: astrobiology. I have argued above that our science is a Eurocentric practice or a Westernised discourse, and here I need to add that so also is the concept of other life. In addition to it being anthropocentric, this understanding of 'Otherness' is also humanocentric – that is, organised around humanity. To no surprise the terrestrial biota – all the plant and animal life of a particular region – are used as a model for the search as seen in Sagan et al. (1993). On the other hand, the discovery of other life would be most important for science, because it is anticipated as a redefining event, firstly for science itself but also, inseparably, for society. My respondents here describe the post-detection reaction in science:

> As for the scientific community, I think there would be a large number of groups who would want to followup the study, and it would probably receive a lot of funding in the aftermath. The follow-up would continue indefinitely as it would allow us to understand ourselves better and our place in the cosmos. It would also give a unique insight into the evolution of life, as the conditions for life to develop on another planet would be unique and in no way similar to how life developed on earth (INT4E:80).

> Depending on what that life was that was detected, for instance if the life we detect was shown to be intelligent, then I guess a lot of the planets would experience some fear and would question their own beliefs. However, the probability is that we will discover bacterial life first elsewhere in the solar system and this would cause a huge

> amount of excitement for scientists, theologians and the lay person alike (INT4E:68).

Not only is imagining the 'Other' based on how we understand ourselves, but also the other way round: the knowledge and understanding of the 'Other' would provide insights into human life– its origins, its characteristics, its nature. But the first and most important point here is the scientific practice of exploring that generates new understanding of the cosmos as a lived or narrated experience. The living organisms, our ancestor or a relative, are in fact a result or a consequence of laws that rule the universe. And so are we, humans, the creatures of the universe, a biological necessity. This minimalist definition of our species categorises 'life' into elements and building blocks and in fact enables the emergence of a scientific ethos of us "being one totality", and subsequently efficiently dismisses the differences and variances (race, body, gender). A renewed vision of a sparsely populated universe appears from the works embedded in the third mode. The exploring, regarded by scientists as a valid 'hard' science, increases the likelihood of other life being detected. This is a motive apparent in some of the interviews, such as the following:

> My opinion is that it is almost certain that there is other life in the universe. Extrasolar planet searches are making new discoveries all the time, and as techniques improve we are able to search and detect planets in the habitable zone (INT5E:2).

I believe that the opinion of my respondent nicely summarises the exploring mode as the third method of the search for extraterrestrial life. Before moving on to the next chapter, which is dedicated to merging the three modes into a contextual description, I would like to use the words of one of my respondents. By answering my question about what message he would send were he to be given the opportunity, he said:

> We should inform these species that we are a space-faring race and show how we have made use of the elements on earth and develop our world (INT4E:111).

# Chapter 6: The ‘Charming Science’ of the ‘Other’

In the previous chapters I introduced the three modes of science in search of life beyond earth. Bearing the history and development of this culture of science in mind, up to now the text has been organised chronologically. Thinking of this culture of science as a dynamic system necessitates describing the conceptual inventions as the first instance of such thinking. After all, even the terminology I use – messaging, listening, and exploring – reflects upon the history and present of the developing ‘charming science’ and also implies the body of techniques used by this particular discipline; the three modes are the three codes of conduct.

In this chapter I aim to focus on various facets of science in the search for the ‘Other’ as a whole and summarise on the ‘charming science’. On the pages to follow I would like to theorise upon the findings and point out to some specific characteristics of the science as seen through the optics of the cultural analysis. Hence, in the sixth chapter I provide a cross-sectional qualitative analysis of the three modes and present the reader with a qualitative analysis of science. In each section I am going to provide a conceptualisation addressing issues that emerged from fieldwork. Firstly I will revise the notion of a ‘charming science’.

## 6.1. The Charming Science

The culture of the ‘charming science’ is the culture native to the contemporary Western world, to the supra-culture that manufactured the ‘Other’ as a product of its conduct. When thinking about the first– that is, the culture of the ‘charming science’ – three things emerge as its prominent features. The first is the status of it as a science; the position of the SETI science as a scientific discipline and also an academic subject. SETI science is a “situated knowledge” (Haraway 1988); SETI science is situated institutionally, historically, and socially. Of course, at this point the term “situated knowledge” needs to be removed from the context of a feminist debate; but then again, each science is not only arranged but also geographically localised (“positioned”). Haraway says: “Positioning is, therefore, the key practice in grounding knowledge organized around the imagery of vision, and much Western scientific and philosophic discourse is organized in this way” (Haraway 1988:587).

SETI science fits within this definition, in fact, SETI science and especially the modes of messaging and listening are based on what Haraway described as "embodied objectivity": universal rationality and common language (Haraway 1988:588).

The second prominent feature of SETI science is its progressive development and adaptability. The pace at which SETI accommodates changes and develops funding strategies stands out as an essential quality by which SETI is recognised; in this sense the SETI (and here I specifically include all three modes) is the site of a "permanent revolution" (Bourdieu 1991:3). The third outstanding feature of the 'charming science' is the mysterious, anticipated, imagined, enigmatic, and still missing subject matter: the 'Other'.

By analysing the SETI science and by introducing the three methods of searching for the 'Other', I aim to address the culture of science. I acknowledge James Clifford's description as the most alike to what I mean by writing about this culture of science. Clifford in 1986 said that "Culture is contested, temporal, and emergent" (Clifford 1986:19). So far I have only used the term 'contested' when talking about visual and material quasi-products of the Space Age and especially to address the power of imagining techniques (e.g. Cosgrove1994 and 2008), the contested earth, and also the contested cosmos. Yet now I argue that it is the culture of SETI that is the contested one in the context of other scientific disciplines, or as a science that takes place within mainstream science. By placing the SETI science in the context of other disciplines, I will depict the ET-life idea as somewhat irrational in the scientific discourse and suspicious to a rigid scientific mind in order to illustrate how this is of special relevance to the early phases of the scientific search for the 'Other'. The words 'temporal' and 'emergent' in Clifford's quote then address such disciplinary dynamics and also the state of a permanent change producing forces of ecological settings conditioned by the need to keep the developmental cycle to ensure the continuity (and future) of the discipline.

Although introduced in separate chapters, all three modes depicted here strictly belong under the header 'scientific search for extraterrestrial life' as the three search methods. One could also describe the mode as a sub-science of mainstream science

and hence a (scientific) sub-culture; as, paraphrasing Martin's description of the disciplines of scientific enquiry and hence fields of sociocultural study, "science can be seen as culture and contains many different 'cultures'" (Martin 1998:29). The first, quite obvious, question when it comes to aliens is whether this is a science at all. In the chapter dedicated to the SETI Institute I asked what is scientific and what is extra-scientific about this particular culture of science and addressed the status of the SETI sciences. The dynamics of this sub-culture seem to be enhanced by the criticism (missing subject) and the need for external financial support. These are the two driving forces that also explain the cutting-edge enterprise and managerial skills of the SETI Institute.

All three modes stem from and embody the core scientific values of exploration, curiosity, and knowledge possession– that is, the way of thinking, rhetoric, and methodology. As one of my respondents pointed out, the ongoing work of the SETI Institute symbolises endurance (INT3). The obvious contrast resides in the concept of other life – or assumptions about it – which gives shape to the conduct of subsequent searching. We have seen that 'life' does not necessarily imply it is an 'intelligent' one in more recent forms of the search. On a basic level, messaging and listening can be classified as a SETI science – that is, a search for extraterrestrial intelligence – while exploring should be labelled as a SETL science: that is, a search for extraterrestrial life. Here we arrive at a simple equation of primitive life versus intelligent life. The intelligent 'Other' is ahead of us; technologically, intellectually, 'culturally'. More than anything else, this belief expresses the linear perception so typical when imagining the evolutionary arrow of progress and development. The search for 'primitive' life does not discount the intellectual levels of the presupposed 'Other', yet it is simply an act of looking back at our origins. The primitive 'Other' is our ancestor and our originator. While messaging and listening are conceptually united, the other life concept embedded in exploring, in other words the concept of astrobiology, and possibly best fits within Eduardo Viveiros de Castro's description of Western ontology:

> In western naturalist ontology, the nature/society interface is natural: humans are organisms like the rest, body-objects in 'ecological' interaction with other bodies and forces, all of them ruled by the necessary law of biology and physics;

> "productive forces" harness, and thereby express, natural forces (de Castro 1998:473).

Each mode is methodologically specific; each search practice assumes its subject. The overview below shows a comparison of the three modes based on the assumptions imposed on the imagined 'Other'. Rather than interpreting the three modes in terms of the opposites of nature and culture, here I show the temporal dimension of the practice. Firstly, time plays a key role in the chronology of the discipline. Secondly, throughout the fieldwork, the timing of the actual communication conduct with the 'Other' emerged as its condition and rather limitation of the interstellar communication, simply due to the physical nature of our universe, the distances and maximum speed a signal travels at:

| | | | |
|---|---|---|---|
| Messaging: | presupposes a RECEIVER | ⇨ | sending to the future |
| Listening: | presupposes a SENDER | ⇨ | receiving from the past |
| Exploring: | presupposes an ANCESTOR | ⇨ | our past and future merged |

The nature and historical context of scientific messaging have been studied elsewhere (Macauley 2006, Capova 2008, Macauley 2010), and hence I focused on the messaging phenomenon, subsequent cultural formations, and especially recent public and commercial messages. Messaging is scientific romanticism in material form, imprinted on a visual and audio message addressed to the extraterrestrials. Messaging is the culture of science that in an attempt to establish a trans-cultural communication provided the description of life on earth and especially of science on earth. Yet, messaging phenomenon captured attention of general public and has developed into popular messaging that unfolds in commercial context.

Listening was introduced as 'organised optimism' the reverse of Merton's notion of science as "organised scepticism" (Merton 1938). The broad debate related to the detection of an advanced signal from outer space is basically divided into two camps, sometimes referred to as the SETI optimists and the SETI pessimists. The listening mode is a technoscientific practice based on the condition that extraterrestrial life is audible – that is, the other life emits information and hence is detectable. The conception of the intelligent 'Other' here reflects the established concept of the SETI

search and also relates back to the origins of this science, typically Tesla's experiments with wireless technology. Not surprisingly, the signal coming from the skies is one of a mathematical design (e.g. Samuels 2005) but also something that could be 'heard'. From the acoustic transformation of the silent vacuum into the audible emerged a whole new set of cosmic sound-marks, or a "broadcasting universe" (Bryld and Lykke 2000).

