

# **Multiplanetary Imaginaries and Utopia: The Case of Mars One**

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## **Abstract**

The prospect of human societies being made anew on other planets is a powerful, recurring theme in popular culture and speculative technoscience. I explore what STS offers to analysing how the future is made and contested in present-day endeavours to establish humans as multiplanetary subjects. I focus on the case of Mars One – an initiative that aims to establish a human settlement on Mars in the 2020s, and discuss interviews undertaken with some of the individuals who have volunteered to be the first humans to live on Mars, drawing on STS work on futures and sociotechnical imaginaries and scholarly discussions of utopia. Seeing themselves as part of a project that would start to ‘establish what it means to live on another planet’, I discuss how interviewees talked about how sociotechnical relations could be remade in the future, both on Earth and on Mars through the pursuit of this technoscientific project. I conclude that this project is an expression of a multiplanetary imaginary of human beings no longer subject to Earth – but, through sociotechnical inventiveness, able to live on other planets.

## Multiplanetary Imaginaries and Utopia: The Case of Mars One

Occupying outer space, visiting, and even living on other planets has long been the subject of national space programs, entrepreneurial ventures, speculative science, public advocacy, and science fiction. Judged from the perspective of the early twenty-first century, this dream might appear to be over: although human-made machines fly through space and move across the surface of another planet, the last time anyone went further than low earth orbit was in 1972. However, the prospect of living on another planet continues to be a powerful, recurring theme in popular culture, speculative technoscience, and entrepreneurial ventures. And one planet in particular has been the site of enduring interest in extraterrestrial human exploration and settlement—Mars (Markley 1997).

For the past sixty years, scientists and engineers have developed numerous detailed plans for sending human beings to Mars. Wernher von Braun published the first “detailed mission architecture” in 1952 that envisaged a highly ambitious plan to send a crew of 70 on ten different craft (Hogan 2007). In 2014, NASA reaffirmed its goal to place a human being on the surface of Mars at some point in the 2030s (NASA 2014). A number of new private efforts to organize and fund missions to Mars have also emerged. In September 2016, Elon Musk presented plans for his firm, Space X, to help establish humanity as a “multi-planetary species,” at the International Astronautical Congress (Mosher et al. 2016). Another initiative, which I focus on in this paper, is Mars One—originally a not-for-profit organization—with the ambitious and controversial plan to create a permanent human settlement on Mars.

Far from being a failed future that need not concern STS scholarship any more, enduring and contemporary speculation about interplanetary exploration and settlement, investments in engineering designs and systems, along with normative claims about the future of humanity, call for precisely the kind of analysis that STS work has given to other technoscientific endeavors. In the past two decades, STS scholars have become increasingly interested in the future through analyzing visions, expectations, promises, hope and anticipation as actively shaping how we think, act towards and feel about possible futures across a wide range of technoscientific fields of activity. Further to this, growing interest in the concept of the imaginary also draws attention to futurity. As Marcus (1995: 4) notes: the imaginary “looks to the future and to future possibility through technoscientific innovation.”

In this paper I explore what STS can offer to understanding how the future is made and contested in present-day struggles over technoscientific projects, such as establishing humans as multiplanetary subjects. To do so, I draw on recent STS scholarship on the concept of the imaginary and bring this together with the relatively neglected notion of utopia (at least in STS circles) through the work of Levitas (2013). I also engage with work within what Messeri (2016) refers to as the “social studies of outer space,” which draws on different intellectual traditions and orientations, from STS (Messeri 2016; Redfield 2002; Vertesi 2016), anthropology (Valentine 2012), sociology (Parker 2009; Ormrod and Dickens 2007), history of science (Geppert 2012; Macauley 2012), literary and cultural studies (Kilgore 2003; Markley 2005), policy studies (McCurdy 2011), to geography (MacDonald 2007).

In this paper, I focus on the case of Mars One and discuss data from interviews I conducted with candidates who have volunteered to be the first people to establish a permanent human settlement on Mars. Mars One—along with other such initiatives to settle Mars—is deeply

contested and represents a heady mix of utopian imagery, desire, hope, and complex engineering and design problems that prompt significant questioning about its financial and technical feasibility.

