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Prologue

A few months ago I presented a paper at the 63rd International Astronautical Congress,¹ the annual gathering of the space technology community, which includes astronauts, entrepreneurs, scientists, technologists, space lawyers, educators and also, more recently, artists like myself, who have undertaken space-related work and now have a mini-symposium of their own within the umbrella congress. I presented at the artists' symposium, but also at the symposium for small satellite missions, entitled 'Hitchhiking to the Moon'. The idea of the session was that small satellite 'payloads' (the separate working instruments inside the satellite) could get lifts to the Moon economically on larger space agency missions. The title was also a play on Douglas Adams' radio play and book *The Hitchhiker's Guide to the Galaxy*. As a non-technologist and artist, I took up the invitation to hitchhike with the real space technologists and present outside of the artists' nominated stream, with the hope that some of the ideas that seem to be absent from the satellite technologists' purview might have a better chance of being heard.

What is presented here is a version of that paper, written without the same caution and careful language that was needed the first time round to convey, in a reasonable and credible way, what appear to me to be the blatantly colonial practices of spacefaring. Space exploration often seems unassailably guarded by a teleological account of human evolution in which going into space is 'the logical next step'. This phrase appears regularly in space industry rhetoric. Its certainty is reinforced by the imagery of science fiction that supports the space industry. Kubrick's sequence in the film *2001: A Space Odyssey* (1968) of a bone being thrown into the air by a hominid and transforming into a spaceship confirms an imaginary that has been deeply persuasive in justifying a vast and complex worldwide industry. This spacefaring imaginary seems to have always existed as a certainty, with no clear root or origin from which to question its logic. That the survival of the species depends on humanity's ability to live beyond Earth remains a central belief of the technoscientific and entrepreneurial communities that are most closely involved in determining the technologies of space. So it is that, within the apparent pragmatism of the space agency workplace and supported by the seemingly unquestionable rationality and stability of scientific discipline, spaceflight harbours ghosts of futurity, naturalised into its fabric, that are dangerously anachronistic.

Introduction

This is a paper by an artist who often works within education and is also a researcher with the Transtechnology Research Group at the University of Plymouth in the UK. This group undertakes research from the angle of non-

technologists (as artists, designers, anthropologists, curators and archivists) in order to develop new perspectives on technologies. It uses a transdisciplinary approach, which allows for a certain freedom to move across disciplinary fields. The subject of this paper is an exploration of what satellite missions – particularly

ones to the Moon – mean to those directly involved in the making of such missions, as well as to those who feel they are affected by them even though they have no tangible relation to the workplaces from which these missions emerge. It therefore concerns a combined field made up of those with and without a satellite. One of the aims is to describe the reach of space enterprises in ways that would help situate a community such as that represented by the International Astronautical Congress in a dynamic relation with what is currently defined by the misleading and misunderstood concept of the ‘general public’. I want to begin by using two thought experiments, exploring notions concerning travel and translation, to indicate how redefinitions could start to occur.

Travel and translation

The first thought experiment poses the ques-

tion, “What is ‘landscape’ and ‘world’ when it is other than Earth?”

To resituate thinking and language that have evolved in relation to this planet to environments in which light, air, touch and sound have entirely different meanings is to interpret phenomena in relation to the established order of things on Earth, thereby misinterpreting other planets. Language and experiences learnt on Earth will always be proxies for something essentially never-before-encountered, the unknown. To imagine the entirely unknown and un-experienced requires great resources of imagination in order to think away from planetary assumptions specific to Earth. This is what is so impressive about decisions to visit other planets, because to do so requires a colossal ability to be open-minded, to let go of habits of thinking and learn from scratch a new vocabulary and new ways of being.

