

Humans in Outer Space

Interdisciplinary Odysseys



Contents

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April 2008
ISBN: 2-912049-81-4

This Paper is published under the responsibility of the ESF Standing Committee for the Humanities (SCH) and the European Space Sciences Committee (ESSC). As such it represents a considered opinion of the community represented by the Committees. It does not, however, necessarily represent the position of the European Science Foundation as a whole.

Cover pictures:

The Spiral Galaxy M74. Resembling festive lights on a holiday wreath, this NASA/ESA Hubble Space Telescope image of the nearby spiral galaxy M74 depicts bright knots of glowing gas that light up the spiral arms, indicating a rich environment of star formation © NASA/ESA –

Leonardo Da Vinci Drawing of Man © Getty Images

Foreword	3
Rationale	4
Interdisciplinary odysseys	5
First Odyssey	
<i>Humans in Earth orbit:</i>	
<i>what effect does it have?</i>	
Second Odyssey	
<i>Humans in space exploration:</i>	
<i>what effects will it have?</i>	
Third Odyssey	
<i>Humans migrating from the Earth:</i>	
<i>how will it affect human thought?</i>	
The way forward	7

Foreword

When faced with the issue of space exploration, one generally has an idea of the fields of study and disciplines that are involved: technology, physics and chemistry, robotics, astronomy and planetary science, space biology and medicine. In recent discussions, the human element of space exploration has increasingly attracted interest within the space sciences. As a consequence, humanities and social sciences have gained in relevance in space exploration and space research, at a time when manned space flights are almost part of everyday life. The contribution of knowledge in these fields will play an important part in achieving the next generation of space exploration, where humans will resume exploring the Moon and, eventually, visit Mars. With regard to technology, one might be prepared for this; much less so in the case of space exploration by *humans*, rather than by robots. This makes human space exploration a topic to address in a cross-disciplinary manner. Exploration is inherent to humans and against this background, addressing the broader issue of humans in (outer) space with a focus on the human element and not only on technology (i.e. robots only) is inevitable.

The ESF's Standing Committee for the Humanities (SCH) has taken a strong interest in the study of the implications of exploration by humans, leading it to develop and lead an interdisciplinary initiative on this topic in close collaboration with the ESF's European Space Sciences Committee (ESSC). The interaction which resulted from a workshop in March 2007 paved the way for a conference on Humans in Outer Space, organised in October 2007 in Vienna, in collaboration with the European Space Policy Institute (ESPI) and the European Space Agency (ESA). It provided a unique perspective by identifying various needs and interests of humanities and social sciences linked to space exploration.

This position paper aims at expressing the main results from this original ESF initiative.

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Un missionnaire du moyen âge raconte qu'il avait trouvé le point où le ciel et la Terre se touchent...

Camille Flammarion, *L'atmosphère*, Woodcut, 1888.
"A middle-age missionary claimed he had found the place where Heavens and Earth met"

Rationale

The aim of this SCH-ESSC collaboration was to set up the first comprehensive and cross-disciplinary European dialogue on human space exploration and humans in outer space; it was also to go beyond seeing humans 'only' as tools in exploration, or as the best possible robots, and to address the inherent human quest for odysseys beyond the atmosphere. A challenge was also to bring together scholars who usually have few reasons to meet in scientific forums, and exchange views in a non-traditional fashion. Non-traditional because, beyond the technical aspects linked to human presence in space that have been studied by space scientists and engineers for the last five decades, humans in space pose challenges that go much further than the ability to survive.

In March 2007, an ESF strategic workshop was organised at the University of Genoa entitled 'Humans in Space. A Humanities Assessment of the Implications of Space Sounding and Exploration', addressing some of the issues identified above. The central theme was the role and situation of humans in orbit around the Earth, their place in exploration, and the search for life in the universe. Should humans explore space? Do the (cultural and economic) drivers for exploration require human participation? What are the human abilities and reasons to adapt to such extreme conditions as presented by the space environment beyond Earth? Are there scientific grounds that should lead humans to be prepared for ethical and societal consequences of an encounter with extraterrestrial life?

The interaction resulting from this workshop paved the way for a conference on Humans in Outer Space, held on 11-12 October 2007 in Vienna, locally organised by the European Space Policy Institute (ESPI) with support of the Austrian Ministry for Transport, Innovation and Technology (BMVIT) and the financial support of the European Space Agency (ESA). Scholars from various disciplines and backgrounds, including history, cultural and religious studies, the arts, anthropology, policy, law, ethics and economics, but also space sciences and technology, presented their views. The proceedings of this conference will be published by Springer later this year.

This conference resulted in a continued and further strengthening of the interdisciplinary European dialogue about human exploration of the Moon and ultimately Mars, with a particular emphasis on the human element. The presentations and discussions were structured around three odysseys in humans leaving the Earth, as shown in this position paper. The conference has thus provided a unique European perspective by identifying various needs and interests of humanities and social sciences linked with space exploration.