### **STS and the future**

STS scholars have developed a range of analytic concepts for investigating how futures are made and contested in present present-day struggles over technoscientific developments and projects (Konrad et al. 2016). The sociology of expectations has concentrated on expectations as these relate to different fields of technoscientific development. van Lente (1993: 191) proposes that “expectation statements are not only representations of something that does not (yet) exist, they do something: advising, showing direction, creating obligations.” In other words, expectations are performative “in attracting the interest of necessary allies (various actors in innovation networks, investors, regulatory actors, users etc.) and in defining roles and in building mutually binding obligations and agendas” (Borup et al. 2006: 289). The theme of performativity also features prominently in discussions of promising and visions, particularly in relation to developments in biotechnology (Fortun 2008; Sunder Rajan 2006). In short, a significant body of work has developed on the role of expectations, visions and promises, which has been incredibly generative and insightful.

It would be entirely appropriate to consider Mars One from the perspective of the sociology of expectations, analyzing press releases and other materials, and focusing on how its leaders and supporters have sought to enroll necessary allies for the venture to succeed. However, this would miss the greater cultural significance of Mars One. To draw this out, I use STS scholars’ work on the concept of the imaginary, which offers another way of analyzing how futures are made, performed and contested.

McNeil et al. (2016) propose that STS scholars’ use of the imaginary concept reflects a new intellectual agenda focused on the importance of values, emotions, and affect along with questions of rationality or epistemology. This is evident in the work of STS scholars who develop the concept of the imaginary to challenge oppositions between science and imagination, with knowledge and reason on one side and speculation and the imaginative on the other (see for example Waldby 2000).

McNeil et al. also point to how the imaginary offers a way to address matters of subjectivity, desire and fantasy. For example, in earlier work, McNeil (2008 :17) suggests that scholars should attend to the “pleasures, dreams, desires and other aspects of how we live science and technology,” and appreciate that “cognitive encounters are only one way in which modern technoscience is lived” (McNeil 2008: 30). Desires and dreams also feature in Jasanoff’s (2015: 19) elaboration of sociotechnical imaginaries as “collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology.” In using the term “sociotechnical” Jasanoff (2015: 5) emphasizes both the traditional focus of STS on the important role played by technoscience in collective life as well as “the aspirational and normative dimensions of social order.”

Therefore, for Jasanoff imaginaries concern not only what can be achieved through technoscience but also bring into consideration questions about how life ought to be lived. With her reference to the aspirational and the normative in relation to visions of desirable futures, Jasanoff’s work takes a utopian turn. As Levitas (2011) acknowledges, the popular understanding of utopia is often as an impracticable fantasy or “idle dream” or worse, the road to totalitarianism. However, this isn’t what Levitas (2013: 4) has in mind when she is discussing

utopia: at its most simple, she defines utopia as the “expression of a desire for a better way of living and being.”

The utopianism implied in Jasanoff’s account of what she understands by sociotechnical imaginaries is of note for several reasons. First, because scholars have argued that utopia as a cultural form is in decline (Kumar 2010). This decline is not only confined to the cultural imagination but is also evident in the writings of many social thinkers, scientists, and engineers as well, who imagine and anticipate imminent futures of disaster, collapse, and decline (Urry 2016). Berardi (2011) argues that the “future” —as it was understood in the twentieth century based on the notion of progress towards improvement, enrichment, even perfection—is over. He contends that in the western cultural imagination, dystopia has replaced utopia in representations of possible futures.

Jasanoff and others’ work on sociotechnical imaginaries would appear to suggest otherwise: although images of decline and collapse are indeed prevalent, they propose that for many actors technoscience is the means to work towards and realize “desirable futures.” However, not all desires are met, as Levitas (2011: 221) notes: she distinguishes between a utopia that is an expression of desire and one that gives hope. As she explains: “utopia expresses and explores what is desired; under certain conditions it also contains the hope that these desires will be met in reality, rather than merely in fantasy.” Therefore, we might query whether all desirable futures are also *hopeful* futures. To give hope, Levitas contends, utopias must also address the practicalities of how they would come into being. They have to be seen as achievable. Such considerations loom large in public debate about the prospects of human spaceflight to other planets and establishing human settlements on them.