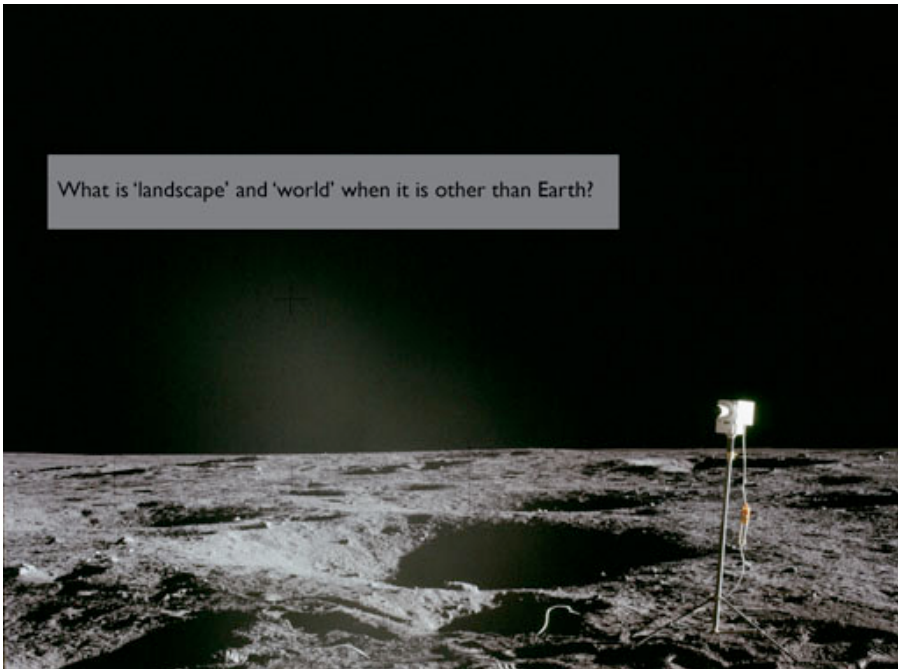


Fig. 1: Photograph from the Apollo 12 mission: “Failed TV camera”

However, it seems that journeys to the Moon or other planetary bodies are rarely accompanied by the suspension of previously held beliefs or openness to the as-yet-unknown. The generation of new knowledge through space exploration may be undermined by the way these forays into other worlds are accompanied instead by the replication and propagation of already-known habits from Earth.

So a second thought experiment poses the question, “What questions, assumptions and ideologies hitchhike with payloads journeying to the Moon?”

The hitchhikers to be wary of are the ones who transport what they already know in order to make their discoveries more familiar. There may be something to glean about this tendency from the field of translation studies. Venturi (1998, p. 67), in a study that reveals the processes of literary mistranslation, writes:

“Translation is often regarded with suspicion because it inevitably domesticates foreign texts, inscribing them with linguistic and cultural values that are intelligible to specific domestic constituencies”. He makes clear that this process occurs beyond the text, and that the cultural inflections can readily be deduced by comparing textual translations into different languages. Such domestication also takes place in other situations that involve encounters with, and interpretations of, the unfamiliar, and it could be that Moon missions follow this tendency when ‘translating’ the Moon for specific constituencies, most obviously for the scientific communities that design, operate and analyse the retrieved data. If this is so, scientific instrumentation, by virtue of the specificity of its data-gathering lenses, must inevitably be involved in mistranslations, both domesticating the foreign land and writing the observer into the observed. This may happen in ways that

What questions, assumptions and ideologies hitchhike with payloads that journey to the Moon?

