

Culture-Space: Towards a Better Understanding of Space Exploration

Final Report

Preamble

This research project was born of a perceived need to develop new ways of interpreting the subject of (outer) space exploration for visitors to the Science Museum.¹ As part of the Museum's ongoing renewal programme, the existing 'Exploring Space' gallery will be replaced with a completely new display. Exploring Space remains popular but dates back over 30 years with only sporadic changes carried out to its content since its opening. The result is a disjointed exposition rooted in largely outdated museological rationales and techniques. In recent years, the Science Museum has sought to position more of its exhibitions and activities within a broader, cultural setting, moving on from depicting science and technology as given and deterministic.

The *Cosmonauts: Birth of the Space* exhibition (2015), although seeking to remedy a decades' long dearth of Soviet and Russian displays at the Museum with a parade of authentic, sometimes flown space artefacts, sought also to dig deeper and expose some of the cultural and social contexts of the world's first space faring nation and its missions.² This, it was felt, would help those prospective audiences, to whom space exploration is remote and irrelevant, engage with the subject; their interest hopefully stimulated by an empathy with the social players involved and depicted. The success of *Cosmonauts* appeared to confirm this and prompted the question of how such a culture-centric approach to the exposition of space might be applied more broadly in the development of a new space gallery.

As a first step, this AHRC-funded Culture-Space Research Network organised a programme of three workshops attended by a multidisciplinary list of specialists³ to exchange ideas and so move towards new understandings of space exploration.

Each workshop was themed and staged in a different location. The first, held at the Science Museum, London, considered 'how space exploration has been represented in museums and beyond'. The second took place at the European Space Agency's ESTEC centre (European Space Technology Research Centre)⁴

¹ 'Case for support: Culture-Space – Towards a Better Understanding of Space Exploration. Rationale', <https://www.sciencemuseumgroup.org.uk/project/culture-space-towards-a-better-understanding-of-space-exploration-rationale/>, accessed 24.04.20

² Doug Millard, 'Cosmonauts: Birth of an Exhibition'. *Science Museum Group Journal*, vol. 5, no. 05, 2016, doi:10.15180/160508, accessed 24.04.20

³ See Appendix 1

⁴ European Space Agency, 'ESTEC', https://www.esa.int/About_Us/ESTEC, accessed 24.04.20

in the Netherlands and discussed ‘multidisciplinary and diversity perspectives on space exploration’. The third workshop, held at University College London’s Mullard Space Science Laboratory (MSSL) in Surrey,⁵ sought to collate issues and outcomes from all three workshops and move us towards a better understanding of ‘potential future space exploration displays’.

Each workshop was held over two days and the programme divided into sessions.⁶ One or more invited speakers led off each session by talking about their chosen area of interest or expertise, with a chair then opening up the floor for discussion. The rest of the workshop attendance comprised Science Museum colleagues and associates drawn from a range of disciplines, expertise and interests, the makeup of the invitees changing from workshop to workshop. A small core team of Museum curators and other invitees attended all three workshops. Workshops 1 and 2 had keynote addresses presented at the end of day 1. All three workshops incorporated tours of the respective host institutions to stimulate further discussion. As an introductory activity for each workshop, attendees produced or talked about an object, image or concept they would like to see in a future gallery of space exploration. The proceedings of each workshop were captured by a doctoral student rapporteur.⁷

Background

It is no surprise that any given subject will be interpreted or understood in different ways by different people. It likewise follows that those same voices may offer an array of alternative suggestions for representing or illustrating their various perspectives of that subject. The objective of this workshop programme, however, was to provide a structure for alternative ways of thinking to be aired, discussed and captured. The viewpoints could then be channelled and directed toward specific ends; in this case, a ‘better understanding of space exploration’ and thence new ways of interpreting the subject for museum gallery and exhibition audiences.