### **Imagination and Utopia in Outer Space**

The interest in imaginaries in STS is also reflected in the “social studies of outer space” literature, which also considers imaginative work and relations as central to the scholarly understanding of how spaceflight technoscience has developed over the past century. For McCurdy (2011: 54), imagining and imaging spacecraft in new visual styles of representation in the 1950s helped to demonstrate how “space travel would be accomplished” in practice. The proliferation of this imagery across specialist and mass media served to bridge the gap between “imagination and reality by creating and embedding persuasive pictures [...] of successful interplanetary travel” (Macauley 2012: 286). Ormrod and Dickens (2007) argue that how spaceflight or outer space is imagined reflects hegemonic struggles over the future; building spacecraft was the dream of engineers, exploiting the potential resources of asteroids or the Moon is the dream of capitalists seeking a “outer spatial” fix to the contradictions of capitalism. Furthermore, Ormrod (2007) argues, imagining oneself floating in zero-g, settling other planets or even terraforming them amounts to little more than misguided and narcissistic fantasies.

In this literature, then, one can find that imagination is both performative in that it brings about new realities and also problematic in that it can be disconnected from or at odds with reality. This tension is vividly reflected in the way that scholars in this field also address how outer space has been a utopia (both the good place and equally non-place) in which imaginings of a radically different way of living and being have been articulated and visualized (Parker 2009; Valentine 2012; Kilgore 2003). Kilgore (2003) discusses the astrofuturism of the 1950s when scientists, engineers, and fiction writers articulated a vision of the future: “devoted to breaking the limits placed on humanity by the surface of this planet, [it] forecasts an escape from terrestrial history [...] [and] posits the space frontier as a site of renewal, a place where we can resolve the domestic and global battles that have paralyzed our progress on Earth” (Kilgore 2003: 1-2). This

vision was continued in the 1970s by figures such as the physicist Gerard O'Neill. As McCray (2012:48) notes, O'Neill's utopia was predicated on a criticism of his present society; he feared the "pessimism, irrationality and social stagnation [that] would continue to grow with society's rejection of science and technology." Space exploration was therefore strongly associated with progress (Bainbridge 1976). Yet some see that this is nothing less than a failed utopia of the twentieth century. Degroot (2006: 266) argues that supporters of human spaceflight "always thought that exploration was the destiny of man [sic]. They thought it was the future. But they were wrong."

The utopia of outer space, however, continues to be reinvented. For example, Valentine (2012) investigates the new capitalist ventures intent on commercializing space that have emerged over the past three decades, from mining rare materials from asteroids, to opportunities for tourism, advertising, or reality TV (Parker 2009). As Valentine (2012: 1041) relates, the leaders of these ventures promote a vision of how "entrepreneurial activity will radically and positively transform the future evolution of society and of our species itself by establishing human settlements in the solar system and beyond." As Valentine recognizes, many may find continuing investment in this utopia to be little more than a dangerous fantasy—one that cannot be realized—that distracts us from what needs to be addressed in the here and now to avoid or ameliorate catastrophes of the kind that Urry (2016) outlines in his work.

Despite this, Valentine contends that critical scholars must engage with the "explicit utopian futures of people who are powerful enough to at least set them in motion" (Valentine: 1064), so that they have an opportunity to say what kind of future should take shape. After all, is this an impossible utopia? How can we judge whether this is indeed the case? For skeptics, part of the problem is that they do not see how it can be done. Degroot (2006: 266) asks: "even if a perfect world exists in deep space, how do we get there? How do we get enough of us there for the trip to qualify as a giant leap for mankind [sic]?" Even if this is a desirable future it is not necessarily a hopeful one, and this tension is central to contemporary speculative practices about establishing multiplanetary settlements.

Having now explored notions of sociotechnical imaginaries, imagination and utopia in both STS and the "social studies of outer space," I turn now to my case study of Mars One. I begin with providing some background to this initiative and the controversies that have surrounded it.