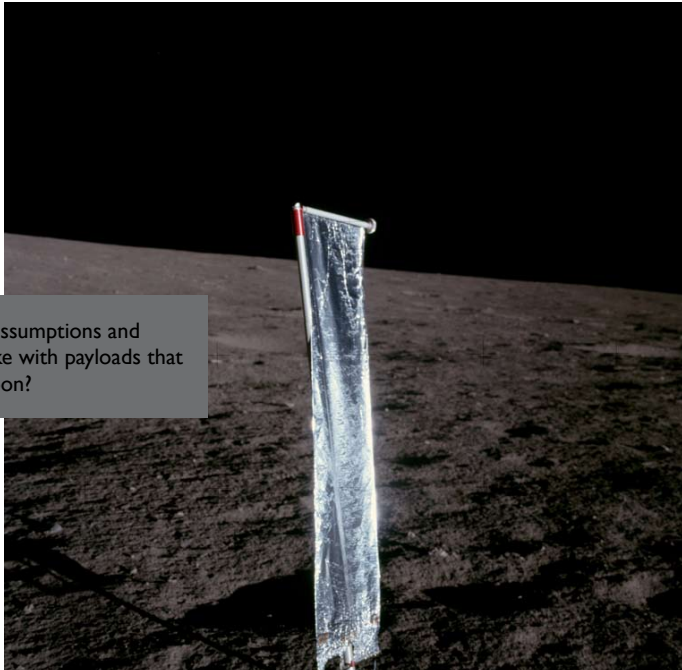


Fig. 2: Photograph from the Apollo 12 mission: “Solar wind experiment”

are particularly elusive because the processes of translation are neutralised, though not erased, by the filter of the scientific texts.²

Moon missions risk becoming a transport system whereby certain ideologies and habits of thinking from Earth are projected onto the Moon. There are two main problems to highlight here. One is that only certain ideologies make it onto the spacecraft.³ The second problem is that projections from Earth, and the transported ideologies that accompany satellite missions to the Moon, construct what it is that the Moon is thought to be.

Transported ideologies

In terms of the first problem of which ideologies go into space, a comprehensive account of the way ideologies from American history are embedded in the rhetoric of spaceflight appears in the NASA History Division's (2007) compendium, *The Societal Impact of Spaceflight*. In an essay in this collection, 'Ideology, Advocacy and Spaceflight', space policy researcher Linda Billings provides a chronology of examples showing how the concepts of 'progress' and 'frontier' have been transferred from American historical narratives into the future trajectory of the space industry, and how this has happened with little critique. In tracing the origins of frontier rhetoric to an essay in 1920 by Frederick Jackson Turner called *The Significance of the Frontier in American History*, she notes:

In making the case for spaceflight, advocates continue to cite, directly or indirectly, Turner's frontier thesis and the related, potentially dangerous, idea of manifest destiny, seemingly oblivious to a changed cultural context and critiques of Turner's thinking. (2007, p. 487).⁴

The names of the Voyager and Pioneer spacecrafts could be identified with such 'frontier' ideologies, stemming from episodes in American history, such as the voyage of the Mayflow-

er and the pioneers who crossed the country in wagons. Another such ideology that has been hitchhiking to the Moon, and that can also be related to a key episode in American history, is that of mining. The Moon mission spacecrafts Clementine, launched in 1994, and Lunar Prospector, launched in 1998, reference the California Gold Rush of 1849 through the popular American folk song *Oh My Darling Clementine*.⁵ These were not decorative titles either: both spacecraft had missions to "assess lunar resources".⁶

Tracing the courses by which such ideologies enter the framework of spaceflight is not always easy; there is little transparency through which to follow such moves, although connections can be intuited and the connected pursuits of science and specific, culturally derived utopias can be anecdotally discerned. As an example, the advocacy group *The Moon Society*,⁷ publishes a monthly newsletter, 'The Moon Miner's Manifesto', which has the tagline 'Towards an Earth-Moon economy – developing off-planet resources'. The Moon Society promotes the idea of mining and of...