The implicit question asked of the workshops was whether a broader, cultural treatment of space exploration, as delivered in *Cosmonauts*, could be applied more generally to the subject and especially to the Museum’s development of a new space gallery for the mid-2020s. *Cosmonauts* exhibited 148 artefacts and other items, all but two of them loaned from Russian institutions and individuals. The Russian space museum and enterprise sectors provided the bulk of these exhibits but a selection of paintings, drawings, sculptures, ephemera and personal possessions from the art sector and from the family members of Soviet and Russian space players helped contextualise the scientific and technological artefacts.⁸

Cosmonauts offered a singular perspective on a particular nation’s relationship with space; this was the main narrative theme of the exposition. Temporary exhibitions tend towards this unitary objective – a particular take on the subject. ‘Permanent’ galleries, however, are likely to follow a more taxonomic approach where a variety of topics, examples and categories of the subject are presented with no one overt, overriding theme. *Cosmonauts* was well received by public and commentators alike, so could such success be translated and applied to the gallery model of display?

⁵ UCL Department of Space and Climate Physics, ‘Mullard Space Science Laboratory’, <https://www.ucl.ac.uk/mssl/>, accessed 24.04.20

⁶ See Appendix 2

⁷ See Project Updates in the drop-down menu at <https://www.sciencemuseumgroup.org.uk/project/culture-space-towards-a-better-understanding-of-space-exploration-rationale/>, accessed 24.04.20

⁸ Millard, ‘Cosmonauts’

In his keynote talk at the first workshop, Alexander Geppert claimed that historians of space had been ‘underperforming’, assuming that people should be interested in their field rather than actively explaining why space history matters. He went on to say that ‘space history is often celebratory, descriptive, and for an inside audience: it is rarely global and [it] keeps repeating the same stories’. While this accusation is directed at the academy, it could be applied equally to the traditionally curated exposition of space exploration in the museum. Indeed, it is possible that some academic treatises have in turn been influenced by what is seen in museum space displays!

This insular attitude is not just of the historian and curator’s making; it evolved in tandem with the early voices of authority from the space sectors themselves. Many a museum display, including those of the Science Museum over many years, recycled received academic histories of the V-2 long-range ballistic missile, progenitor of the first space rocket of the 1950s. Such accounts included depictions of the rocket’s chief designer, Wernher von Braun, and verged on the hagiographic – his undoubted ability to marshal and manage engineers, technicians and even his own senior management, emphasised to the exclusion of more rounded and analytical accounts of his work.⁹ These early histories were essentially internalist versions of the V-2 story told by von Braun’s inner circle and associates. In more recent years, curators have reached out to far broader studies of the V-2’s technological development and especially the use of slave labour in its manufacture.¹⁰

A less controversial subject’s seminal history was written by two of its leading scientific figures, Harrie Massey and M.O. Robins. Their *History of British Space Science* became a staple tome on the curator’s shelf, recounting as it does the political and scientific evolution of Britain’s space science programme from the eyes of the authors’ own involvement.¹¹ But the text is detailed, technical in many parts and offers little in the way of entry points for the lay reader. It nevertheless remains a valuable source, there being no near equivalent dealing with the subsequent decades of British space science activity.

In echoing the voices of such authorities in their museum displays, curators were moving little beyond sets of presumed interests of their many audiences, presupposing that ‘the visitors’ interest in spaceflight is limited to the science and technology of rockets, their engines, satellites, spacecraft and probes’. Further, ‘while that is self-evidently the case for the more technically-minded visitor, it misses the opportunity to address broader questions about the place of space flight in culture, and to engage those with limited taste for plinths parading cold and mysterious concoctions of impassive metal’.¹²

The Workshop Programme

Those invited to the three workshops shared an interest in space but rarely as a main area of knowledge or expertise. Their viewpoints, it was hoped, would be less blinkered by the rigours and specificity of the ‘space scientific and technological’. A small number of colleagues attended all three workshops, so offering an element of continuity across the programme.

The attendees represented a broad swathe of occupations and responsibilities. The curatorial, necessarily, was represented – curators from the United States, Germany, Russia and China joined their British peers, offering invaluable international perspectives. They joined a wide-ranging group of scholars that included delegates from the fields of history (especially of science, technology and

⁹ See especially Frederick I. Ordway, and Mitchell R. Sharpe, *Rocket Team* (2nd edition; Burlington: Apogee Books, 2008) and Walter Dornberger, *The V-2* (New York: Viking Press, 1958)

¹⁰ See, for example, Michael J Neufeld, *Von Braun: Dreamer of Space, Engineer of War* (New York: Random House, 2007)

¹¹ Harrie Massey and M.O. Robins, *History of British Space Science* (Cambridge: Cambridge University Press, 1986)

¹² See ‘Case for support: Culture-Space’

medicine), archaeology, anthropology, media studies, psychology, sociology and science communications. The visual, sonic and musical arts were all present, as were philosophy, law and, of course, space science itself. Equally important were the comments and observations of those bearing witness to some of these players and especially to the scientists: those who administered a space laboratory and its occupants, or helped cultivate (international) dialogue between the scientist and the curator, as well as those newly embarked on their academic careers.