The third mode, exploring, brings us back to the waters of high-budget rigid science. The study of terrestrial extreme environments also includes the idea of alien extreme environments (Helmreich 2009). But this does not only signify a conceptual shift in searching for intelligence towards microbial forms of life; the opposites of nature and culture seem to reunite and merge in an emergent concept of the 'Other', in what Helmreich calls "extraterrestrial relativism", "multinaturalism", or the "after nature" (Helmreich 2012).

## 6.2. The Aspiring Science of No Science?

In the introduction I offered an overview of the intellectual origins of this diverse field, as it emerged from the history-of-science perspective to show how the question of 'Otherness' had been negotiated and had developed in line with the scientific cosmology and scientific projections of the world order. If we consider this event a milestone marking the commencement of the scientific search for other life outside our planet, we get more than 100 years of history of an intellectual debate, conceptual evolution and contact attempts. Although the missing significant 'Other' has not been found yet and we do not know if the "thing" factually exist; the scientific search for it has been redefined from being a heresy against religion. Moreover, the scientific investigation was launched and the 'big if' as a legitimate question was later incorporated into a scientific framework and nowadays recognised as a valid scientific question.

Can the 'charming science' be described as a science going where no science has gone before? SETI scientists (and others as well) regard this to be potentially the most important discovery in the history of humankind, the greatest discovery after Copernicus. The subsequent events and cultural formations that have formed around

the other life idea – in particular cultural, societal, and political arrangements – are the subject of anthropological inquiry.

The ‘Other’ as understood by SETI scientists (and embodied within the SETI acronym) is colloquially used as a term for an extraterrestrial intelligence. The equation is simple: extraterrestrial communication is conditioned by the development of advanced technology; that is inseparably science. It is clear by now that the imagining of the ‘Other’ as both a life form and a type of advanced intelligence reflects upon how scientists think of ourselves, of ‘human life’. Throughout the text I deliberately avoided using the word ‘alien’ when describing the extraterrestrial, although this is how people usually describe creatures from outer space. The Alien is unfamiliar, unknown and strange, while the ‘Other’ addresses the emergence of a new, different character. The Alien is hostile and feared; the ‘Other’ is imagined, estimated, predicted, and anticipated.

In this sense, the significant ‘Other’ as the product of the ‘charming science’ is the reflection of the significant Same (Us, Ourselves). This is by no means a by-product; it is the very subject of both the science rhetoric and method. The realisation of the true nature of the ‘Otherness’ is a crucial moment; the extraterrestrial ‘Other’ is socially and culturally constructed. The science in search of the other life goes beyond the boundaries of technology and advancement in sciences and asks the fundamental questions, such as who are we? We have seen, especially in messaging, that in attempts to contact the Others, the scientific team was challenged to communicate information about human life on earth. This involved creating a description of the origin of life and its evolution and development into a technological civilisation (Capova 2008). The major prerequisite of the ‘Otherness’ as embodied within the listening mode is the communicative, technological, and broadcasting ‘Other’ (e.g. Bryld and Lykke 2000).

In the exploring mode, the ‘Other’ is articulated as our common ancestor, the origin of life itself. Cosgrove (1994) argued that the space exploration and imagining techniques generated the notion of “One World”. In the context of recent advancements in space science and related discourse (by which I mean the exploring mode), I see the emergent concept of ‘One Galaxy’ populated with life forms

notwithstanding their actual ontological status united on behalf of a common ancestry that consists of building blocks of life and extreme environments, the latter described by Helmreich (2009). The onset of this thinking is to be recognised in Carl Sagan's writing about "starstuff" we are all made of (1985:233): we are all children of one cosmos. From a theoretical and more essentially theological dispute and philosophical speculation, we shift to a mathematically estimated number of civilisations within our galaxy as shown in the Drake equation.

The other life idea intrigued scientists for decades; nevertheless, science, nowadays both SETI and astrobiologists, is still in search of the answer. The "big if" (INT5E:35) or "missing subject matter" (ENC), "the thing" or the "other life", is a speculation, a possibility, a hypothesis, possibly even an anachronism. The 'alien' and 'UFO' concepts within science have caused friction between scientists, especially in the context of so-called 'ufology'– that is, activities associated with an interest in unidentified flying objects – and other misconceptions of various kinds. Nowadays the 'alien' topic does not seem to provoke such antipathy, probably due to the recent emancipation of astrobiology as a legitimate discipline that proposes a more plausible definition of such 'alien' life based on the recent developments within the field. But this does not mean that the presence of the new notion has smoothed off the rough edges so much that there is conceptual agreement. The three sociocultural landmarks of UFOs – usually regarded as a socio-psychological phenomenon enhanced by popular conspiracy theories; the presence of alien beings that populate our science fiction stories; and a scientific concept – simply coexist in various forms throughout the popular culture. Here I arrive at sense-making as a rational operation that was best described by Sheila Jasanoff in her description of the work of an anthropologist:

> Our shared enterprise is to create pockets of sanity, reason, and understanding in a bewilderingly complex world (Jasanoff 2000:630).

The complicated thing with the other life concept is its ambiguity, which also makes it problematic to distinguish between the cause and effect. It is not only the case of scientific concepts but also the complexity of imagining the 'Other' in popular culture. This is especially true for the science fiction stories, the narratives about and

of our science. It was suggested above that the relation between science and science fiction is causal. I assume that both the science fiction and the sciences are fed from one source, from human imagination. As Albert Einstein, the prototype of a genius and role-model scientist, once said: "Logic will get you from A to Z; imagination will get you everywhere."

It is the 'if' and 'why', the conditions of uncertainty and unknown quality, that stipulate the spirit of endeavour, the ethos of intellectual inquiry transformed into transcendental scientific hardcore value. The value charge and exactly the default value of the SETI programmes are the justification and apologetics of its activities and also the cultural significance of SETI science. This is nicely demonstrated in some of the interviews, where my respondents would acknowledge the value-bringing to science although would at the same time question the efficiency of the search practice. I have demonstrated the cultural significance of SETI science in popular culture (Chapter 4) and also the active social role of the alien life idea, and now I address the social arrangements of science by using the UFO concept as embedded in popular culture and presented in science.

## 6.3. The Taboo Subject of Charming Science

Carl Gustav Jung interpreted UFO sightings from a psychological viewpoint as modern mythology and established a respectable way of interpreting these sightings. His pioneering study "Flying Saucers: A Modern Myth of Things Seen in the Skies", published in 1959, established the tradition of interpreting alien sightings as modern mythology (Sutton and Sutton 1969). Continuing the Jungian tradition, prominent American astronomer (and historian of astronomy) Krupp pointed to the two contexts in which the UFO phenomenon is interpreted; that is, the popular opinion and mythological aspects of UFO sightings:

> While popular culture and public commentary continue to portray the UFO experience as a consequence of the same kind of exploration of the cosmos in which we are ourselves engaged, the real story about UFOs seems to have very little to do with spacecrafts, hardware, and traffic between stars. Instead we are dealing with the human psyche, with myth, the belief (Krupp 1992:340).

Grunloh for instance highlighted the anthropological viewpoint when describing a UFO sighting as a cult within contemporary society, a cult related to the religious visions of the past (Grunloh 1977). On a similar note one of my respondents (an astrophysicist) addressed the religious dimensions of UFOs and pointed to the motive of human vulnerability (INT3:150), giving me an insight into the narrative dimension of the UFO stories:

> There are similarities with stories of angels and demons which are also about humans being vulnerable in the face of non-human powers (INT3:150).

Bernard Russell described the "dispelling of many traditional beliefs" as one of the effects of science (Russell 1985:11). But by doing so, the traditional beliefs become regarded as superstitious and pseudoscientific and hence dismissed without regarding their historical traditional role or sociocultural dimension. The UFOs and related debate within the scientific community seem to illustrate this process, as we can see demonstrated in one of the early (and possibly pioneering) studies of UFOs by American astrophysicist J. Allen Hynek. In his book "The UFO Experience: A Scientific Inquiry" (1974:14), Hynek classified and introduced three kinds of close encounters, which were made famous by Spielberg's film "Close Encounters of the Third Kind" (USA 1977). Hynek's term "close encounters" describes the contact event with an alien life form, which in this context means 'seeing' the alien spaceship (UFO) and in the case of a close encounter also means seeing the alien beings. Interestingly, Hynek, in the prologue to his book, notices that:

> The UFO phenomenon may well be one such challenging area of interest even though it is seemingly out of place in our world picture –as incredible to us as television would have been to Plato (Hynek 1974:11).

The UFOs, "flying saucers" and their pilots, and the little green/grey men or "UFOnauts" (Sanarov 1981:63) also play a key role in so-called conspiracy theories and take part in Hollywood-produced and mass-distributed stories of doom and salvation (e.g. Knowing, USA 2009). Contact in the "War of the Worlds" adaptations is portrayed as a struggle for survival, accompanied by panic and fear.

Most notably, "Independence Day" (USA 1996) and "Cloverfield" (USA 2008) present the scenario of an alien attack. Another perspective is offered by the famous American TV series "The X Files" (USA 1993 – 2002). The main character, the UFO believer Agent Mulder, is in search of the truth, and the feature film of the series had the title: "The X Files: I want to believe".

And with UFOs, the believing plays a central role (seeing is believing). Let me return to the 2008 UK YouGov survey quoted in Chapter 2 and use sociometrics generated by the public polls to present the quantitative data available on the societal awareness of extraterrestrial life (YouGov 2008, YouGov 2010a, and YouGov 2010b). From under the layer of quantitative data, in the lines of the survey we read that almost half of respondents (43%) stated that they "have never seen a UFO but believe they exist", while 36% of people said they don't believe UFOs exist; and, more interestingly, almost the same percentage of people said that both the British and US governments have information on UFOs and extraterrestrials that they are concealing.[151]

While I was following the "thing" (Marcus 1995) through the public culture, I couldn't stop wondering if there is a link between the SETI and UFO cultures. One of my notes in my fieldwork diary asks what the difference is between a UFO believer and a scientist who sends out a message to the universe. While scientists define other life as a rational category and such a link is unthinkable, there seems to be a link drawn by the popular mind, which is supported somewhat by the stories generated by the mass media. I asked one of my respondents about this link, about the SETI and the UFO findings; specifically, I was interested in the presence of debates about other life in the universe, about aliens, about mysteries, and about the volumes of UFO sightings in particular parts of the world, which are those usually described as the most advanced ones because of the technology that they develop:

[151]Do you believe there is life beyond earth in…?
Our solar system (the sun and the planets that circle around it): Yes, definitely – 13; Yes, maybe – 29.
Our galaxy (the stars and planets in "the milky way"): Yes, definitely – 20; Yes, maybe – 48.
The rest of the universe: Yes, definitely – 41; Yes, maybe – 38.
Aliens have tried to communicate with earth: Yes, definitely – 7; Yes, maybe – 33.
An alien being has visited earth: Yes, definitely – 9; Yes, maybe – 28.