... accelerating the day when there will be civilian settlements on the Moon, making use of local resources through private enterprise both to support the pioneers themselves and to help alleviate Earth's stubborn energy and environmental problems. (*The Moon Society*, 2005)

This group advocates private enterprise as the ideological framework that should determine the future of the Moon. In this frame, the Moon becomes an object to be exploited for its resources. At the 2010 Global Lunar Conference in Beijing (which the author attended), this agenda seemed to have wide acceptance. Worryingly, the frameworks and criteria being used to determine the future of the Moon seemed to lack any critique; they built on a consensus that is reinforced by the organisation of the space industries – one that is not



Fig. 3: Three of the convenors of the Global Lunar Conference Beijing 2010: Bernard Foing, Executive Director of the International Lunar Exploration Working Group (ILEWG) (left); Berndt Feuerbacher, President of the International Astronautical Federation (IAF) (centre); Phillippe Willekens, Executive Director of the International Astronautical Federation (right)

necessarily representative of a wider societal realm beyond these organisations, where the future of the Moon matters in other ways.⁸

This photograph of three key convenors of the Global Lunar Conference (fig. 3) draws attention to the elusive question of how individuals closely associated with developing policy and technologies for the Moon might account for their own beliefs, ideologies and agendas.⁹ This raises the question by what criteria, and according to which cultural systems, are the actions of space agencies held accountable, and what is the democratic process of technocracies in general?

A prevalent ideology attached to current Moon missions is that minerals found on the Moon are needed on Earth to solve the crises of energy and climate.¹⁰ There are many problems with this way of thinking, not least that it sits uneasily with moves towards sustainable practices that promote better management of

existing resources and move away from the environmentally destructive and often inhumane methods of mining. Such shifts towards sustainable practices expose the short-term behaviours adopted by consumer capitalism, rendering the pro-capitalist futures anticipated by the space industry out of synch with the more visionary paradigm shifts that are emerging in response to evidence of climate change. The ideologies that hitchhike into space can sometimes appear dislocated from current thinking, more atavistic than futuristic.

Reconstruction of the Moon

A second area to address concerns what the Moon is thought to be and how such ideas are constructed. If the Moon changes, or at least if the idea of what the Moon is changes, through the interventions of spacecraft missions, then the Moon can be said to be constructed in part through space technologies. These tech-

nologies are themselves socially constructed to some extent from within specific disciplinary constituencies that cannot be said to be either ideologically or culturally neutral, even if this may be the aspiration of scientific communities. Space technologies at some level translate, and at some level – even though it may be difficult to discern – create spaces and fissures through which the culture, ideologies and even the personalities of the investigating communities can intervene and travel to the Moon.

Here the insights of the cultural critic Edward Said provide a cautionary note. Said noted the effect such interventions by the observer had on the image Europeans constructed of South Asia. In Said's (2003 [1978]) seminal account, 'Orientalism' was the idea of the 'Orient' constructed from afar. What this suggests, much like Venturi's observations on translation studies, is the inability of those coming

from one country to another to think afresh, to think from and with the land encountered, a land that preceded both their visit and themselves.¹¹ In Said's thesis, "the phenomenon of Orientalism ... deals principally, not with a correspondence between Orientalism and Orient, but with the internal consistency of Orientalism and its ideas about the Orient ... despite or beyond any correspondence, or lack thereof with a 'real' Orient" (2003, pp. 5-6). What Said notices is not just a discrepancy, but what has been invested in the idea of Orientalism, and the consequences of this. If the terms 'Orientalism' and 'Orient' are replaced with 'Moon missions' and 'Moon' respectively, a similar discussion around "the internal consistency of Moon missions and their ideas about the Moon" could draw attention to the fact that a version of Orientalism is present within recent scientific interventions. Such a move might insert the current investment in a par-



Fig 4: Images from the Global Lunar Conference 2010, Beijing, China including a Technical Visit to the National Astronomical Observatories, Chinese Academy of Sciences, Beijing where a globe of the Moon was presented.

ticular construction of the Moon in its place as a temporal position or additional overlay in a history of versions of the Moon.