The attendees' energetic and imaginative engagement with the subject of the first workshop – 'How space exploration has been represented in museums and beyond' – demonstrated the plethora of new approaches to be considered for the museum gallery of the future.¹³ This was manifest in the choice of objects and other items and ideas brought to the table by each attendee as a means of introducing themselves to the gathering. These selections presaged and represented many of the ideas that were developed and discussed during the rest of this and the other two workshops.

The authentic artefact remained vital to many. A Hasselblad camera that took *those* photographs of astronauts walking on the Moon offered a unification of cultural imagery with the proximity of the physical. A Russian meteorite – the oldest 'thing' of space the owner had ever touched – was a conduit to the infinite. The image itself could do more, it was suggested. A DEXA scan of the human body showing how it responds to the extreme environments of space – looking inside ourselves to illustrate changes to bones and muscles, how the body self-regulates, self-heals, and continuously transforms – could be a life-size 'before' and 'after' of space travel, showing gallery visitors the risks on, paradoxically, returning to the rigours of Earth's gravity.

Alternatively, the original object could be accidental or marginal, such as the wads of punch cards from the MSSL space scientist's computer programming of the 1960s and 70s, held together with perished rubber bands. Similarly, the sheets of computer printouts from Jodrell Bank's hard data of decades-past – the unformed empirical evidence for research – exemplified the 'dirty science' normally hidden by pristine outcomes. Or the artefact may come from outside the professional space sphere: a squeeze toy astronaut from an exhibition shop, its printed Stars and Stripes and American decals a baking-in of national rhetoric. Or a grand fireplace from MSSL's common room – a vestige of the laboratory's days as a stately home – made concrete the necessity of the collegiate in space research, marking an area to meet, relax and exchange thoughts. It might also challenge stereotypical images of where science is carried out in the 21st century – not necessarily in the sterile conditions of a pristine laboratory.

That space exploration is a cultural activity was made clear during these sessions. How could *Star Trek's* title music not speak for many as a signifier of space travel? Do not psychic studies, crop circle investigations and cosmic interpretations of megalithic monuments contribute to the cultural milieu of space? A displayed sarsens stone would certainly stand out! And does not the ethereal calling of the Theremin, so redolent of the B-movie, remain to this day a sonic signifier of the alien and the unworldly?

What about depicting scale and the infinite, perhaps showing the Earth in a dark room to recreate an 'overview effect'¹⁴ for the museum gallery visitor? Or might Olaf Stapledon's writings on the immensity of time and space help us think about the blip of humanity.¹⁵ Or could a Malevic move us to a union with

¹³ See also 'Culture-Space Workshop 1 Report', from the Project Updates drop-down menu, <https://www.sciencemuseumgroup.org.uk/project/culture-space-towards-a-better-understanding-of-space-exploration-rationale/>, accessed 24.04.20

¹⁴ A psychological shift in their awareness of the Earth, reported by some astronauts, as a small and fragile world in an immense void of space.

¹⁵ Olaf Stapledon (1886-1950) was an author of science fiction. Works like *Last and First Men* spanned vast tracts of time and influenced the thinking of peers including Arthur C. Clarke and Brian Aldiss.

the cosmic.¹⁶ Perhaps instead a statement in some form or medium, after Valerie Olson¹⁷, might testify to our already being there.

Further, these contemplations of the workshop attendees were conducted in a convivial and friendly atmosphere masking, perhaps, another perspective on space exploration that is difficult to convey in the gentle ambience of a museum gallery – that of the danger, threat, even terror and emptiness of space. When Alexey Leonov performed the first spacewalk, he could hear nothing save the pumping of blood through his arteries.

The second workshop was themed around ‘Multidisciplinary and diversity perspectives on space exploration’.¹⁸ It was staged at ESTEC’s Erasmus Centre, an ESA facility used for informing and advising prospective partners of the Agency’s capabilities.