### **Introducing Mars One**

Mars One, established in 2011

... aims to establish a permanent human settlement on Mars. Mars is the only planet we know of that can currently feasibly support human life and will be humankind's first step to become a multiplanetary species. Before carefully selected and trained crews will depart to Mars, several unmanned missions will be completed, establishing a habitable settlement waiting for the first astronauts to arrive. The Mars One crews will go to Mars not to simply visit, but to live, explore, and create a second home for humanity. (Mars One 2017)

Since its inception, Mars One has been subject to intense scrutiny on technical, financial and ethical grounds. A number of controversies have grown up around its applicant selection process, technical feasibility, organizational credibility, and financial sustainability. To outline briefly, its plan is as follows: Mars One seeks to attract significant funding from media companies to fund several missions to Mars, with the explicit aim to create a permanent human settlement on the planet. The first mission serves as proof-of-concept and also involves a

communication satellite positioned in orbit; the second sends a rover to prepare the site for the settlement; the third is a cargo mission and the fourth mission sends four Mars One candidates to be the first people to land and live on Mars. This is currently projected to take place in 2031. The precursor robotic missions serve to ensure that key technological systems operate as expected and that, crucially, potable water can be extracted from beneath the Martian surface.

The founders of Mars One are Bas Lansdorp, who made his personal fortune from establishing a renewable energy company in the Netherlands, and Arno Wielders who works part-time at the European Space Agency. Only two members of its original seven-strong core team (as listed on its corporate website) are accredited with space-sector experience, with others having skills in conceptual art, marketing and online media. Given this, Mars One is better characterized as a media or cultural organization that aims to create a successful sociotechnical model for the settlement of Mars by attracting resources and partnerships from investors, aerospace industry contractors, agencies with launch facilities, and future Mars residents. The organization aims to generate revenue for its undertaking by selling media rights to applicants' training regimes, selection processes, and to eventually broadcast live their journey to and arrival on Mars. Mars One, therefore, not only seeks to generate not only expectations about its ability to successfully orchestrate the first ever human mission to and subsequent settlement of Mars, but also expectations that billions of people will watch it as a form of media spectacle. In 2012, Mars One announced that:

To finance the mission, Mars One will create an international media event around the project. The audience will help decide as the teams of settlers are selected, follow their extensive training and preparation for the mission and observe their settling on Mars once arrived. (Mars One 2012)

In the same release, Lansdorp is quoted as saying that: “we expect it to capture an audience of millions, culminating in several billion online spectators when the first crew lands on Mars.” (Mars One 2012). Already, Mars One—and more specifically those individuals who volunteered to be considered to be future Mars settlers—has attracted considerable media interest in various parts of the world. Creating the expectation that billions of people in the near future will watch the Mars One mission is critical to successfully raising the funds that it needs to contract construction of spacecraft and equipment. The dilemma, however, is that to appeal to investors (the media companies who will pay for the rights) Mars One must demonstrate that it is likely to complete its mission. To do that, it needs to contract with aerospace industry contractors and actually begin launching to and successfully landing on Mars. Of course, before it can try to do these things, it needs funds. In December 2016, it announced that it had attracted €6 million of investment from a Hong Kong-based investment firm World Stock & Bond Trade Ltd. (Mars One 2016).<sup>1</sup>

In addition to media companies, the other significant group of allies for Mars One comprises the people who responded to its open call to join its program. Mars One itself reported that 202,586 people from 140 countries had expressed interest in “wanting to be among the first human settlers of Mars,” which it later clarified led to 4227 people actually completing the application process (Mars One 2013; Keep 2015). Much of the popular attention given to Mars One has focused on the motivations, personalities and biographies of the people who completed the application process. Many of them have made media appearances on TV news programs, chat shows, and online, and they have been passionate spokespeople both for (and in some cases against) Mars One and its aims. Mars One awards its candidates points and badges on their individual profiles, for activities such as crowdfunding, merchandise purchasing, and their “support.”

Mars One has attracted significant criticism and skepticism from a number of quarters. John Logsdon, Director of the Space Policy Institute at George Washington University, referred to it as looking like a “scam” (Vergano 2015). Others see it as misguided or at best naïve in its approach to solving highly complex engineering problems and contend that its business model will not provide the required finance. From her investigation of Mars One, journalist Keep (2014) concluded that: “it seems to be [...] an amazingly hubristic fantasy.”