This collection of images taken during the Global Lunar Conference 2010 in China illustrates how the images of the Moon become mediated. The kinds of images currently being made of the Moon are very unlike the photographs taken by astronauts with Hasselblad cameras from the surface of the Moon (see figs 1 and 2). Furthermore, the way the images from the Moon are presented, in the particular context of a viewing room within a secure building, mean the terms on which the Moon can be encountered are identified with a specific, privileged audience. New artefacts continue to emerge out of this long-running translation process, such as the light-up globe, a potentially commercially popular product that is also a translation and a projection onto

the assumed passivity and singularity of the Moon. At their core, such representations re-construct the Moon as familiar and available to humans – or at least to certain humans. So the question returns of how to hitchhike to the Moon and intervene in the privileged logic of its construction. Here an actual experience of hitchhiking with the spacecraft Chandrayaan is introduced as a means to further locate the kinds of transportations that occur, with and without intention, by way of spacecraft missions to the Moon.

Hitchhiking with Chandrayaan-1: the 'Moon Vehicle'

This hitchhiking experience happened by way of a two-year project, 'Moon Vehicle', based in an art and design school in Bangalore. It was initiated in response to the mission of the Chandrayaan-1 spacecraft, which was as-



Fig. 5: Exhibition model of Chandrayaan being transported in a pick-up truck in Bangalore in 2010

sembled in Bangalore and launched in 2008. Initially, the project aimed to draw out cultural associations of the Moon from the Indian perspective, of which there are many. The phases of the Moon are the reason for festivals, when particular foods are prepared and attention is paid to gods. Eating, farming and social activities have a correspondence with the Moon, more so in rural areas than in the cities. In the north of India there is a day when women fast for the well-being of their husbands. The fast ends when the Moon rises at which point the women are not to look directly at the Moon but only at its reflection in water or through the mesh of a sieve. The word 'Chandrayaan' has an association with ancient mythology and can be translated as 'Moon Vehicle' or, more accurately, 'Moon Chariot'.

The most significant and unexpected value of the project, however, was as a vehicle for a transdisciplinary conversation. The Moon Vehicle project, which was urban in nature, taking place mainly in and around Bangalore, developed into a creative and critical enquiry into what it is that happens when a spacecraft goes to the Moon, asking what is changed on Earth and on the Moon as a consequence, and who is included in this journey and who excluded? Members of the project began an amicable correspondence with the CIXS (pronounced 'kicks') team working on the x-ray instrument, one of the payloads of Chandrayaan. By working in mutually beneficial ways, the CIXS team, art and design students from Srishti, and children living near the space agency base developed an ongoing dialogue. The project may look like what is often categorised by space agencies as 'outreach'; however, it was not intended as either outreach or public engagement, but to fulfill a different purpose: to act as a diagnostic from the margins of the space agency indicating that a shift was needed, or a (transdisciplinary) expansion in the thinking space, concept space, intentional space of satellite missions to the Moon.

The Moon Vehicle project used the mission of Chandrayaan as a proposition and a focus with which to find ways to visit the Moon without a spacecraft, to think through how these journeys might be imagined. The construction of 'Moon analogues' provided a way to build an imagination of the lunar world and a vocabulary of sorts with which to guide the experience of being on another planet.

Fig 6: Making Moon analogues workshop MV2 Drishya Kallika Kendra, Bangalore, 2010

One experiment involved no building, simply imagining a journey across a lunar landscape. It was a powerful experience – the mind has such unacknowledged capacities, which can be used to construct the totality of a visual environment in which it is possible to think experientially, reflectively and sympathetically within the Moonscape.

As these analogue experiments progressed, the project learnt that the Indian space agency was also embarking on the construction of an analogue site. The parallel experiments carried out within the Moon Vehicle project, though crude, provided sufficient vocabulary with which to share notes with the space agency scientists, and to know what kinds of questions to ask. The Moon Vehicle group (led by artists and children), however, felt it was able go one step further than the scientists: imaginative reconstruction is crucial for tests in the analogue environment and, in this, both artists and children can claim expertise. The distance between those making the space technology and those living nearby seemed to elide slightly onto a similar plane. But more than this, the encounter drew attention to the anomaly of confining the actual Moon experiments – an evidently expansive, multi-sensory and culturally delicate enquiry – to the scientific and technologically focused space industry.