During the sessions, a European Space Agency programme manager stressed the challenges of managing a multi-million-dollar international space mission, with all the vagaries of differing traditions, working practices and standards to reconcile and focus. Another ESA officer reported on the overly restrictive traditions of able-bodied recruitment to space programmes that needlessly exclude those who, with a physical disability, may in fact be closer to the reality of space travel; weightlessness, after all, imparts a disability on the able-bodied.

Such diverse voices and messages would normally be airbrushed from the museum display, there being insufficient room or enthusiasm for straying beyond the straight and narrow and pedagogical. Yet such disparate but relevant stories and perspectives of space exploration could surely invite empathy and understanding from new audiences, particularly from those who would be able to identify with, in these cases, the day-to-day and strategic management of any substantial work force, or with the personal experience of disability and all the societal constraints and restrictions it brings.

Such exclusion extends also to the uncaptioned individual in a display image or, more fundamentally, the likely location of where that person and, indeed, almost all space explorers work. With the exception of the few hundred astronauts and cosmonauts who have ridden into space, all other players involved directly, indirectly or vicariously in space exploration are very much located on the ground. And yet their activities and stories are usually absent from the gallery display. The Apollo astronauts were the first to acknowledge, from the pedestals they had been placed upon, the efforts of the hundreds of thousands who worked on the Moon programme and got them safely to the Moon and back.

Also excluded are those not belonging to these establishments or projects but affected by them none the less. The story of a new ground-based observatory, its siting and construction, would not normally include its effect on the local communities for whom its presence is deemed an intrusion or an offence to indigenous tradition. Similarly, the impact on the local environment and populations of a space launch site would likely not be included in a standard museum display narrative.¹⁹

¹⁶ Kasimir Malevic (1879-1935) was a Russian artist whose abstract works aimed to move away entirely from the objective towards a wholly spiritual depiction of existence.

¹⁷ Valerie Olson writes of outer space already being part of the terrestrial ecosystem. See Valerie Olson, *Into the Extreme: U.S. Environmental Systems and Politics Beyond Earth* (Minnesota: University of Minnesota Press, 2018).

¹⁸ See ‘Culture Space Workshop 2 Report’, from the Project Updates drop-down menu, <https://www.sciencemuseumgroup.org.uk/project/culture-space-towards-a-better-understanding-of-space-exploration-rationale/>, accessed 24.04.20

¹⁹ In 2017, for example, protests at the ESA French Guiana launch facility stressed a contrast of infrastructure investment between local public transport and the railway that carries rockets to the launch sites. See Peter D’Auria, Tim Fernholz & Commentary, ‘How a handful of South American protestors took Europe’s space program

The term ‘hidden figures’ came to the fore with the synonymous book and film.²⁰ They told the story, hitherto neglected, of black female mathematicians who worked on the Apollo programme in the 1960s and 70s. The acknowledgment of previously ignored groups and individuals of space exploration is welcome and should surely be translated for the gallery display. It brings challenges with it, however, particularly the need to avoid tokenistic representation, when so many could be acknowledged, and accordingly the problem of how to represent so many without introducing unwelcome narrative and informational complexity.

ESTEC provides a singular and distinctive sense of place. The Centre houses some two and a half thousand engineers, technicians, scientists and managers from the 23 ESA member states,²¹ pooling resources, expertise and techniques in the development, building and operation of spacecraft. Its cosmopolitan and bustling population was manifest during the annual open day held on the eve of the workshop. Here, families and friends were able to talk to the scientists, engineers and managers from an array of countries, alongside their table-top displays of space artefacts and interactives. But during the working week, and with the exception of the Centre’s restaurant – where everyone snacks and dines and chats – ESTEC’S diversity of activity was evident but reticent. Essential facilities for the development and testing of spacecraft, including vacuum and thermal chambers, vibration rigs and suites of clean assembly rooms, were deserted during the workshop tour. The atmosphere and feel of the buildings themselves started to intrude – the character of place. Workshop attendees responded in multisensory ways to the aesthetics of the rooms, to their colour (subdued but pure shades), to their smell and to their acoustics. To some there was something of the sacred about the cavernous chambers.