In 2014, a group of MIT doctoral students presented their own evaluation of the feasibility of the Mars One Mission Plan (Do et al. 2014). Using available information, they assessed the readiness of space transportation technologies, habitation, life support, and the ability to utilize in situ resources (such as extracting water from beneath the Martian surface). They concluded that, while Mars One claims it will use only existing technology, much of that technology is at relatively low levels of readiness and has not been tested or designed for use in a Martian environment. As they note, there is no operational experience of human spaceflight to another planet, let alone experience establishing a permanent base there, so modeling, and data from simulations are the only sources of knowledge on which to base assessments about the likelihood of Mars One succeeding. Three key conclusions from their assessment are worth highlighting: (i) transporting the first crew of four and the infrastructure to support them would require 15 launches of the Space X Heavy Falcon (a rocket that has yet to fly at the time of writing) at a total cost of US\$4.5bn; (ii) after 130 months cargo missions to support the crew would carry a significant number of spare parts (up to 62% of the cargo sent); (iii) unsafe levels of oxygen would be produced in the habitat if enough crops were planted to provide all of the crew’s caloric and nutritional intake (Do et al. 2014).

As I have shown, Mars One has attracted intense scrutiny on technical, financial and ethical grounds. However, as indicated above, my aim is not to analyze Mars One in terms of its leaders or investors’ expectations about whether it can deliver on its interrelated missions of media spectacle, public engagement and settlement of Mars. Instead, in what follows, I focus on interviews with applicants to join the Mars One Astronaut Program. I explore how these individuals give voice to a collectively shared sociotechnical imaginary of a multiplanetary future utopia.

### **The Mars 100**

In 2015-16, I interviewed six of the so-called “Mars 100” applicants who had progressed to the second round of the selection process. Three were men and three were women, with two living in North America, three in Europe, and another in East Asia. I approached candidates with prominent public profiles and used snowballing to contact others. The interviewees are not necessarily representative of the larger “Mars 100” group, but are varied in many ways. I use pseudonyms in this paper to help protect the anonymity of those whom I interviewed. In the interviews (the average length of which was 50 minutes), I asked them to reflect on their decisions to apply, why humans going to Mars mattered, what it would accomplish, and how they imagined a future life there. I also asked them about their views on the technical feasibility of the Mars One plan, and the credibility of the organization and its leadership.

Consistent with previous research (Ormrod 2009), three of the candidates, when discussing their reasons for applying to Mars One, reflected on how their interest in outer space and other planets began when they were children: Paolo said: “I remember I was 3 or 4 years old and I was already thinking about space”; Brian related that when he was a child, “it was space and dinosaurs; those are the two things that I was interested in growing up,” while Carl told me that

“I have always been fascinated by space exploration ever since I was a young boy.” Melinda, however, didn’t discuss a childhood interest in outer space per se, but related a somewhat different story of watching *Star Trek: The Next Generation*, which was the only program her parents permitted her to watch during the school week. This program and its depiction of future human beings in outer space had a significant impact on her childhood notion of what the future should be like. Therefore, some of the candidates I interviewed shared a long-standing fascination with outer space. In what follows, I focus on what they said about the significance of their attempt to settle another planet, some of the challenges involved, and the possibilities of a new social order that could be attained through this undertaking.

### Why Mars Matters

When asked to reflect on why it mattered that a group of people should seek to travel to and settle on Mars, four of the six candidates thought that this endeavor had the potential to act as a catalyst for bringing together people from different regions of the world. Not only had Mars One itself attracted a wide range of applicants from different nations and cultures, but the journey to Mars that four of the Mars One applicants then would make, and their attempt to establish a settlement there, would also unite the whole of humanity. For example, Katie told me that:

It’s not a mission to go to Mars; it’s a mission to make life on Earth better for everyone. It’s a mission for Earth, not a mission for Mars. That’s what really strikes me as the motivation for why we need to; it’s the most immediate payoff for going to Mars. Everyone who saw the Moon landings remembers where they were, but that was 1969; we haven’t had a single unifying moment where it is humanity doing something amazing and incredible. That will be the immediate payoff.