> It is possible. I think these are things a little bit like a river where you have different streams all flowing in together. I think SETI gave a scientific framework to begin to rationalise visitation from other planets. Of course we need to be very clear what we mean by the SETI programme. People have been speculating about other life but the SETI programme as a science is I think 50 years old. I think partly our interest in UFOs is more likely to come on the back of the Second World War and rocket technology which I think was more powerful in saying –well, if we can send rockets from one part of the world to another, V-2s and V-1s from Germany to England, then the possibility of interstellar travel on the basis of this is more imaginable. And they {crackle} technology gain as well. So I think it was technology that encouraged the belief in alien life (INT3:137).

It is useful to be aware of the social importance of the phenomenon of UFO studies, and I believe that wider consideration of it will support the field research, in particular when dealing with the question of fusion or confusion of extraterrestrial life with UFOs. As a matter of fact, the occurrence of UFO phenomena and the "belief in alien life" here are explained as a socio-psychological effect of technological advancement. Or possibly, "the alien/UFO religions, and online and offline communities, and individual seekers of a 'truth that is out there' reveal the inner workings of relations enabled, and disabled, by prospecting starward for social connection, with the expectation that this action is reciprocal" (Battaglia 2005:3).[152]

Nevertheless, the case of mistaken identity of the advanced 'Other' with UFO phenomenon and the deemphasising of the SETI importance are not the only problems METI and SETI have to face. There is ongoing transmission debate on messaging mode (or the Active SETI as Zaitsev calls it), not only regarding its means but also policy implications (e.g. Shuch 2007). Even some SETI scientists are likely to agree with Hawking's statement and proposed to "avoid attracting attention" as the 'Other' might be "extremely aggressive super-predator", one for all Michael Michaud, the Member of the SETI Permanent Study Group, IAA in his "Active SETI Is Not Scientific Research"[153] As a criticism of messaging, Michaud concluded that "Active SETI is based on belief or preference, not on proven facts."

[152]Battaglia (2005: 2) writes about "galaxies of discourse" that "reconfigure how we relate magic, science, and religion in contemporary practice and, often to actors unaware of this, in terms recalling the science spirituality of times putatively more mystical".
[153] Retrieved from http://www.setileague.org/editor/actvseti.htm. Accessed 01 April 2013.

(Michaud 2005). Alexander Zaitsev, the representative of Russian METI activities, expressed his opinion in response to Peter Backus' editorial "Three SETI Myths" (2006) and published a short note entitled "Searching for Extraterrestrial Idiots?"[154] Zaitsev defended the messaging activities and concluded with ironic line that "If only idiots transmit, then by implication, those of us on Earth who propose or practice METI must be idiots."[155]

Although some scientists would dissociate themselves from SETI, regarding it as unscientific or using the pejorative expression pseudoscience, some others see SETI as positioned within science. I recall here how Hynek (1972) described the reaction of a scientific community when an unidentified object was reported outside the meeting venue: the "news was met by casual banter and the giggling sound that often accompanies an embarrassing situation" (Hynek 1972). With the same phrase, but decades later, Kerr described the "giggle factor" that accompanies conversations about SETI (Kerr 2005).

## 6.4. The Visual and Audible Science

So far the imagining techniques were mostly presented as visual, while technology has the ability to transform the experience of our world into the audible. In this sense a telescope as a knowledge acquisition tool is a magnifier of images of distant objects and the radio telescope is an amplifier of sounds of distant objects. Both count as scientific tools and as such are re-presenting the distant and remotely placed in space-time, the first in visual, and the latter in audio, regimes. As I described in SETI@home, the data gathered via the radio telescope are recorded and used to analyse the cosmic soundscape and celestial objects. The radiotelescope generates a cosmic soundscape (sonic map) of celestial objects (such as pulsars). In an analogy to Alvin, the submarine described by Helmreich (2007), the radio telescope makes the universe an audible experience and the traces of other life something that can be heard through the agency of the big ear, and not only seen through the agency of the

[154] Retrieved from http://www.cplire.ru/html/ra&sr/irm/idiots.html. Accessed 01 April 2013.
[155] The editorial note followed by a disclaimer "the opinion of individual authors do not necessarily reflect the position of The SETI League, Inc., its Trustees, officers, Advisory Board, members, donors, or commercial sponsors". Retrieved from http://www.cplire.ru/html/ra&sr/irm/idiots.html

extended eye.[156] The search for the 'Other' includes both visual and audible components on the sides of both a receptor and a sender of a message. The following table introduces the two modes compared along the traditional nature-versus-culture dichotomy. Drawing an analogy between observing and listening, I aim to show the two methods of sensory operation– that is, of seeing and hearing.

**Table 6: Comparison of Visible and Audible**

| | Visible | Audible |
|---|---|---|
| nature | to reflect | to echo |
| | eye | ear |
| | naked eye | |
| | observing (watching) | listening (recording) |
| | seeing | hearing |
| culture | optical telescope | radio telescope |
| | magnifier | amplifier |
| | to observe | to listen |
| | extended eye | big ear |
| | watching | recording |
| | video | radio |

[156] In relation to space exploration I would like to mention a new generation of cyborgs – the astronauts. As Helmreich described the Alvin submarine: "The assemblage of the sub and its encapsulated scientist is clearly a cyborg, a combination of the organic and technical kept in tune and on track through the self-correcting dynamics of visual, audio, and tactile feedback." (Helmreich 2007:622) And so is the astronaut in the spacesuit is a new generation of cyborgs, described by Haraway (1991. Astronaut's space suit as a heroic icon in both fictional and documentary space narratives was studied by Debra Shaw in "Bodies out of this world: the space suit as cultural icon" (2010). Roger D. Launius in his study "Heroes in a Vacuum: The Apollo Astronaut as Cultural Icon" (2008) described the American astronauts as "heroes in the vacuum" and "cultural icon" (Launius 2008:174 ). The Apollo astronaut is the discoverer, the explorer but also a symbol of patriotism and values and an actor in the Cold War machinery play. Launius explored the mythology of the astronaut in American culture and addressed the cultural stereotypes, encouraged by NASA PR that began to form with the first astronauts of the Mercury Program, first American astronauts by vocation. The astronaut was usually portrayed as bearers of national pride and patriotism, "personification of ordinary American", "defender of the nation", "masculine representative of the American ideal", "fun-loving young man" and a hero of course (Launius 2008:193&194)

A new role is played here by the search technology, the cultural gear of the search. The original role of a scientist here as a spectator, an eyewitness who watches or surveys the sky– the role since Galileo, who established observation as a key scientific method – now emerges also as an 'earwitness' to outer space. This is best illustrated in "Contact" (USA 1997), where the SETI scientist is portrayed traditionally as a spectator; but instead of watching something without taking part in it, in other words being an eyewitness, the SETI scientists are 'earwitnesses' to the extraterrestrial signal. Instead of seeing with your own eyes, the main character, who is persistent enough to keep listening despite the budget cuts and criticism, eventually hears the civilised 'Other' with her 'own ears'. Sound, an articulated signal, is a metaphor for intelligence, for extraterrestrial sonic culture, and an alternative to visual observation.

The rhetoric of science is not only textual but also visual and especially sonic. Escobar described "visuality as a cultural and epistemological regime" (Escobar, Hess et al. 1994:216), and here we encounter the new epistemological regime of 'audibility' but also a rhetoric of science that is not only textual and visual, but especially sonic. Similarly to a star chart that maps what's visible of our cosmos, or the latest sophisticated large-scale galactic maps I described in the second chapter, the radiotelescope generates a cosmic soundscape (sonic map) of celestial objects, typically pulsars. Here I point to the 'pulsar map' used to signify the position of earth within our galaxy that was used on the Pioneer 10 and 11 and the Voyager I and II messages (Figures 28 and 29).

Listening as the second search mode also signifies the development of a new way of understanding the universe, of ways we relate to it, and that is through "soundscape" (Helmreich 2007). Along with the acoustic transformation of the universe into an audible experience, a cosmos that is audible, the notion of a "broadcasting universe" also emerged (Bryld and Lykke 2000). Outer space is now, thanks to advancements in imagining technologies (delivered through the Hubble space telescope and clever software), full of colourful images of nebulae, dotted with galaxy fields and stars

with planets, and filled with planetary and stellar music, populated with our ideas about other life, and a melody.[157]

SETI's appearance not only accompanies the translation of the cosmos into sounds, but also vocalises a new notion of science. The SETI science is defined by its subject matter, or, more precisely, the 'missing subject matter'. The paradoxes within the scientific search for the 'Other', the missing subject matter and in case of the SETI also eerie science shed light on SETI science as a case study of a scientific practice with unclear status.

## 6.5. The Cultured Science

I choose to use term cultured science to talk about 'science of no science'. The 'charming science' is captivating; the socio-scientific online formation SETI@home attracted more than 3 million users worldwide and can be regarded as a case study of an engaged science. The SETI website announces: "Be humanity's hero. Ensure the future of this multi-generational quest for knowledge".[158] It is composed of people from many parts of the world, popularising the SETI quest internationally; the characteristics illustrate the recent globalisation of science, and the added value of SETI science is that it is not provincial in attitudes or interests. The institute's culture of openness in combination with the participation of the public of SETI science makes it possible for people to engage with and participate in the search. The SETI science, especially SETI@home, affected what Escobar calls the "techno-scientific imagery" (Escobar 1994:221) on a global scale by generating soundscapes that are distributed among the public, and the popularising dimension has been acknowledged by my respondents.[159] The science in search of extraterrestrial life is a mixed genre that takes place within the "big science" (de Solla Price 1963).