The dearth of people visible in the ESTEC facilities, but the workshop’s fascination with their work when they spoke at the sessions, reinforces a need to embody space science and technology in the museum display. The ‘impassive’ artefact needs to be reunited with its maker. The rigour and extreme attention to detail necessary in the design and construction of a spacecraft and its components is difficult to convey. The methods used by the technicians are intricate and laborious. The people, their thoughts and their working would need to be captured: a movie of/interview with ESA technicians constructing (sewing) thermal blankets to envelop the spacecraft, or historic photographs of ‘computers’ employed by NASA contractor, Raytheon, writing code for 1960s space missions. There is the occasional incongruity that offers a way in; the familiar but unexpected – something the museum visitor would be more likely to identify with. One clean room sported a row of birthday party-grade helium-filled balloons. They would be used to suspend, say, a satellite’s thin and delicate solar array for inspection and testing under simulated weightless conditions. A jolly balloon and a solar panel section would provide a museum display with a provocative juxtaposition for the visitor.

The sentience of place loomed large at the third workshop, ‘Potential Future Space Exploration displays’.²² University College London’s Mullard Space Science Laboratory belies the typical image of a science laboratory, situated as it is within the grounds and buildings of a former stately home in the Surrey countryside. Here sits a case-study, singular perhaps, in the institutionalisation of scientific research – a community insulated from the mainstream yet achieving global reach in the international

hostage’, *Quartz*, <https://qz.com/960817/how-a-handful-of-south-american-protestors-in-french-guiana-took-arianespace-and-europes-space-program-hostage/>, accessed 30.05.20.

²⁰ Margot Lee Shetterley, *Hidden Figures: The American Dream and the Untold Story of the Black Women Who Helped Win the Space Race* (New York: Harper Collins, 2016) and Melfi Theodore (Dir.), *Hidden Figures*, 2016.

²¹ European Space Agency, ‘ESA Member States, Canada and Slovenia’, https://www.esa.int/Education/ESA_Member_States_Canada_and_Slovenia, accessed 24.04.20

²² See ‘Culture-Space Workshop 3 Report’, from the Project Updates drop-down menu, <https://www.sciencemuseumgroup.org.uk/project/culture-space-towards-a-better-understanding-of-space-exploration-rationale/>, accessed 24.04.20

space science sector. There is a concentration of the rational and the whimsical in close proximity as one moves from the ease of the old drawing room – littered with bespoke display cabinets of detectors, instruments and sundry spacecraft components – to a new, bright and shiny positive-pressure clean room; or when moving around the old master bedroom where mission designers sit at their screens, under the gaze of the faded mirror and its ornate mantle and surround. A far smaller bedroom compresses a handful of engineers constructing almost infinitesimally small and astronomically expensive integrated circuits, their steady and sure dexterity looming large beneath their magnifiers. Across the floors of the house, one is confronted with both the anthropological and the archaeological of space, both valid perspectives on how space exploration is done.

This workshop's sessions demonstrated how such viewpoints extend also into space, with archaeological studies underway of the Apollo sites on the Moon and of those of the robotic spacecraft that preceded them.²³ Likewise, the orbiting settlement that is the International Space Station is both a centre of scientific investigation and a dwelling, the evidence of its tenants all around, floating weightless within its modules, stuck to surfaces or stowed in lockers; the functional, the recreational, the personal and the sentimental. It is an accretion of material culture, a bricolage of artefact, ephemera and memento. It prompts another question, that of ownership: the astronauts', the scientists', the technicians' personalisation of the working space; the fixing of identity to the chattels of research and activity in the Russia corner on the ISS; the home-drawn cartoon of MSSL directors-past stuck to the workshop wall; a Lego *Millennium Falcon* sat on a desk alongside its owner's cam cad of a new spacecraft design.

And what of space itself: who owns that? It is clear that it is not clear; current international agreements and treaties are limited in their coverage and relevance, very much the products of the 1960s and 70s.²⁴ Yet space is open to observation by the bulk of humanity, so what rights of ownership do the many have?

Then there is space itself as place. How do scientists picture their targets of investigation, whether an alien planet's suffocating surface or the mind-bending location that is a black hole? What might their own perspective offer the museum visitor for a 'better understanding of space exploration'?