The conference has been a real success, yielding the so-called 'Vienna Vision on Humans in Outer



Space'. It was successful not only on a scholarly level, through discussions with colleagues in other disciplines with whom, indeed, regular interaction is not self-evident, but also in demonstrating the necessity and productive contribution of humanities and social science disciplines in understanding the universe in which we live, or will live in the future.

We would like to thank the participants to the workshop in Genoa, as well as the speakers at the conference in Vienna, for sharing their views in an open and cross-disciplinary manner. We would also like to thank Prof. Luca Codignola from the University of Genoa and SCH member, and Prof. Kai-Uwe Schrogl from ESPI, for their invaluable support and driving force in bringing the cross-disciplinary dialogue about, as well as Ms Marie Suchanova from ESF and Ms Agnieszka Lukaszczyk from ESPI for taking care of the practical arrangements and organisation of the Vienna conference in a professional way. The financial contribution from ESA to this conference is kindly acknowledged.

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Interdisciplinary odysseys



Participants to the Vienna conference

The first part of the conference was split in several sessions, addressing various aspects of this transdisciplinary dialogue.

- Setting the scene (encounters; are we alone? space and the movies; the next generation)
- Can we compare? (exploration in the 16th century; inside the human being; useful analogies)
- Space as a source of inspiration (space in literature, marketing and branding, international cooperation)

Following this exchange, the discussion was split into three ‘odysseys’, corresponding to phases of space exploration: in Earth orbit; exploring the solar system; and leaving the Earth.

Each session included three or four keynote presentations around which participants then interacted. A final session attempted to capture lessons for the future and possible outcomes. The following sections extract the most salient elements and findings from these three odysseys, the so-called ‘Vienna Vision’.

First Odyssey

Humans in Earth orbit: what effect does it have?

Home – Earth is a fragile oasis in the solar system and it needs to be protected from natural and human-made threats. Once in space, humans are no longer just citizens of individual countries, but also of the planet Earth, caring for its overall global sustainability.

Progress – Human space flight is a major source of innovation. It can benefit societies around the world

What is exploration?

Is it the pursuit of knowledge and science, wherever it leads us? Explorers throughout the ages have searched for fire, fresh water, food, milder weather, new hunting grounds, stones, minerals, spices, terra incognita, gold, precious stones, other life forms, rare animals, high mountains to climb, remote and/or mysterious places to reach and, in this process, bring back answers, novel things to study, theories, and many more questions to be asked.

Exploration seems to lie at the convergence of several drivers and behaviours, not necessarily compatible, such as curiosity (search for novelty and change); quest for new territories, conquests and riches; the need to display and consolidate a nation’s prestige. Thus exploration is not the realm of scientists alone: it is truly a societal enterprise that requires defining and enforcing rules and ethics. Science seems to come out as a by-product of exploration, even if explorers were sometimes also scientists.

So what is exploration? It is perhaps defined in the well-known quote from the famed television series *Star Trek*: “*Exploration is to boldly go where no man has gone before*”. Space exploration certainly follows that definition. What could be bolder for humans than to sit on top of a largely untested and slowly exploding bomb, back in the early 1960s, if not the yearning to go where no one had gone before: around, and then beyond the

limits of the Earth itself? What could be bolder than to land a craft and place a foot on the Moon when nobody was certain that the ground would not collapse underneath? The rest of the story is known and largely deals with refining the science and the technologies that make these voyages possible. However, and from the very start, it was essentially that humans go beyond the existing limits.

Indeed can we leave it to machines to explore the universe in our place? Even though, for billions of human beings, exploration will remain a ‘virtual’ adventure for a long time, possibly forever, it is difficult to relate to what a machine is doing 250 million kilometres away. Humans in space bring *un supplément d’âme* to exploration. Finally, since one of the ultimate quests of space exploration by humans and robots is to discover whether or not we are alone in the universe, the search for extraterrestrial life is an extremely powerful driver: can we leave that to robots? Naturally, there are places where humans can go, and places where only robots can work. The exploration of the planets will continue to be done first robotically, and then with humans, but the key issue is that the debate on ‘man or machine’ is obsolete, and that humans should and will play a leading role in the exploration of space. Without them space exploration will simply lack an important societal and even scientific interest and perspective.

Interdisciplinary odysseys

with a variety of technological spin-offs and scientific research possibilities. Through endeavours such as the International Space Station new partnerships are built, which can cultivate international cooperation in a spirit of friendship and mutual understanding.

Technology – Humans rely more and more on technological advancements in their everyday lives. The relationship between humans and machines will reach new dimensions, and in the process may make it necessary to readjust our notion of ‘humanity’. Space applications can have a positive impact on the quality of life on Earth and eventually beyond. Through television and the Internet everyone can ‘virtually’ experience space flight or the vistas of planetary surfaces. In the near future space tourism may no longer be a dream but become a possibility.