The alien sky remains silent. As Seth Shostack explained in London in 2010, SETI was going through a bad phase, but he suggested that "the Enlightenment process will guide us through" (LO2010). In fact, the SETI scientists keep listening to the

[157]To celebrate Halloween, NASA, on their website in November 2007, presented "Spooky Space 'Sounds'", which are essentially radio emissions recorded by NASA spacecrafts.
[158]Retrieved from http://www.seti.org/supportus. Accessed 14 March 2013.
[159]The term "technoscientific imagery" is used by Escobar (1994:221).

sounds of silence, and some of the scientists who participated in my research described the ethos of the SETI search as a virtue. I recall here again what one respondent said: "you have to have a lot of endurance to keep looking after 50 years and not seeing anything" (INT3:188).

To sum up, if we describe messaging as "images of science" and listening as "sounds of science" (Helmreich quoting Moody 2005), the third mode, exploring, means a giant loop back to science per se, to the "future of science". The modes of the search for life beyond earth– that is, messaging, listening, and exploring– are responsible for the formulation and reformulation of the conception of the 'Other', and, in doing so, are also vocalising the conceptions of human life. The information and knowledge are initially diffused through standard scientific channels; however, new channels have also recently entered the scene, such as social networks.

## 6.6. The Online and Networked Science

So far I have provided a few instances of the SETI Institute employing its website and making use of the Internet to enhance its science. Similarly, in the messaging mode, we have seen how the latest projects utilise online platforms to collect responses from all over the world (e.g. Hello from Earth 2009, A Message from Earth 2012). The third mode, exploring, continues and extends this tradition. Recently, the online platform Planet Hunters enables the public to participate in detecting planets beyond earth by analysing the data online.[160] The convergence of social media reached out to extraterrestrial space. A milestone in the history of the micro blogging tool Twitter was the day the first tweet from space was posted. The ISS resident at that time, astronaut Timothy J. Creamer, in the online community possibly better known as@Astro_TJ, is credited with posting the first orbital social update in January 2010: "@Astro_TJ, "Hello Twitterverse! We r now LIVE tweeting from the International Space Station -- the 1st live tweet from Space! :) More soon, send your?s."[161] Receiving good coverage in terrestrial media and high numbers of

[160]Retrieved from http://www.planethunters.org/. Accessed 14 March 2013.
[161]Retrieved from http://twitter.com/#!/astro_tjAnotherfamoustweetingastronautistheSTSAstronautMikeMassiminohttp://twitter.com/#!/Astro_Mike/. Accessed 20 August 2012. Retrieved from: http://www.computerworld.com/s/article/9147418/NASA_Astronauts_start_Twittering_from_space_station. Accessed 20 August 2012.

followers, the orbital tweeting marks another turning point in both the history of the Internet and the history of space exploration.

Drawing from its use by scientists (or by those who market science) as recognised in the scientific search for other life, I look at social media as a cultural practice that takes place in a period of profound social change, change I describe as the age of the Internet and the subsequent digital media revolution. Here I address the double role of the Internet, firstly as a mass media channel and secondly as a vehicle of societal change and a facilitator of cultural diffusion. The necessity of having an online presence – a website – is nowadays clearly justified by a need to provide publicly available information and to present the research institution.[162]

The online environment is where new touch points of interaction are generated, which have also been described as "cyberspaces" (Aronowitz, Martinsons et al. 1996) as a consequence of technological society, the "cyberia" (Escobar, Hess et al. 1994). Allowing the voice of the masses to be heard, social media, as well as a means of providing first-hand information, also enables virtual online interaction– the highest level of engagement ever imaginable.[163] Social media have already been recognised as facilitators of social change (by social scientists, business studies) and there is a growing body of literature examining social media and mobile technologies from various viewpoints (smart phone analyses yet to come). A systematic study of emergent "Convergence Culture" was provided by media and popular culture scholar Henry Jenkins (2006), who addresses the concepts of media convergence, participatory culture, and collective intelligence. Jenkins predicted the role of media audiences to actively participate within the culture. This is especially true for the new technologies and brought to a whole new level by social networks available to general public and professionals. The Internet enables scientists to register with professional networks (such as LinkedIn, Academia, etc.), register membership with international networks, and cooperate online. This substantially changes the modus operandi of science, which is now networked globally. The technological revolution

[162]According to the latest available data provided by the Internet Usage and World Population Statistics, as of 31 December 2011, more than 2 billion people – that is, approximately 32% of the world's population – have access to the World Wide Web.

[163]Information is now distributed online, in real time, and with little or no censorship (at least as I believe); the importance of social media has been shown most notably during the so-called Arab Spring.

again refers not only to how technology influences everyday life but also to how people consume media and relate to technology.

Secondly, in this study I address the management of social media profiles and social media networks as a novel way of engaging with the public globally and internationally, typically via Twitter and Facebook. Certainly, for some the usage of social media is an unexplored area, but the potential of Twitter and Facebook has been appreciated and utilised by some of the leading scientific organisations, such as NASA, ESA, and especially the SETI Institute.[164] For early adopters, such as NASA, the reason was to efficiently manage the organisation's public image (essential to have public policies). SETI's utilisation of the Internet and collaboration platforms has been described in Chapter 4. Listening.

Social media play a key role in science popularisation (or science socialisation). With the growing use of the Internet and social networks, such as Facebook and Twitter, a new touch point with the public has emerged. The Internet enables users to engage and interact with science institutions and receive the latest updates. Also scientific institutions make the most of the communication links and emerging web technologies. Another online enterprise worth mentioning is the social network Bebo's project, A Message from Earth.[165] Following the scientific message sending, the Bebo message has been compiled from content submitted online by Bebo users and was broadcast into the universe in October 2008.

## 6.7. The Inhabited Universe

The three modes of the search for the 'Other' illustrate the process of negotiating our place in the new cosmos, of the inhabited universe. Hence it is not only the 'Other' that has been produced by the cultural practice called Western science, but more importantly also the conception of 'Us', of life forms inhabiting earth. This inevitably brings us to the question of what is understood as universal identity. This process will be explored in the context of science as "making identities" (Jasanoff 2006). The messages contain self-representation, the representation of the self, of

[164]E.g. Mazali (2011) addresses the role of social media in the emergence of a new public sphere.
[165]Retrieved from http://www.bebo.com/amessagefromearth/. Accessed 20 August 2012.

ourselves as the human race, that is addressed to the 'Other'. Drawing on Todorov, Harding argues that the "primitive Other was produced along with the advanced, civilized, rational 'self' of European culture" (Harding 1992:312). It seems after all that the superior, super-intelligent, technologically advanced, and extraterrestrial 'Other' was produced along with the civilised and rational scientific self. Recently, science reviewed and re-evaluated the extraterrestrial-life hypothesis through the exploring mode described above, and currently operates on a different level. The 'Other' is understood in the context of current hypotheses of habitable environments and extraterrestrial origins as a new "origin story" (Harding 1991) of the primitive 'Other'. Or, at least, we fit within the elementary *in vitro* conception of a substance – life. While the messaging and listening modes refer to the search for intelligent extraterrestrial civilisations typical of the second half of the twentieth century, the aim of the most recent exploration of the universe is to detect water in liquid form. This paradigm shift was detected by Helmreich and resulted in "Not extraterrestrial messages, but otherworldly organisms" (2009:254).

The engendered and also de-gendered (he-and-she) human has been removed from associations with gender, race, or ethnicity, an idealised twentieth-century citizen of earth. Each of the scientific messages presents a generic self. Mostly, generic self denotes 'life'; however, in some cases the use of the phrase 'life on earth' refers to the totality of living things, e.g. nature[166]. The question of how the humankind is self-identified and presented is relevant, particularly in the context of the emergence of the vague term 'we' that is frequently used in search activities. For example, this can be seen in President Carter's official statement sent to the universe in 1977 on the Voyagers: "We are trying to survive our time so we may live into yours.[167] We hope someday, having solved the problems we face, to join a community of galactic civilizations." From a cultural point of view, the term 'we' signifies underlying

[166]Public self represents terrestrial receivers of scientific messages. The public self in this research will be represented by focus groups and also by recent (commercial) messages that were made up of public responses from all over the world. Also included in the concept of public self are public responses to messaging, listening, and exploring, available on media and web forums. The scientific self is representative of a body of scientists of various areas of expertise engaged primarily in the message-creating process. Use of the phrase scientific self was inspired by Daston and Galison's book "Objectivity". As Daston and Galison have shown, the scientific self was "realized and reinforced by specialized techniques of the self" that are related to practices of scientific objectivity (Daston and Galison 2007:38).

[167]The full text of the statement is available from http://www.bigear.org/CSMO/HTML/CS07/cs07p02.htm. Accessed 13 August 2012.

structures and meanings not obvious at first sight and easily mistaken for one another but present in any of SETI's activities and changing depending on the context in which the 'we' term is used. This notion subsequently develops into the concept of the technology-possessing society, space explorers, until very recently the Western part of the world. Drawing from the contents of the messaging, 'we' is the very modus operandi of messages that include a description of human bodies or more precisely of what is regarded as an average physical appearance humans have in common. This new self is a prototype, a product of synthesis; the generic self was compiled and presented by the scientific community.

In case of the inhabitants of "one-world" – earthlings – have been inscribed with a new identity that unties boundaries of culture and introduces loose boundaries of being human. When describing human beings from planet earth, as seen from the presumably objective and neutral scientific viewpoint, we can borrow a description provided on the Voyager Record. This "scientific narrative about human beings" (Capova 2008:77) displays a generic human identity that rests primarily in biological factors and is further based upon cultural universals, elements common to all members of our species, for instance language and reproduction. The earth citizen of the twenty-first century, removed from the boundaries and traits of his/her native culture, is ready to set off into the new inhabited universe and introduce the non-anthropocentric identity, the humanity of the future. The concept of "interstellar humanity" was described by former NASA Chief Historian Steven J. Dick. In his scientific estimate of human destiny in the future, Dick predicts that "Cosmic evolution, extraterrestrial intelligence and interstellar travel will shape interstellar humanity in the next millennium" (Dick 2000:565). For the moment, having entered outer space in the late twentieth century, the earth inhabitants – present, past, and future ones – have been united into 'we'. A new identity has been ascribed to human entities: our evolution, our present, and our future seem to have been recognised as a requisite of 'us' who now live sub specie aeternitatis, of 'we' who have entered a potentially inhabited space. 'We' are defined by a sameness based on our sharing one planet, being a Worldling, and our commonness in this context is valued over individuality.