Discussion and Conclusions

This project asked, 'How and why do we explore space?' It considered ways in which 'multidisciplinary perspectives can complement existing approaches to space displays' and, moreover, whether the associated discussions might help, 'develop a culture-centred framework for a new generation of public engagement'. Those attending the three workshops brought with them ample evidence of the many ways 'we' – humanity – explore space; how we do it as individuals, as team members and as communities. That these means stretch across boundaries of discipline, medium, technique and genre was manifestly apparent across the three gatherings, explicit examples being offered during each workshop introductory session.

It was clear that gallery 'stories' of space exploration could extend beyond the *science* to stories – professional and personal – of the *scientist*. A common thread ran through the workshop programme: the hidden figure; the individual or group that traditionally plays little or no part in conventional displays of space exploration. New stories might embrace the neglected professionals of space – the technical,

²³ See, for example, Alice Gorman, 'The cultural landscape of interplanetary space', *Journal of Social Archaeology*, 5, issue 1 (2005): 85–107. doi:[10.1177/1469605305050148](https://doi.org/10.1177/1469605305050148), accessed 24.04.20

²⁴ United Nations Office for Outer Space Affairs, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 1967, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>, accessed 24.04.20

managerial, medical, physiological and psychological. Be it the technician in the MSSL workshops (formerly the potting sheds of the house) quietly applying a coating of the ultimate black to a spacecraft detector's internal surfaces (to eliminate all reflection). Be it the manager cajoling and coordinating the multifarious teams working on a space mission. Be it those individuals throughout society who interrogate space through their art, or through their hobbies and pastimes, or through their passions. Be it those besides the astronaut who contribute to the furthering of her mission and the human spaceflight endeavour: the physiologists and psychologists, the trainers ... the astronaut families! Be it those new space-faring nations and new industrial and commercial kids-on-the-block who are building novel launch vehicles and ever smaller satellites capable of ever more applications for here on Earth. And be it those historical, social and cultural tableaux of peace and war against which the space age emerged and flourished. Such stories would necessarily roam freely across cultural and artistic boundaries, reflecting people's own contemplations of and relationships with the subject of space exploration.

The implicit question of the workshop programme was whether a broader, cultural treatment of space exploration might be appropriate for new galleries of space exploration. That so many disparate individuals, groups and communities have and continue to identify with the subject of space exploration through their own lenses of interests and activities, according to the evidence from these gatherings, suggests that the answer is surely 'yes'.

Less clear, it being outside the remit of the workshops, was how these new approaches can be put into practice; how they would be delivered as displays in the museum gallery. This will require extensive trialling, experimentation and audience research; gathering data on what will work for the visitor and what will not.

The workshops paid less attention to the reasons for exploring space – 'why do we explore' – and similarly, despite international representation at the meetings, only hinted at a global picture of space exploration, one that stretches beyond the activities of the national players that dominated in the twentieth century. There are now scores of space exploration concerns around the world. We need to learn more about how, 'the cultures of individual nations are driving unprecedented national diversity in the field'. Further, there is an implied yet largely hidden global circulation of space exploration knowledge that underpins much of this new international activity. This hints at further rich seams of cultural context that both stand apart from but also meld with the western tradition and which need to be investigated. A future research programme should address this international perspective following Asif Siddiqi in asking, 'How [do] individuals, communities and nations perceive space travel [and] how [do] they imbue it with meaning and how [are] those meanings contextual and repeatedly reinvented as more and more nations articulate the urge to explore space'?²⁵

²⁵ Asif A Siddiqi, 'Competing Technologies, 'National(ist) Narratives, and Universal Claims: Towards a Global History of Space Exploration', *Technology and Culture*, 51, no. 2 (2010): 425-443 (p. 443)