This, then, is the often-rehearsed story of the Apollo mission and the lunar landing of 1969 as more than just an American achievement and one with significance for the whole of humanity. Commentaries on the Apollo missions describe how astronauts’ photographs of Earth either from the moon or on the way there, such as Earthrise or “The Blue Marble,” became some of the most widely distributed and reproduced images and have been attributed as enabling a new “planetary consciousness.” A commentator at the time is said to have observed that: “on the way to the moon we’d discovered the Earth” (Riley 2012). This is sometimes inflected through environmental concerns: for example, the Mars Society’s founding declaration advances a case that Mars, with its similarity to Earth, will provide knowledge that could ensure humanity’s survival in relation to climate change.

However, in describing going to Mars as a mission *for* Earth, interviewees tended to stress how endeavors to go into space have the power to overcome social division and national and cultural differences. As another applicant, Melinda, explained:

So I think that space exploration demand [sic] we would be the very best versions of ourselves [...] I feel like this [Mars One] is the greatest possible way to unite us a species I think, right now especially. The world can use something that reminds us that we are more alike than we are different, especially in this country where we have got racism running amok.

Therefore, Melinda appeared to see the prospect for people of different races to be unified in a common project and for entrenched social conflict to be overcome. She felt that tangible benefits would flow that would improve everyone’s lives through technological innovation and



economic growth. However, in 1970, the African-American musician Gil Scott-Heron lamented in verse that: “I can’t pay no doctor bill (but Whitey’s on the moon),” symbolizing the gulf between national ambitions to send human beings to visit the moon and entrenched inequalities in US society. Today, as interest in settling Mars is gaining some renewed traction, the contrast between the huge investment of resources and time required to undertake this effort, and the ongoing lack of political will and funding to ensure everyone has equal access to healthcare or clean water, remains a pertinent concern (Russell and Vinsel 2017).

Mars One in particular was praised for the way that it had attracted and appeared to foster a multicultural and multinational settlement mission for Mars. As Katie commented in her interview:

They [Mars One] are very deliberately going out and saying this is humanity’s mission to Mars; this is for everyone; this is for the ordinary person who dreams of going somewhere. I think that the way they are going it trying to be kind of representative of the multi-cultural nature of our planet is incredibly positive and I am not convinced that any of the other kind of Mars Missions out there are really offering anything like it in terms of a good representation of humanity.

In talking about going to Mars in this way, the candidates echoed some of what Mars One itself has claimed on its website—that “exploring the solar system as a united humanity will bring us all closer together,” and that, “as with the Apollo Moon landings, a human mission to Mars will inspire generations to believe that all things are possible, anything can be achieved” ([www.mars-one.com](http://www.mars-one.com)).

Interviewees indicated that a desirable new social order on Earth could be attained through the pursuit of the Mars One project to settle another planet; but unifying people of diverse backgrounds was not the only concern. Another candidate, Carl, raised a different point about the importance of exploration:

So this is who we are as a species; we are traveler people; we are an explorer people; we do not have places to explore anymore. I cannot fully articulate the ways in which I think that is harmful to the human psyche [...] and I think that having some place to go is very important to us.

For Carl, to go exploring is what humans do—it is embedded in our nature—and can be traced back to the very first humans who migrated out of Africa. It is common for many space advocates to talk in such terms about exploration as a universal human need. Yet, as Redfield (2002) notes, accounts of exploring outer space rest on retellings of North American and European colonial and frontier narratives as analogues: the adventures of white men of the last five hundred years replayed in a cosmic context as they move to other “new worlds” beyond the Earth. Such analogies are deeply problematic, not least because they tend to romanticize the historical experiences of colonization (Williamson 1987). Nevertheless, Carl’s comment points to his understanding that a human need is not being met by the current social order, and this is causing harm. This again echoes the kind of statements made by the Mars Society: that going to Mars provides the kind of “challenge,” without which people and societies tend to “decay.”