Reason – as a virtue of Western ergo scientific culture– also presents the key feature in indicating human development that proceeded towards science and technology. Human history is presented as a linear history of intellect coming to its enlightened phase of reason, which leaves space for rational questioning (note Descartes' Dubito, ergo cogito, ergo sum; in English: I doubt, therefore I think, therefore I am.) and a little space for personal beliefs. God was eliminated from the divine equation of creation over a century ago, and the vast space above our heads – the universe – became a place to fascinate human curiosity, to expand the understanding of the universe (now also conceptualised as our living environment). The universe has yet kept its divine features; it is still a place of mathematical order and physical laws of nature that exist independently of us.

## 6.8. The Global Science and Contested Worlds

The universe is the place outside earth atmosphere, is the final frontier of human imagination, the place where everything is possible: cosmology, mythology, religion, science, anthropology, and mystery. The sociocultural formations related to search for Other life are earthbound, terrestrial. Beyond the horizon are located the extra-terrestrial places and this is where supposedly resides the other life. In fact, the first celestial beings, first inhabitants of a divine heaven were the gods. The origin myths are usually cosmogonies. Meier in the study "What's "Up" With God? Vertical Space as a Representation of the Divine" examined the hypothesis that representations of divinity would be linked to higher levels of vertical space. Meier concluded that the phrase "Glory to God in the Highest is not merely the title of a common hymn, but a phrase that reveals an important truth about our thoughts, memories, and social judgments concerning divinity related concepts" (Meier, Hauser et al. 2007). Not limiting the conclusion on one specific geographic area the authors also suggested that "multiple religions use vertical space when conceptualizing high levels of spiritual attainment, even within non-Christian religions" (Meier, Hauser et al. 2007)

The bilateral symmetry of the untouched, distant, eternal sphere is now distorted and subjected to rational examination. Man has not only entered the space but also brought back cosmic souvenirs, cultural artefacts, subjects of rational examination

and potentially future resources; humans are bringing moon rocks to the laboratories and collecting samples of comets. Originally supernatural sphere is now a target for our aspiring spirit of exploration, our science, and our sentiments. The outer space is far from being an empty, culturally sterile vacuum, one would be tempted to say intact nature, or as Alice Gorman in "The cultural landscape of interplanetary space" described, the "interplanetary space can be seen as a cultural landscape forged by the organic interaction of the space environment and human material culture (Gorman 2005:86). Symbolically, this is the place where the new 'situated' knowledge is produced in situ.

Bruno Latour noted that the "global is largely, like the globe itself, an invention of science" (Latour 2004b:451). The study of scientific visual culture is an essential part of studying the technoscientific processes (Pink 2001; Chen 2003; Daston and Galison 2007). It is exactly the imaging techniques that present or make present the distant, or 'invisible', or 'silent', universe, transforming it into a colourful, "broadcasting" (Bryld and Lykke 2000:173) universe. But the images have also changed the global perspectives, as presented below.[168]

The image on the left (Figure 66) is the Soviet "Man in space" postage stamp from 1978, which features an imitation of a drawing of Vitruvian man by Leonardo da Vinci.[169] This is another example to support Haraway's notion that the "Man of Perfect Proportions has paved his way in the imaginations of technoculture", which was her reflection on seeing the Vitruvian man in scientific brochures, etc. (Haraway 2008:7).[170] Here the allegory of da Vinci's Vitruvian man is used in Soviet propaganda. The right image (Figure 67) originates from China and depicts humans as, in the words of one of my respondents, "a space-faring race" (INT4E:111). The

[168]Kearney for example has shown the interesting implications of such notions as reflected in the changing field of anthropology. His study "Changing fields of anthropology: From local to global" (2004) calls for an anthropology of globalism and trans-nationalism and highlights the new perspective that accompanies a "reconfiguration of the images and assumptions of several basic world-view universals" (2004:219).

[169]Image retrieved from space and astronomy stamps from the USSR. Retrieved from http://www.spacemartgifts.com/stamp_album/ussr%20space%20stamps0004.html. Accessed 29 August 2012.

[170]Haraway D., 2008. When species meet Posthumanities, Vol. 3. University of Minnesota Press, London.

commemorative stamp from 1999 "Uphold science, eradicate superstition" seems to celebrate the first Chinese man to walk into outer space.


**Figure 66. Soviet postage stamp "Man in Space" (1977). Licence: Editorial Use Only. Image Credit: Maxim Ibragimov / Shutterstock.com**


**Figure 67. Chinese postage stamp "Uphold science, eradicate superstition" (designed by Cheng Guoying in 1999). Image Credit: chineseposters.net.**

The notion of global can be recognised in logotypes where the global perspective is concerned, typically in news broadcasts: for example, BBC World News.[171] The UNICEF (the United Nations Children's Fund) logo for example shows a mother holding a child on the background of a globe. Similarly the logo of the UN as well as the UN Division for Sustainable Development is the globe being held in a human hand (Figure 68).

New sentiments have emerged from the notion of global. Cosgrove discussed the role of pictures in Western environmentalism (2008:1864) and described the blue planet as "environmental icon" (2008:1874), hence also a hand holding the fragile whole earth addresses the global environmental problems and has become a symbol of various environmental protection

**Figure 68. The UN Division for Sustainable Development logo. Image Credit: UN.**

[171]Source http://www.bbc.com/news/. Accessed 29 January 2013.

efforts. New policy documents have emerged, such as the UN Policy document "Space solutions for the world's problems" (UNOOSA 2005), which is obviously in line with the current trend/necessity to prove social values brought by science, which is perceived as detached from the world's problems.[172] In her study of the abortion debate in the US, "Contested Lives: The Abortion Debate in An American Community", Faye Ginsburg noted that the foetal image became a symbol in the abortion wars (Ginsburg 1989). For us, the photo of earth became a symbol of a contested universe. As Haraway later stated, "the global fetus and the spherical whole Earth both exist of, and inside of, technoscientific visual culture" (Haraway 1997). Both are presented on the cover of popular American magazine Life (Figure 69 and 70).

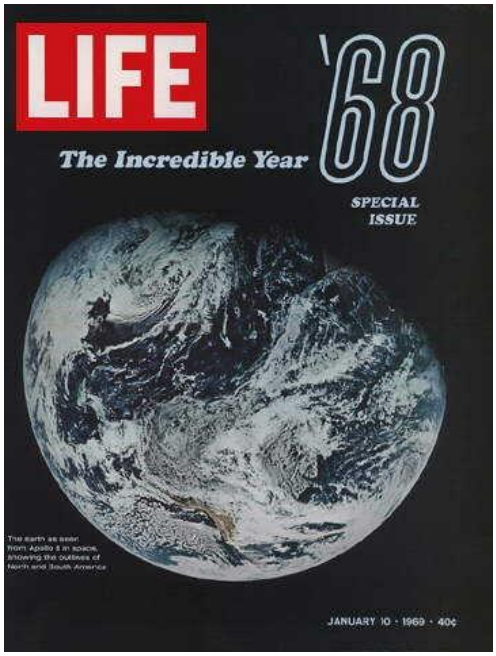


**Figure 69. The cover image of Life in 1969 shows Earth as seen from Apollo 8. Image Credit: Life Magazine.**

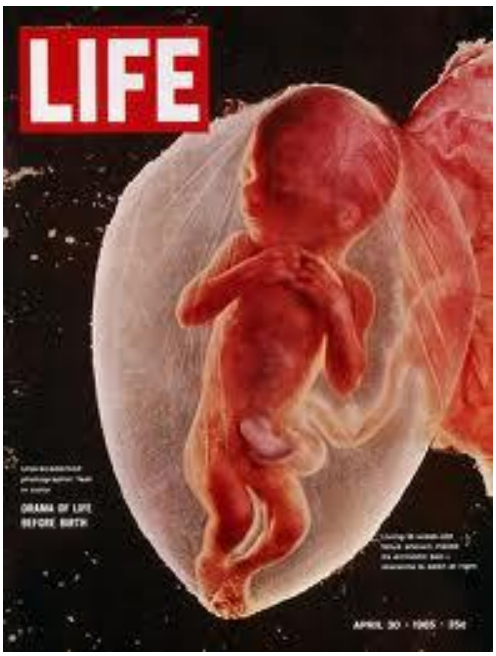


**Figure 70. The cover image of Life in 1965 advertises an 'Unprecedented photographic feat in color'. Image Credit: Life Magazine.**

Haraway in "Modest Witness@SecondMillenium.FemaleMan Meets OncoMouse: Feminism and Technoscience" interprets the notion of "whole Earth" and the foetus

[172] Space Policy also became a public affair. In support of the UN, the Space Generation Advisory Council is a non-governmental and professional network that "works on the international, national and local level to link together university students and young professionals to think creatively about international space policy issues and inject the youth point of view into international space policy creation." Available from http://spacegeneration.org/index.php/about-sgac/what-we-do. Accessed 24 August 2012.

as "icons for the emergence of global, national, and local struggle over a recent natural-technical object of knowledge called environment" (Haraway 1997a:174). Both Harding and Cosgrove pointed out the importance of visualisation technologies and the power of the "mimetic truth of photography" (Cosgrove 1994). Nevertheless, earth has been contested in more specific senses: visually, technologically, and politically. Amongst the religious, philosophical, or alternative cosmologies all around the globe, the most powerful rational discourse is created and shaped by Western science. In this sense, the universe around the earth is no longer the divine area, but a place to explore.

Like "European expansionism" (Harding 1992), the conquest of extraterrestrial space is to be recognised as a form of colonialism. Drawing from Todorov's study of the conquest of America as a universal victory of Christianity (Todorov 1992) I regard the scientific messaging as a symbolic conquest of interstellar space. An act of conquest, under socio-political circumstances, represents a victory of American or alternatively Soviet science. In this sense we deal with the "imperialist expansion" (Cosgrove 1994) into the interstellar domain. During the Space Age a whole set of new disciplines and institutions have emerged: outer space affairs office, planetary management, exopolitics, outer space treaties, and the prospect of space tourism.

In 1987 the UN Report of the World Commission on Environment and Development, now known as the Brundtland Report, was addressed to "our common future" (Brundtland 1987). The opening lines of the Brundtland report – "our planet from space for the first time ... From space, we see a small and fragile ball dominated not by human activity and edifice but by a pattern of clouds, oceans, greenery, and soils" – leave us with no doubts: the global vision facilitated by the "view-from-outside at our planet" is the result of the space exploration programme, which generated the notion of "one-world" and "whole-earth" as described by Cosgrove (1994). Chomsky showed that success in the conquest of space leads to a militarisation of outer space and increases authority, power, and global control (Chomsky 2004).[173]

[173] Frank Borman, Apollo 8 astronaut, reported after seeing earth from the outer space (Space Quotations 2012): When you're finally up at the moon looking back on earth, all those differences

The following section introduces artists' concepts capturing imagined worlds – the construction of extrasolar reality images pushing the scientific frontier to underline the importance of visual presentation in scientific rhetoric. Chen, in a study of visualism in science, asked what metaphor can be used to visualise scientific frontiers. One of the metaphors used is the Voyager message as "knowledge domain visualisation" (Chen 2003:3). Here we are presented with another two examples of scientific visual thinking about imagined, remote worlds – on the frontier of contemporary science - yet to be conceived by the general public (Figure 71 and 72).