Appendix 1 – Workshop Attendees

Name	Affiliation	Workshop
Alexander Geppert	Associate Professor of History and European Studies, New York University	1
Alexandra Smirnova	International Engagement Manager, Science Museum Group	1,3
Alice Gorman	Associate Professor, Humanities, Arts and Social Sciences, Flinders University	3
Alison Boyle	Keeper of Science Collections, Science Museum	1,2,3
Amanda Rees	Reader, Department of Sociology, University of York	1
Andrei Sadovski	Space Research Institute, Moscow	1
Andrew Coates	Professor of Physics, Department of Space and Climate Physics, Mullard Space Science Laboratory, University College London	3
Dan Kendall	Curator, National Space Centre, Leicester	3
Daniela de Paulis	Artist in Residence, Dwingeloo Radio Telescope	2
David DeVorkin	Senior Curator, History of Astronomy and the Space Sciences, National Air and Space Museum, Smithsonian Institution.	1
David Kirby	Professor of Science Communication Studies in the Centre for the History of Science, Technology and Medicine, University of Manchester	1
Dmitrii Stalnoi	Deputy Head of Learning, Tsaritsyno Museum-Reserve, Moscow	1
Doug Millard	Deputy Keeper, Technologies and Engineering, Science Museum	1,2,3
Ekaterina Kabalina	Project Manager, State Polytechnic Museum, Moscow	3
Elisa Raffaella Ferré	Senior Lecturer, Department of Psychology, Royal Holloway, University of London	2
Ellie Armstrong	Doctoral student, Institute of Education and Department of Science and Technology Studies, University College London	2,3
Ersilia Vaudo	Chief Diversity Officer, European Space Agency	2
Francois Spoto	Exomars Programme Manager, European Space Agency	2
Glyn Morgan	Curator – Exhibitions, Science Museum	1
Jill Stewart	Department of Government, London School of Economics	1,3
John Zarnecki	Emeritus Professor, Faculty of Science, Technology, Engineering and Physical Sciences, Open University	3
Jon Agar	Professor of Science and Technology Studies, University College London	1,3
Justin Walsh	Associate Professor, Department of Art, Chapman University	3
Kate Robson Brown	Professor of Biological Anthropology and Biomechanical Engineering, University of Bristol	2
Kevin Yates	Head of Exhibition and Design, National Space Centre, Leicester	1
Kyle Osbrink	Assistant Curator – Exhibitions, Science Museum, London	1
Libby Daghorn	Administrator (ret'd), Mullard Space Science Laboratory, University College London	3

Lucie Green	Professor of Physics, Department of Space and Climate Physics, Mullard Space Science Laboratory, University College London	3
Mark Jankovich	Professor of Film and Television Studies, University of East Anglia	1
Mark McCaughrean	Senior Advisor for Science and Exploration, European Space Agency	1,2
Martin Collins	Curator of Civilian Application Satellites, National Air and Space Museum, Smithsonian Institution.	1
Melanie King	Artist and curator; Co-Director, super/collider	1
Melanie Vandenbrouck	Curator of Art, Royal Museums Greenwich	1
Miha Turšič	Artist, designer and researcher	2
Mike Allen	Senior Lecturer in Film and Electronic Media, Birkbeck, University of London	1
Niamh Shaw	STEAM artist, presenter and communicator	2
Osnat Katz	Doctoral student, Department of Science and Technology Studies, University College London	3
Rachel Hill	Masters student, Goldsmiths, University of London	3
Richard Dunn	Keeper of Technologies and Engineering, Science Museum, London	1,2,3
Richard Tutton	Lecturer, Department of Sociology, University of York	1,2,3
Robert Poole	Professor of History, Language and Global Studies, University of Central Lancashire	1
Roger Luckhurst	Professor in Modern and Contemporary Literature, Birkbeck College	1
Sarah Angliss	Musician and composer	1
Tamara Masevich	Head of the multifunctional exhibition centre at TSNIMASH, Moscow	1
Tasha Kitcher	Doctoral student, Department of Media and Communications, Loughborough University	1,2,3
Tim Boon	Head of Research & Public History, Science Museum	1
Tony Milligan	Visiting Research Fellow in the Ethics and the Philosophy of Religion, King's College London	3
William Macauley	Visiting Research Fellow, Centre for the History of Science, Technology and Medicine, University of Manchester	1,2,3
Zhao Yang	Deputy Director, Exhibition Design, China Science and Technology Museum	1
Ziri Younsi	Department of Space and Climate Physics, Mullard Space Science Laboratory, University College London	3

Workshop Programme Day 2 – Thursday 1 August 2019

09.30 *Coffee*

10.00 *Recapitulation* – Ray Macauley

Visual Arts and Sonic Culture

10.15 *Space in visual arts* – Doug Millard

Melanie King

Hannah Redler Hawes

Melanie Vandembrouck

11.45 *Coffee*

12.15 *Provocation and discussion: the sound of space* – Tim Boon

Ray Macauley

Sarah Angliss

13.30 *Lunch*

Cinema and Television

14.30 *Space, cinema, and television* – Richard Dunn

Mike Allen

David Kirby

Mark Jancovich

16.00 *Tea*

Science Fictions

16.30 *Space narratives* – Glyn Morgan

Mandy Rees

Richard Tutton

Roger Luckhurst

18.00 *Commentary*

Rapporteur(s)