### **Life on Mars**

While these comments relate to what a successful Mars One mission would mean for everyone on Earth, interviewees also spoke about the possibilities of social life and the social order that would emerge on Mars as the settlers arrived and established the material conditions of their day-to-day living. When interviewed, Carl observed that:

It's very easy to get caught up in the, well this is how the Mars One mission is going to go and this is how we will get on Mars, and afterwards it's kind of its an open book. Thinking about well then what are the social and political problems that we will be put up against? How do we go about then expanding the settlement for the future? How will the people that are coming to Mars affect things?

While much of the critical commentary on Mars One has centered on the technical feasibility of going to and landing safely on Mars, this candidate emphasizes that reaching Mars is not an end in itself, but rather a radically more open future must be addressed. What a small human colony on Mars could become over time is unknown. Melinda reflected on what she saw as the potential risks and dangers of travelling to and landing on Mars at some length. Yet despite these hazards she went on to say that:

This is incredibly naive I know but I feel like there's an opportunity to sort of build a Utopia on this next planet and to be a part of that is a mind-blowing opportunity; it is the opportunity of any lifetime.

She voiced excitement at the prospect of being one of the first people to live on Mars and so to help establish that Utopia. However, for Melinda, this would be a temporary state of affairs linked to the number of people who would be there: she imagined a communal environment in which all would weigh in on decisions, but, as more people came, this would change. She said:

I know that if by some miracle I go as one of the first people I've got 6 to 10 years maybe on that planet that I am going to have to enjoy this community and in that time every person's life will matter equally. Unlike here on Earth where as much as we want to believe that all lives matter equally they don't get the same attention.

Aimi also addressed this point in her interview. She looked beyond the initial stages of settlement led by the Mars One crews to a time when the settlement would grow in size as others joined it.

Afterwards it will be different type of people coming; I think it's going to open up more opportunities then it has to think about more structured way of maybe politics we need, some kind of political system. We have to think what kind of political system we need, to put [in] the leadership and how we are going to do that. Are we going to have a dictatorship or democracy? What kind of democracy do we have? What is meaningful unit of society; is it family or is it individuals?

Carl, too, saw that the Mars One settlement was only the beginning and that its successful establishment would encourage other organizations or nations to plan their own settlements.

I think once one group goes then other groups will follow and I think at that point we really start to establish what it means to be living on another planet and how that will work [...] I think that's when most of the sort of work will get done in terms in figuring all that out because it's completely new and its quite exciting that's a part of history that I might be a part of because it will eventually, I am sure, set precedence for the far future and how we go about settling on other places in the universe. Yeah there's so much potential there.

Carl's remarks reflect Mars One's own characterization of the longer-term value of its mission, by which Mars becomes the "stepping stone of the human race on its voyage into the universe." The utopianism evident in the interviews is also articulated by other organizations, such as the Mars Society (2017), which claims in its founding declaration that settling Mars is a chance for humanity "to shed old baggage and begin the world anew." In cultural terms, as Markley (2005: 2) argues, Mars has been the "screen on which we have projected our hopes for the future." This

is reflected and explored in science fiction, such as the work of Kim Stanley Robinson, whose *Mars* trilogy several interviewees mentioned as a key reference for their own speculations about what form of social life could take shape on a future Mars. Robinson's trilogy is a meticulous "future history" of the settlement of Mars that addresses the technological, material, social, political and economic challenges of establishing a human society on another planet. As well as transformations in social, political and economic life, Robinson also deals with the science and politics of transforming Mars itself through terraforming. Brian saw the possibilities of not only remaking society on Mars but remaking Mars itself too:

There is also the fact that in the very long term, say, two or three centuries down the line you can actually deliberately alter the environment on Mars; it's called terra-forming to make it like the Earth. That could actually be done with current technology; it would just be expensive. In fact, I have heard one estimate that you could terra-form Mars for about what American spent on the Iraq war.

STS scholarship has long recognized that we cannot think the social without reference to the technological. As Menser and Aronowitz (1996) suggest, we cannot easily separate the human from the technological as we have multiple and often intimate relations with technologies. Arguably, an imagined future life on Mars intensifies these relations even further as the entire viability of a new social order is entirely dependent on certain material conditions being sustained—an assemblage of technoscientific arrangements that extends from the production of a breathable atmosphere, potable water, to the ability to generate power. The very possibility of life itself on Mars is embedded in complex technological systems. Recognizing these challenges, Carl noted:

I think [...] that there's a follow-on problem where you need to keep sending more and more resources because the time to independence is so large and you are essentially... we're [...] growing the population and you're having to add more and more stuff and there's a huge launch burden. Mars One doesn't have good answers to this stuff.