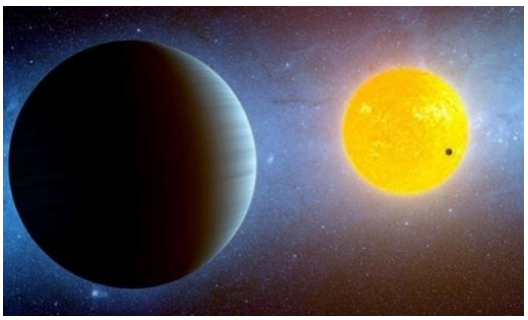

**Figure 71. Artist's impression of Kepler-10 Stellar Family (2011). Image Credit: NASA/Ames/JPL-Caltech/T. Pyle.**

**Figure 72. Artist's impression of Free-Floating Planet (2011). Image Credit: NASA/JPL-Caltech/R Hurt.**

## 6.9. The Competing Science

I would like to mention also the political context of space exploration and the Space Race between the USA and former USSR as the two competing cultures of science operating in the polarised world. From early 50s USA and USSR, two super powers of the world competed in the cosmic enterprise. The space exploration accelerated by politics and excessive amount of financial resources was transformed into the space race and into the conquest of outer space (first man in the universe was Russian, first man on Moon was American).

Every success was understood and made public as an ultimate proof of technological superiority of the winning site and the space exploration program in this sense had ideological connotations and pragmatic dimension. The history of the Space Race

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and nationalistic traits are pretty well going to blend, and you're going to get a concept that maybe this really is one world and why the hell can't we learn to live together like decent people.

was described amongst other by Gorman in her contribution "An ideological vacuum: the Cold War in outer space." published in “A Fearsome Heritage: Diverse Legacies of the Cold War“. Gorman offers historical perspective and describes the race from the e to acquire the V-2 ballistic missile from liberated Germany in 1945 as one of the early battle of the Cold War (Gorman 2006:73).

The Space Race shows similarities to the mediaeval conquest of Americas. What was expected was the victory granting the power, profit, and more importantly the control and dominance over the outside world giving the winner’s site the unique position in the global politics. Cold war propaganda machinery was used by both poles of the world to promote the ideological principles of political system. Moreover, science and technology became devices of a military competition which includes intercontinental ballistic missile, artificial satellites, and control over the outer space bringing out unquestionable inner paradoxes within science and the importance of stakeholders role in research. Battaglia for example noticed that “It is worth dwelling longer on the cultural environment of the cold war, which gave birth to modern ufology - the technological wing of the E.T. imagery.” (Battaglia 2005:19)

Taking place in the immediate context of Cold War, the Space Race marks the beginnings of the Space Age era. And it was the scientific understanding and interpreting the living world that commenced to grow on importance and enabled to invade sacred spaces. The Space Age introduced a new ways of how we relate to the formerly divine sphere, and subsequently to find our place in this newly introduced place/space. The new space technologies developed during the era also have had impact on advancement in technologies commonly employed in terrestrial affairs. The new technological revolution enabled through NASA’s science lists improved baby food, satellite television, and much more.

The Space Age now enters a new era by establishing the European Space Agency (ESA). The Inter Agency Consultative Group, IACG, the joint enterprise of ESA, NASA, USSR, and Japan to study/observe Halley’s Comet. Giotto spacecraft encountered the Halley Comet in 1986. Bonnet and Mannon described:

> The whole of the Halley's Comet epic would be dominated by this sentiment of a joint, historical, and unprecedented effort, coordinated among the four main space powers of the world. Never among the participants was there any argument about who would do the best job, who would stand up for the first prize. All agencies would be first! (Bonnet and Mannon 1994: 88)

Bonnet and Mannon described the meeting of space scientists with Pope John Paul II in Vatican in 1986, where "the pope greeted the space scientists as "people of good will [who] seek to identify those areas of knowledge ... which unite the human family rather than divide it ... and thus ... merit to be called peacemakers" (Bonnet and Mannon 1994: 92)

## 6.10. The Commercialised Science

There is a new dimension to space exploration, and that is commerce entering the domain of extraterrestrial places. Outer space was contested by imagination, politics, and finally also by commerce. The space industry is no longer a vision for the future but is becoming an emergent phenomenon and also a selling point with millions of dollars' worth of investments. Outer space poses a great challenge to policy makers and space commerce.

The first obvious example is space travel. The British airline company Virgin Atlantic now has Virgin Galactic.[174] According to their Facebook page: "We are Virgin Galactic, the world's first commercial spaceline. We are working hard to make access to space orders of magnitude more affordable, frequent, and safe than ever before."[175] Recently, Lynx, a producer of male grooming products, launched the Lynx Space Academy. The Apollo 11 astronaut Buzz Aldrin, the second man to walk on the moon, announced the space competition on the video playable on the website. The winners will be trained and travel with space tourism company.[176]

[174]Virgin Galactic homepage: http://www.virgingalactic.com/. Accessed 20 August 2012.
[175]Virgin Galactic Facebook page: http://www.facebook.com/pages/Virgin-Galactic/51080213587. Accessed 20 August 2012.
[176] Lynx Space Academy website https://www2.axeapollo.com/en_GB/. Accessed 28 March 2013.

According to the news websites an asteroid mining company will be launched in 2013 entitled Planetary Resources.[177] USA Today stated that "investors and advisers to the new company, Planetary Resources Inc. of Seattle, include Google CEO Larry Page and Executive Chairman Eric Schmidt and explorer and filmmaker James Cameron."[178] Mining asteroids for resources will ensure outer space provides a new level of profitability. According to Anderson: "We're in this for decades. But it's not a charity. And we'll make money from the beginning."

Moon Estates Ltd products include land on the moon, Venus, and Mars that is being sold online (Figure 73).[179] What we witness here is not only a lack of space legislation and the subsequent privatisation of celestial bodies; it is space commerce. Possibly, then, NASA should reconsider its space mission budgets and landing plans and invest in extraterrestrial real estate to secure a landing site, because the rest of Mars's surface will be privately held.

[177]Source: http://mashable.com/2012/04/24/planetary-resources/. Accessed 20 August 2012.
[178]USA Today, Source: http://www.usatoday.com/money/industries/technology/story/2012-04-23/tech-tycoons-mine-asteroids/54495052/1. Accessed 20 August 2012.
[179]Moon Estates website: http://www.moonestates.com/?gclid=COrw0rv89bECFUoYzQodXQIAQQ. Accessed 20 August 2012. A quote from their FAQs: "What is the law today?
With regard to extraterrestrial property sales, two treaties exist today.
These treaties do not refer to 'ownership' as such, they more commonly refer to the 'exploitation of the Moon and other celestial bodies for profit purposes', and extraterrestrial property sales distinctly fall under that section. The treaties are, The Outer Space Treaty of 1967 and the Moon Treaty of 1984. The Outer Space Treaty of 1967 explicitly forbids any government from claiming a celestial resource such as the Moon or a planet. What does this mean? Well it means that governments can not appropriate the Moon or other celestial bodies. Effectively, governments have signed to the fact that they have no rights to these bodies at all. What is actually important here is what the Outer Space Treaty does not say. It explicitly does not say whether commercial enterprises or private individuals can claim, exploit or appropriate the celestial bodies for profit. (Note that the Lunar Embassy is not a government body.) The United Nations and all countries that signed the Outer Space Treaty became aware of this vital omission almost immediately after the treaty was ratified in 1967. In fact, the United Nations have expended a large amount of time trying to ratify an amendment to the treaty ever since, that would explicitly include corporations and individuals. All attempts at ratifying such an amendment failed because member states did not agree with it. So, in the end, all the ratification attempts were summarized into the famous Moon Treaty some 15 years later. This information is a well documented fact today." Available from http://www.moonestates.com/p2/One_acre_parcel_of_land_on_Mars/product_info.html. Accessed 20 August 2012.


**Figure 73. Screenshot of the MoonEstates.com Ltd website offering land on the Moon, Mars and Venus for sale (2012). Image Credit and Copyright: Moonestates.com.**

Overall, we obtain a compelling picture of the competition in selling extraterrestrial properties such as Mars Real Estate and also other extraterrestrial merchandise.[180] The website Out of this World Gift features a Name a Star service, which is a package containing a dedication and a personalised certificate with your "chosen star name" for only £20.[181]

This of courses invokes international space law and policy implications. In a very recent paper on "asteroid activism", Olson (2012) raises a question for astronautics practices and policies regarding astronomical objects "as environmental objects that are considered to be threats as well as exploitable natural resources" (Olson 2012:1027). Our universe has been contested not only ideologically, politically, and scientifically, but also commercially.

## 6.12. Concluding Remarks

The messaging was presented as a blueprint of interstellar communication and a visual cliché that conforms to the rules of culture of science. Listening mode was introduced as a case study of emancipating science with ambiguous status, a science negotiating its status to the mainstream science. Finally, the exploring moved the

[180]Website http://www.marsshop.com/. Accessed 20 August 2012.
[181]Out of This World Gifts website: http://www.outofthisworldgifts.com/p39/Name_a_Star_Gift_Pack/product_info.html?utm_source=moonestates&utm_medium=banner&utm_campaign=looking. Accessed 20 August 2012.

analysis back to the conceptual ground of cutting-edge hard science and is the next generation of search for the Other.

The charming science is a site of permanent scientific revolution that also brings new cultural formations into being. As opposed to other scientific concept, the 'Other' is not defined by a convention but rather several parallel concepts. The scientific community cannot agree on this topic because there is nothing to agree on, the science only has several operational definitions of the imagined 'Other'. The 'Other' is the 'missing subject matter'.