The Moon Vehicle project, taking place outside the space agency but in correspondence with it, has some similarity with those external advocacy groups, such as the pro-mining Moon Society, that seek routes through which to reach the spacecraft and the construction of technology by building a parallel alternative imaginary. Curiously, although spacecraft are touched by very few, being located out of reach (both in terms of being physically at a distance and of being controlled from within confined organizations), the apparently passive recipients comprising the 'general public' can find mechanisms whereby they can invent their tactical inclusion – in much the same way as the resourceful hitchhiker does when faced with limited funds and no vehicle.

The imagination of spacecraft

Another way to enrich the kinds of conversations that take place around space technology, and thus perhaps around space exploration activities, is to consider the nature of a technology such as a spacecraft as technological, biographical and ideological – an artefact substantially material and imaginary. In this endeavour, artists have a role in expanding the terms of reference, the space for criticality and the imagination of technologies.¹²

One of the most fascinating aspects of spacecraft is the ways in which they are inscribed with questions and aspirations, with traces of the biographies of their makers, with whom they are intimately entangled. Because of these entanglements, spacecraft inevitably emit something of the zeitgeist of the times in which they are built. This is one reason why there are calls for the care of the cultural heritage of space technologies.¹³ This inscription happens despite, or perhaps precisely because of, the adherence to functionality and the limitations of technological capability in the making of space technologies. One of the effects of these

unavoidable inscriptions is that spacecraft have ways to describe back to us historical and cultural moments, as splinters of ourselves. Some, such as myself (as an artist), go to great lengths to pursue the chance to get close to and learn from these interwoven complexities between people and things that are made more potent by their location in outer space.

It is clear that within the focus of the process of a mission to the Moon there is little time to grasp the implications or resonances that hover around the carefully described scientific goals and mission statements that it ostensibly adheres to. It is, though, of pressing importance to do this, because what happens away from the planet becomes amplified, subtly reinforcing and supporting similar kinds of practices on Earth, and incrementally devaluing others.

Concluding remarks

The purpose of this paper has not been to undermine the knowledge or achievements of the space industry, but to suggest a way of grasping an overview of what is being constructed by way of the Moon missions of spacecraft as a reminder that none of this is neutral or without complex and cautionary precedent. The mission-makers have a responsibility to attend to the consequences, but their assumption of responsibility will always be inadequate unless it is shared.

My own attempts to expand and extend the conversation have felt both pioneering and isolating, welcomed by some individuals and institutions, but as equally resisted. The proposition of this paper is for small-scale satellite missions – these already have a natural advantage in that they are innovative – to foster the intellectual and creative critique of the certainties that have so far guided space exploration. These certainties have been useful; it has been useful to believe that exploration and science are manifestly justified, because it has allowed

for so much to be achieved. Now, however, it is safe to remove these structural and structuring certainties, and to work with equanimity in a co-created space, capable of facing up to the unfamiliar, the untranslatable and the inef-fable.

Epilogue

While I was giving my presentation, in an adjacent room, Buzz Aldrin, the astronaut who stepped onto the Moon with Neil Armstrong in 1969, was delivering a tribute to Armstrong, who had died only a few weeks earlier. I had wanted to be there, listening to the astronaut give witness, in some partial, inadequate but nonetheless poignant way, to his experience of being on the Moon.

After my presentation, I went over to the room where the tribute was still in progress. It was question time, and at the front of the room were some of the artists I had seen in the artists' symposium. One asked a question about music: had any of the astronauts experiences of music in space they would like to share? I knew from her presentation in the artists' symposium that she had previously been an artist-in-residence at the European Space Agency, and had developed instruments that had travelled to and been played on the Space Station. I wondered about the journey she had taken in order to put her proposal into action, to have her musical idea transported into space. I noticed how artists, without the funding of space agency employers, had found ways to attend the conference in Naples, in order to place certain questions within the framework of spaceflight, and the evanescent ways in which these questions, reminders and suggestions hitchhiked into the realms of outer space.