Law – The legal framework for space activities needs to be further developed in a manner that cultivates peaceful uses of outer space and equal rights for all humankind.

Second Odyssey

**Humans in space exploration:
what effects will it have?**

Humanity – In the new era of technological advancements, the human factor is essential. Without human presence in space, spaceflight any exploration will lack an important dimension. Global cooperative endeavours will allow fostering the further development of collaboration among peoples, societies and cultures.

Discovery – Space exploration allows for discovery in two ways: It makes it possible to search for specific things, for instance new energy resources; but it also opens up the opportunity to follow the thrust of scientific and cultural curiosity. The latter has always been one of the most inspiring traits of humankind and it should lead again to incredible discoveries.

Culture – Space exploration is a challenging and cooperative endeavour that offers opportunities to further strengthen European ties and define European values and priorities. The identity of Europe is constituted by its specific cultural approach towards both scientific and moral issues, and it will be this angle which will influence societal development as well as serving as an inspiration for the younger generation.

Rights – Through space exploration, new partnerships will form. This will call for a proper legal framework serving to peacefully regulate issues such as space

traffic management. Furthermore planetary protection (forward and backward contamination) needs to be clearly defined with international partners and Europe must play an influential role in that context.

Third Odyssey

**Humans migrating from the Earth:
how will it affect human thought?**

Habitat – Driven by curiosity and in order to extend opportunities, humans may eventually search for settlements outside our planet. What is unimaginable today may become important in the future. The first child to be born in space will mark the dawn of a true space generation.

Encounters – Humans should be open to the idea of possible ‘encounters’ with other forms of life in outer space, either through the discovery of life in the solar system (extinct or extant), or through the reception of extraterrestrial radio signals. A new era will begin should humans realise that they are not alone in the universe. Such a discovery may likely cause the development of a new collective identity for humanity.

Belief systems – What people believe in, and how such beliefs are structured, has a strong binding force on societies. Human belief systems, whether religious or secular, change in the context of new living environments, and in contact with other forms of life and societies. As the merely technological or political approach will no longer be sufficient in dealing with such contacts, the humanities and the social sciences will gain in importance.

Adapting – Past encounters that took place on Earth show that human beings did eventually adapt to unforeseeable realities, although often at a very large cost. While the first effects of an encounter between human and extraterrestrial life are unpredictable, humans need to be aware that they will be held morally, economically and politically accountable for their reaction and/or choice.

The way forward



Human voyages – Earth, Moon, Mars

ESF's Standing Committee for the Humanities together with ESF's Expert Committee on Space Sciences have identified the topic *Humans in Outer Space* as an area for cross-disciplinary collaboration, that should be addressed through a broad European approach.

The Space Age has reached its 50th anniversary. Development of robotic exploration to distant planets and bodies across the solar system, as well as pioneering human space exploration in Earth orbit and the Moon, paved the way for ambitious long-term space exploration. Europe has always played a significant role in the endeavours of humankind to explore other worlds and to understand the universe in which we live.

Our next generation may be given the opportunity to explore new places and discover new worlds. Such adventures will be driven by the human quest for knowledge and by human curiosity. They will provide a major opportunity for equitable international cooperation. Humans divided on Earth will hopefully unite in space as citizens of one planet.

Call for Expressions of Interest

A call for Expressions of Interest was launched in March 2008, in order to identify key challenging topics from any discipline in this area and investigate the best ways to explore them. This consultation process will provide ESF with the views of the European scientific community on these issues. All Expressions of Interest received will be synthesised in order to identify key topics of interest to be developed at the European level.

One topic recognised by ESF and ESA as interesting for further cross-disciplinary collaboration is the human impact of human spaceflight. Human spaceflight is a major endeavour that calls together many scientific and technical disciplines. Up to now, the emphasis in this context has mostly been on engineering, and physical and life sciences aspects, where major achievements have been obtained.

However, with Europe preparing itself to make a decision on its ambition for future human spaceflight to further destinations other than a low orbit around the Earth, it is timely to also address the human and social aspects of having 'some of us out there'.

The Vienna Vision on Humans in Outer Space clearly indicates that here is a very interesting field to explore. Europe could take the lead in bringing this a step closer and provide a social sciences and humanities-based framework for decisions and events that are expected to happen in the next decades. Examples include:

- Psychology of isolation
- Ethical aspects of human spaceflight
- Socio-economic costs and benefits
- Space law
- Religious implications of leaving Earth
- Administrative and social structures in Lunar or Martian settlements
- Finding non-terrestrial life forms: social, psychological, religious implications
- Artistic expression as a means to share the human exploration experience

The call for Expressions of Interest is open to researchers and scholars based in Europe. Deadline for submission is 31 May 2008. The details of the call can be found at www.esf.org/HiOS.

After selection by a multidisciplinary panel, the most engaging ideas will be pursued in a collaborative way through ESF-managed workshop(s) to be held in 2008-2009.

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