But the uttermost feature of the charming science is that its work underlines the science assumptions about mankind. The implicit presumptions about the 'Other' make reference how scientists conceptualise human life and subsequently to how we think of ourselves. In my attempt to arrange together the diverse elements that form a cultural mosaic of the 'Other' I also aimed to introduce current multiplicity of the other life concepts. According to Russell, science is responsible for "dispelling of many traditional beliefs" (Russell 1985:11). The 'charming science' is responsible for producing new beliefs about the 'Other' that are mass mediated and distributed amongst public globally. It is the outreach that makes the science in search for extraterrestrial so charming; the charm that captures the imagination and interest of public.

### 6.12.a. Fieldwork in the Realm of the Other

I introduced the fieldwork at home and the problematic of spacial separation but also the problem of multiply situated cultures of science. The use of Internet as a method alternate to traditional fieldwork enabled me to access and handle the cultures of science and scientific cultures that spread across the national borders and hence pushed me beyond the frontiers of traditional fieldwork.

I grounded the field research methodology in two major anthropological approaches to fieldwork. Firstly I was inspired by the study of culture at distance, work pioneered by Margaret Mead (Mead and Mâetraux 1953). I used George Marcus's concept of multi-sited ethnography to explore ideas that extend over multiple

locations and approach "the thing" (Marcus 1995:106) by following it through various locations and contexts. This made it possible to introduce the 'Other' – the thing with interchangeable subject–object status - as a new field of ethnographic research. Hence instead of moving onsite of ethnographic research, I was located in the "no-man's land between the two cultures" (Latour 1999:17); not only physically but also on conceptual and symbolic level.

### 6.12.b. Limitations of the Study and Future Research

Despite my attempt to avoid generalisation that would exclude one concept over another, just by focusing on the 'Other' I have ignored the 52% of population who do not think there is other life and also I have not included testimonials of people who think we should not seek contact.

Similarly, many Western cultures have been rather non-problematically presented here as the Western culture united by its science. This piece of work is clearly based on a premise that the Western ergo scientific culture is hence a secular one. That means that its natives do have access to scientific knowledge, science education, and popular media and that the concept of the 'Other' not only does not clash with their belief system but in fact has become a part of their general world-view.

The question for cultural settings of 'charming science' in other than Western cultures remained unanswered. The imagining and narratives about the 'Other' and the overall perceptions of its existence in other cultures and in different religious contexts is subject to further comparative ethnographic research and discussion. The realisation of the multi-cultural perceptions of the 'Other' and acknowledgement of this diversity is important also for the SETI scientists who work on post-detection protocols. It is clear that exactly because the detection of extraterrestrial life is likely to have global consequences, the post contact scenarios need to be managed on a multi-cultural and multi-national basis. Another obvious direction for further research is the religious dimension of the SETI search in context with the emergence of new religious formations and further exploration of the way current religious systems conceptualise and eventually adapt the idea of extraterrestrial 'Other'.

# 7. **One Final Word**

This dissertation has investigated the socio-cultural aspects of scientific search for other life and introduced the concept of the ‘Other’ as culturally biased, whether we deal with culture of science or scientific culture. The typology of ‘charming science’ presented in this dissertation consists of the three modes that classify the scientific search for extraterrestrial life.

Our universe is said to be the one of endless possibilities, and one of those is the possibility for life – and hence the other life – to evolve. Finding the answer would beyond any doubt change the ways we think of ourselves and our cosmos. Perhaps, in the near future the ‘charming science’ will find its subject. Yet for the moment the story of science in search for life beyond earth is an open-ended narrative.

The main point of this writing was to show that the imagined ‘Other’ and the science on mission to discover the extraterrestrial life have already changed the ways the Westerners think of themselves. There is nothing extraterrestrial or extracultural or extrascientific about the charming science of the Other. And it is clear that the outer space is merely a dark void. It has been captured by human imagination and populated with cultural meanings.

# Appendices

## Appendix 1. The Facebook Pages

Appendix 1 lists the Facebook Pages related to the space exploration and ETI search worldwide I monitored during the research and writing-up period.

| Facebook Page Title | Facebook Category | Liked Since |
|---|---|---|
| AIAA - The American Institute of Aeronautics and Astronautics | Non-Profit Organisation | 2011 |
| Arecibo message | Interest | 2010 |
| Arecibo Observatory | Interest | 2010 |
| Astrobiology (Exobiologie) | Interest | n/a |
| Astronomy Now Magazine | Magazine | n/a |
| Astronomy Picture of the Day | Website | 2011 |
| British Interplanetary Society | Educational Organisation | 2012 |
| Canadian Space Agency | Government Organisation | n/a |
| EarthSky | Science Website | n/a |
| EPOXI Mission | Science Website | n/a |
| ESA Education | Government Organisation | n/a |
| European Space Agency | Government Organisation | 2010 |
| Extraterrestrial life | Interest | 2010 |
| Giant Magellan Telescope | Community | 2010 |
| Gliese 581d | Interest | 2013 |
| Hubble Space Telescope | Government Organisation | 2012 |
| Hubble Space Telescope | Non-Profit Organisation | 2010 |
| Human Exploration Projects | Science Website | 2012 |
| Human Space Flight Plans Committee | Government Organisation | 2010 |
| International Space Station | Organisation | 2011 |
| Jet Propulsion Laboratory (JPL) | Government Organisation | 2012 |
| Jill Tarter | Public Figure | 2013 |
| Kepler Mission | Government Organisation | n/a |
| LCROSS Lunar Impactor Mission | Community | 2009 |
| Mars Exploration Rovers | Aerospace/Defence | 2012 |

| | | |
|---|---|---|
| Mauna Kea Observatory | Science Website | 2010 |
| MESSENGER Mission | Science Website | 2010 |
| Milky way scientists | Aerospace/Defence | 2013 |
| NASA Ames Astrophysics & Astrochemistry Laboratory | Local Business | n/a |
| NASA Ames Research Center | Government Organisation | 2010 |
| NASA Goddard | Government Organisation | n/a |
| NASA Goddard Space Flight Center | Government Organisation | 2011 |
| NASA Solar Dynamics Observatory (Little SDO) | Government Organisation | n/a |
| NASA Universe Education | Government Organisation | 2012 |
| NASA Webb Telescope | Government Organisation | n/a |
| NASA's Curiosity Mars Rover | Aerospace/Defence | 2012 |
| NASA's Earth Observatory | Science Website | 2012 |
| NASA's Juno Mission to Jupiter | Government Organisation | 2012 |
| NASA's Kennedy Space Center | Government Organisation | n/a |
| NASA's Marshall Space Flight Center | Aerospace/Defence | n/a |
| NASA's Spitzer Space Telescope | Education | n/a |
| National Aeronautics and Space Administration – NASA | Government Organisation | n/a |
| National Astronomy and Ionosphere Center (Arecibo Observatory) | Organisation | 2012 |
| National Space Society | Non-Profit Organisation | 2012 |
| One Flag in Space | Community | 2012 |
| PlanetHunters | Science Website | 2012 |
| Royal Astronomical Society | Non-Profit Organisation | 2010 |
| Seth Shostak | Public Figure | 2013 |
| SETI Institute | Non-Profit Organisation | 2012 |
| SETI@home | Community | 2011 |
| Space Generation Advisory Council | Organisation | 2012 |
| The European Extremely Large Telescope | Science Website | 2010 |
| The Planetary Society | Organisation | 2013 |
| The Royal Society | Educational Organisation | 2011 |
| Thirty Meter Telescope | Community | 2010 |

## Appendix 2. The Information Sheet

The Information Sheet distributed to participants in preparation to the interviews.

Project Title: In Search of the Inhabited Universe
An anthropological inquiry into messaging, listening to and exploring
The ethnography of contemporary projects in space studies

Name: Mgr. Klara Anna Capova
PhD Candidate
Department of Anthropology, Durham University
Contact Information: k.a.capova@durham.ac.uk

**About This Research**

The aim of this research is to capture current trends in search strategies, evaluate past projects and to describe what the idea of extraterrestrial life is within science. Detailed information about the research objectives is provided on the attached research summary. Before the session start, you will be given the opportunity to ask questions.

This research adheres to the Durham University Principles for Data Protection and the good research ethics practice is based on the guidelines of the Association of Social Anthropologists of Great Britain and the Commonwealth. In practice it means, that the identity of all research participants is protected. No personal details which could be used to identify you retained in electronic or written form will be kept for longer than is necessary and the output of the research is strictly anonymous. However, if you wish to be credited for you contribution to this research, please give the relevant details on the attached Consent Form.

The recording device will be used only with your written consent. The session will be subsequently transcribed into a text and the recording erased. Based upon your consent, you will be provided with a summary of research findings.

**What Will Be Going On**

The interview will take approximately one hour. The interview includes following topics:

- history of the search for life, messaging and listening;
- current concept of life in the universe;
- meteors, comets, cosmic origin of life, habitable zones;
- civilisation, SETI and UFO;
- personal belief versus scientific data

You will be asked following questions:

- What do you know about current scientific activities in search for life in the universe?
- What do you think about the message sending activity?
- What do you think about the SETI activities?
- What is the current concept/definition of life in the universe?
- Is the question of life in the universe of importance (within science/for you) and why?
- Is there life in the universe and what it might be like?

## Appendix 3. Research Summary

The research summary was provided to the research participants along with the Information sheet.

Project Title: In Search of the Inhabited Universe
An anthropological inquiry into messaging, listening to and exploring
The ethnography of contemporary projects in space studies

Name: Mgr. Klara Anna Capova
PhD Candidate
Department of Anthropology, Durham University
Contact Information: k.a.capova@durham.ac.uk

**Introduction**

The focus of my research is the scientific understanding of the idea of life in the universe. The extraterrestrial life hypothesis is introduced as part of the current worldview that changes over time and space and embedded in three scientific search methods: message sending, the analysing of cosmic signals and the search for extrasolar planets (exoplanets), conceptualised as messaging, listening and exploring.

Based on the research hypothesis that scientific search for life in the universe also encompasses and vocalises the understanding of the terrestrial life; my research attempts to offer an account of the ways science defines what is life, firstly by producing stories about both terrestrial and extraterrestrial life and secondly by presenting such specific knowledge to its audience.

I aim to argue for the extraterrestrial life hypothesis as part of the current worldview and to show how this is perceived by both the scientific community and by representatives of the public. Exploration of public understanding the extraterrestrial life is intended to introduce the scientific search in broader social context.

**Research Activities**

An anthropological inquiry into messaging, listening and exploring is based in a multi - sited and multi-method approach to research. The field research consists of two research methods: focus groups and semi-structured interviews.