18.30 *Final comments and end of Workshop*

Doug Millard

WORKSHOP 2: Multidisciplinary and diversity perspectives on space exploration

European Space Research & Technology Centre (ESTEC), Keplerlaan 1, Postbus 299, 2200 AG Noordwijk,
The Netherlands

7/8 October 2019

(NB – ESTEC Open Day precedes on 6 October and is open to workshop participants)

Workshop Programme Day 1 – Monday 7 October 2019

- 10.30 *Registration and coffee*
- 11.00 *Workshop welcome*
Doug Millard
- 11.10 *Mutual introductions/group exercise – Ray Macauley*
- 12.30 *Lunch*

Mission Multidisciplinary

- 13.30 *Tour of Test Centre*
Mark McCaughrean/A.N.Other
- 15.00 *Tea and Reflections on tour - Ali Boyle*
All
- 15.30 *Space Mission Project Management*
Francois Spoto
- 16.15 *Cultural Boundaries: Science, Technology and Art*
Miha Turšič
Daniela de Paulis
- 17.15 *Short break*

Reaching Out

- 17.30 *Keynote talk*
Mark McCaughrean
Chaired by Doug Millard
- 18.30 *End of Workshop programme Day 1*

Workshop Programme Day 2 – Tuesday 8 October 2019

09.30 *Coffee*

10.00 *Recapitulation* – Ray Macauley

Diversity in Space

10.15 *Diversity at ESA* – Doug Millard
Ersilia Vaudo

11.45 *Coffee*

12.15 *Conformity of Display* – A.N. Other
Ellie Armstrong

13.00 *Lunch*

The Human Condition

14.00 *Mind and Body* – A.N. Other
Elisa Raffaella Ferré
Kate Robson Brown

15.15 *Short Break*

Commentary and Final Comments

15.30 *Commentary* – Tasha Kitcher

16.15 *Final comments and end of Workshop*
Doug Millard

WORKSHOP 3: Potential Future Space Exploration displays

University College London, Department of Space and Climate Physics, Mullard Space Science Laboratory,
Holmbury St. Mary, Dorking, Surrey RH5 6NT, United Kingdom.

21/22 November 2019

Workshop Programme Day 1 – Thursday 21 November 2019

- 10.30 *Registration and coffee*
- 11.00 *MSSL and Workshop welcome*
Lucie Green
Doug Millard
- 11.15 *Mutual introductions/group exercise – Ray Macauley*
- 12.00 *Reflections on MSSL – Lucie Green*
Libby Daghorn
John Zarnecki
Andrew Coates
- 12.45 *Lunch*

Institutional Space

- 14.00 *Tour of MSSL – Lucie Green/colleagues*
- 15.30 *Tea and Reflections on tour - Ali Boyle*
All
- 16.00 *Keynote Talk – Space Archaeology – Richard Dunn*
Justin Walsh
Alice Gorman
- 17.00 *Short break*

Communicating Space

- 17.30 *Film showing and Talk - 'Man in Space', BBC Horizon (1966)*
Andrew Coates
Lucie Green
- Chaired by Doug Millard

18.30 *End of Workshop programme Day 1*

Workshop Programme Day 2 – Friday 22 November October 2019

09.30 *Coffee*

10.00 *Recapitulation – Ray Macauley*

Reaching out into Space

10.15 *Space as Place – Jon Agar*
 Ziri Younsi
 John Zarnecki

11.45 *Coffee*

12.00 *The Material Culture of Space – Science Museum*

13.00 *Lunch*

Ethical and legal space

14.00 *The Legal – Tim Boon*
 Jill Stewart

14.30 *The Ethical - Richard Dunn*
 Tony Milligan

15.00 Short Break

Commentary and Final Comments

15.15 *Commentary – Tasha Kitcher*

15.30 *Culture Space Workshops: A Synthesis of Ideas*
 Doug Millard
 All

16:30 *End of Workshop Programme Day 2*