Notes

¹ International Astronautical Federation (IAF) (2012) *Space Science and Technology for the Needs of All: The 63rd International Astronautical Congress*. Mostra d'Oltremare Conference Centre, Naples, 1-5 October: IAF.

² For further discussions of the cultural implications of mistranslation, see Gayatri Spivak (1993). For a key discussion of translation between natural language and mathematics in scientific texts, see Sundar Sarukkai (2002). For a discussion of how instrumentation is not neutral but in many ways produces effects and data, privileging what can be measured above what cannot, see Hannah Drayson (2010).

³ For further work about the ideologies that have accompanied spaceflight, see Walter McDougall (1985). See also Amitai Etzioni's (1964) argument that there is nothing intrinsic to be gained by going into space other than ideological and political battles that would be more effectively worked out by other means.

⁴ 'Manifest destiny' is the aggressively chauvinistic concept that implies the future territory of the United States will be the whole of North America. To understand the racialism directed at Canada and Mexico through this phrase, see the recent controversy over a GAP T-shirt emblazoned with this slogan. Available online at: <http://www.guardian.co.uk/commentisfree/2012/oct/16/gap-manifest-destiny-t-shirt> (accessed 23 January 2013).

⁵ The lyrics are "In a cavern, in a canyon, excavating for a mine, dwelt a miner '49er and his daughter Clementine". The term '49er' refers to the 1849 Gold Rush.

⁶ For both this reference and the Clementine reference, see author and curator David R. Williams, NSSDC, NASA (updated 2005). Available online at: nssdc.gsfc.nasa.gov/planetary/lunarprosp.html (accessed 21 January 2013).

⁷ See 'The Moon Society's facebook page.

⁸ The outcomes of the conference are recorded online. Available at: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38863> (accessed 13 May 2013). Notably, these include the statement, "More possibilities for participatory engagement should be offered to the society for example via interdisciplinary activities with the humanities". This had not appeared previously.

⁹ Bernard Foing, pictured to the left in the photograph, advocates robotic lunar villages over human exploration. At one point in the conference he asked for a show of hands of those who supported human and those who supported robotic exploration. The vote seemed to go in favour of robotic exploration, which Foing took to be indicative of a general consensus supporting his views.

¹⁰ An example would be this quote, "Many of the precious metals and minerals we mine here on earth are also available in vast quantities on the moon without adverse impacts on our planetary environment" (The Star, 2013) from an online article *Space, the final frontier for entrepreneurs: Everyone's getting in on the space action*, even Justin Bieber published June 14 2013 by Ashante Infantry http://www.thestar.com/business/2013/06/14/space_the_final_frontier_for_entrepreneurs.html [Accessed 18 June 2013]

¹¹ See, for instance, Tejaswini Niranjana's (1992) *Siting Translation*, in which she analyses translations of poetry that include the replacement of references to Hinduism with references to Christianity.

¹² See Herbert Marcuse (1964: 2002, p. 71): "Naming the 'things that are absent' is breaking the spell of the things that are; moreover, it is the ingression of a different order of things into the established one – 'le commencement d'un monde'." See also Sundar Sarukkai's (2004, pp. 175-6) call for artists to redefine tech-

nologies: "I want to suggest here that artists can enlarge our understanding of technology, not by becoming technocrats but by enriching the ways in which we talk about technology."

¹³ See Alice Gorman's papers (from 2005 to 2009) on the cultural heritage of space artefacts, and the compendium of essays by space engineers and archaeologists, *Handbook of Space Engineering, Archaeology, and Heritage* (2009), edited by Darrin and O'Leary.

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