**Interviews**

The interviews are designed to offer ethnography of contemporary projects in space studies, in particular of the search for extra solar planets and studies of celestial bodies within the solar system. The series of interviews with planetary scientists seek to give an ethnographic account of the current search for extra- or non-terrestrial life, in particular to:

- document the contemporary concept of life in the universe;
- reveal the current concept of life and its origin (continuity, discontinuity);
- define the position of this specific field within science;
- identify the channels of representing the research with special focus on its visual part (current cosmologies and its visualisation) and its presentation to the public;
- detect the linguistic expressions and characteristic use of language (Kvale and Brinkmann 2009)

Interviews will be held in Durham, and in several locations within the UK commencing June 2010. The e-mail communication will be used as an alternative to the interviews, whereas time or space will not enable face-to face interviews.

**Research Ethics**

The research adheres to the Durham University Principles for Data Protection and the good research ethics practice is based on the AAA guidelines. In practice it means, that the identity of all research participants is protected. No personal details e.g. name and e-mail address are kept and the output of the research is strictly anonymous.

The recording device will be used only with participant's written consent. The session will be subsequently transcribed into a text and the recording erased. Based upon the consent, the participants will be provided with a summary of research findings.

**Reporting Strategies**

Provided that permission is granted, both interviews and focus groups session will be recorded as well as documented by field notes. For purposes of the analysis the recordings will be transcribed (Transcriber) and the recordings deleted.

The "meaning coding" (Kvale and Brinkmann 2009) as a tool of reduction the text into keywords and related topics is the first step of the data analysis. "Following the plot" approach within each single site of fieldwork (Marcus 1995: 109) then seeks to follow general formulations that serve to guide further investigation.

## Appendix 4. Supplementary Readings

The list of supplementary readings includes scientific papers and other texts consulted during the research period which I consider important to familiarise with the fields of scientific enquiry. These texts are not referenced within the text. All in-text scientific publications cited are listed in References.

### a. Messaging


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Rose C., Wright G., (2004). Inscribed matter as an energy-efficient means of communication with an extraterrestrial civilization. Nature, Vol. 431, 2 September 2004.

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Sagan, C., et al. (1972). "A Message from Earth." Science 175(4024): 881-884.

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## Appendix 5. Multimedia

The overview of Multimedia includes key cinematic works from the science fiction genre, TV documents, and videos available online.

### a. Science Fiction Films

Avatar. Directed by James Cameron. USA: Twentieth Century Fox Film Corporation, 2009.

Cloverfield. Directed by Matt Reeves. USA: Paramount Pictures, 2008.

Close Encounters of the Third Kind. Directed by Steven Spielberg. USA: Columbia Pictures Corporation, 1977.

Contact. Directed by Robert Zemeckis. USA: Warner Bros. Pictures, 1997.

District 9. Directed by Neill Blomkamp. USA: TriStar Pictures, 2009.

E.T. the Extra-Terrestrial. Directed by Steven Spielberg. USA: Universal Pictures, 1982.

Galaxy Quest. Directed by Dean Parisot. USA: DreamWorks SKG, 1999.

Hitchhikers Guide to the Galaxy. Directed by Garth Jennings. USA, UK: Touchstone Pictures, 2005.

Independence Day. Directed by Roland Emmerich. USA: Fox Home Entertainment, 1996.

Solyaris. Directed by Andrey Tarkovskiy. USSR: Mosfilm. 1972.

Sphere. Directed by Barry Levinson. USA: Warner Bros. Pictures, 1998.

Stalker. Directed by Andrey Tarkovskiy. USSR: Mosfilm. 1979.

Star Trek: The Next Generation. Created by Gene Roddenberry. USA: Paramount Television, 1987–1994.

The X Files. Directed by Rob Bowman. USA: Twentieth Century Fox Film Corporation, 1998.

War of the Worlds. Directed by Byron Haskin. USA: Paramount Pictures, 1953.

War of the Worlds. Directed by Steven Spielberg. USA: Paramount Pictures, 2005.

### b. TV Documentaries

The Story of Science: Power, Proof and Passion (Documentary). Directed by Nicola Cook, Giles Harrison, Peter Oxley, Nat Sharman, Jeremy Turner, Nigel Walk. UK: BBC, 2010.

The Planets (Documentary). Directed by David McNab. UK: BBC 1999.

### c. Radio Plays

The War of the Worlds, 1938. Radio Play. Directed by: Orson Welles. USA: The Mercury Theather on the Air. (Adaptation of the book by H.G. Wells). Available from www.mercurytheatre.info (Accessed 30 March 2013)

**d. Video Sharing Websites**

| | |
|---|---|
| ESA YouTube Channel | http://www.youtube.com/watch?v=6-vrWci8G30 |
| NASA Multimedia | http://www.nasa.gov/multimedia/index.html |
| NASA Television | http://www.youtube.com/user/NASAtelevision |

## Appendix 6. Project Websites

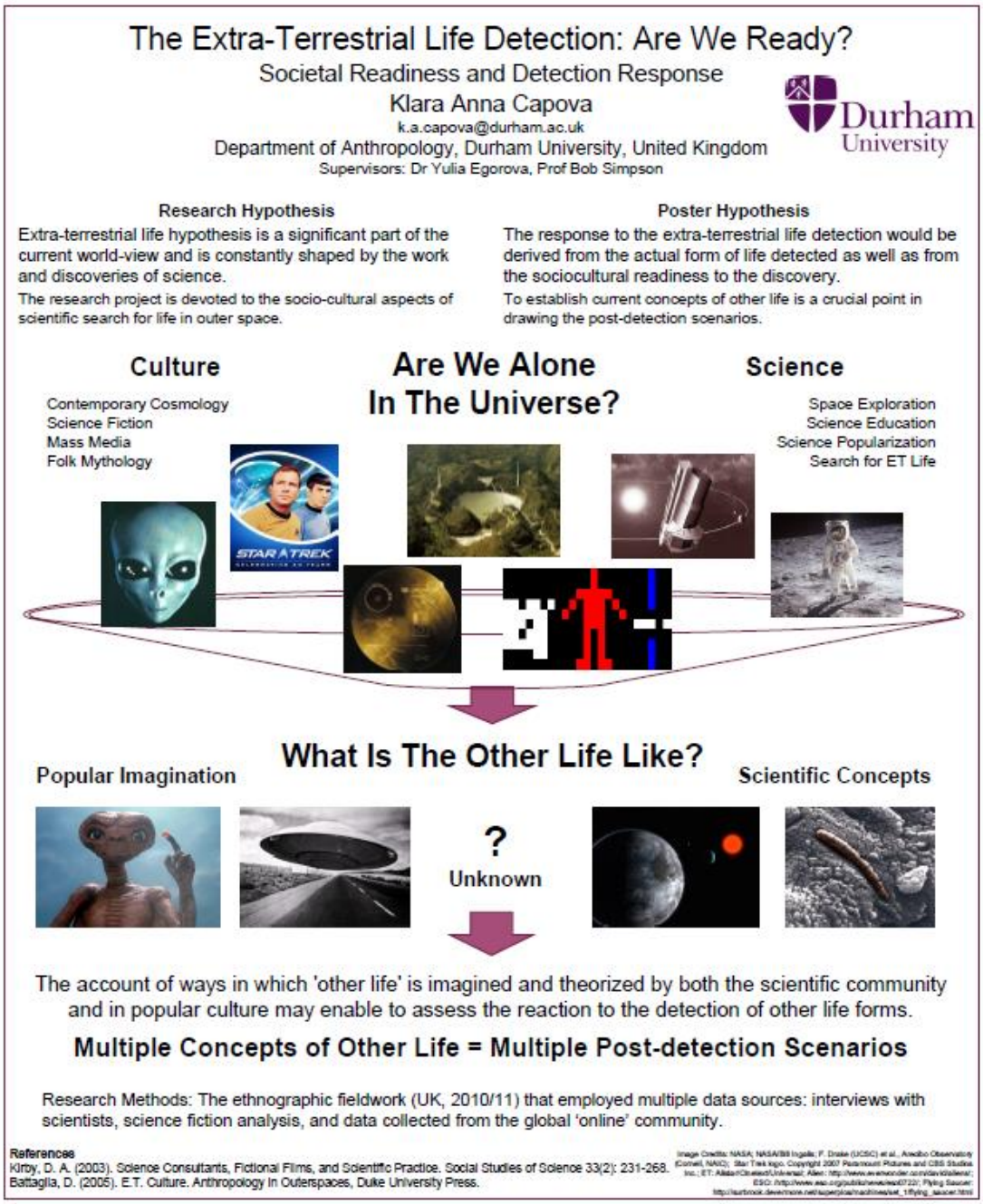
The overview (webography) of Project Websites and other resources lists the website I have located and consulted during the research period. All websites last accessed 23 March 2013.

| | |
|---|---|
| ESA | http://www.esa.int/ESA |
| ESO | http://www.eso.org |
| Hello From Earth | http://www.hellofromearth.net |
| Golden Record Website | http://www.goldenrecord.org |
| NASA | http://www.nasa.gov |
| NASA Astrobiology | http://astrobiology.nasa.gov |
| NASA Exoplanet Science Institute | http://nexsci.caltech.edu/ |
| NASA Kepler Mission | http://www.nasa.gov/mission_pages/kepler/main/index.html |
| NASA Mars Exploration Rovers | http://marsrover.nasa.gov/home/index.html |
| NASA Multimedia | http://www.nasa.gov/multimedia/index.html |
| NASA Pioneer Mission | http://www.nasa.gov/mission_pages/pioneer |
| NASA Planet Quest | http://planetquest.jpl.nasa.gov |
| NASA Voyager Mission | http://voyager.jpl.nasa.gov |
| Space Daily | http://www.spacedaily.com |
| SETI Institute | http://www.seti.org |
| SETI League | http://www.setileague.org |
| SETI@home | http://setiathome.berkeley.edu |
| Silicon Valley Astronomy Lectures | http://astrosociety.org/education/silicon-valley-astronomy-lectures |
| United Nations Office for Outer Space Affairs | http://www.oosa.unvienna.org/oosa/index.html |

and WordWeb Online Dictionary http://www.wordweb.info/WW3

## Appendix 7. AbSciCon 2012 Poster

The poster presentation "The Extra-Terrestrial Life Detection: Are We Ready? Societal Readiness and detection Response" was prepared for The Astrobiology Science Conference (AbSciCon) organised by NASA in April 2012.



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