The flipside of the potential to establish a new form of social life on Mars are the complex and presently unknown technical problems that people there would face. Given this, Carl expressed some ambivalence about the resource demands to sustain a human settlement on Mars.

## **Conclusion**

My interviews with the Mars One candidates reveal how the organization has successfully attracted people with clear hopes and desires for the future. They have a strong sense of what they can offer to the undertaking and express passion for how the future should be. They see the endeavor itself as having the potential to bring a new social order into being on a planetary scale, to fulfill human needs (such as the need to explore) that they see as currently unmet by existing social conditions, and to create a permanent human presence on Mars that can be open to anyone. In addition to changing the social order on Earth, the candidates talked about the prospects of creating a new social order on Mars, of the future there as an "open book," full of potential rewards and hazards. They saw themselves as part of a project that would start to "establish what it means to live on another planet." In sum, they imagined a desirable future that articulated shared understandings of a preferred form of social life—one couched in terms of human unity and common purpose—that could be achieved through the pursuit of a sociotechnical project to establish new forms of social life on another planet.

In articulating their visions of the future, interviewees borrow from and inflect a repertoire of narratives and cultural representations that are reflected in endeavors such as Mars One and that have also been taken up in other organizations such as the Mars Society, which lobbies for material investment in settling Mars. Some of these narratives and representations can be traced to science fiction, narratives about past colonial adventures or the human significance of past space missions. Indeed, the crucial aspect to note here is the collectively shared nature of the narratives and representations that very much animate advocacy for Mars settlement. Whether Mars One fails or not—and the likelihood is that it will fail on its own terms—we should appreciate that as an endeavor it gives expression to and is a product of a utopic sociotechnical imaginary of a multiplanetary future. This involves not only human beings re-ordering material, technical (and maybe even biophysical) relations so as to live on another planet, but also contains and is predicated on preferred “forms of social life and social order” (Jasanoff 2015: 4), which the technoscientific project of interplanetary spaceflight and settlement can bring about. This sociotechnical imaginary reflects the desires and hopes of different generations of technoscientific elites and others, primarily but not exclusively in the west since at least the 1950s. This is a “multiplanetary imaginary” of human beings who are no longer subject to Earth—no longer bound to this planet and its conditions of life—but rather able to reproduce those conditions through sociotechnical inventiveness and move away to create social life on other planets. It makes a normative claim about a future—not only a desired future but also a strongly preferred one. As Mars One attests, such an imaginary is not confined to the “orphans of Apollo”<sup>3</sup> but may enroll a diverse group of people from different places.

In drawing on Jasanoff’s work, STS scholars who analyze technoscientific projects in terms of sociotechnical imaginaries should also appreciate their utopian dimensions. If we follow Levitas in thinking about utopia as the desire—and in some cases the hope—for a “better way of living and being,” this adds an additional element to how STS scholars can interrogate sociotechnical imaginaries—complexifying questions of what is desirable (and by whom), what is viewed as practically possible or feasible and what is not, and how these questions are resolved or not in the present-day contestations over alternative futures. Some desirable futures may remain, as Levitas suggests, merely desired and never fulfilled because of their impracticalities: yet they may excite, be pleasurable to entertain, stimulate exchanges and foster social relations in the present-day. Equally, we might relate positive visions to more tenebrous imaginings of more troubled futures. Elon Musk, for instance, presents the case for settling Mars as insuring against the possibilities of planetary catastrophe on Earth (Mosher et al. 2016). Therefore, connecting the STS conceptualization of imaginaries with the wider scholarship on utopia could prove an insightful approach to analyzing sociotechnical future-making.

Renewed public interest in human spaceflight to Mars and the possibility of settling there attest to how spaceflight technoscience remains an enduring example of one of “modernity’s grand aspirations and adventures with science and technology” (Jasanoff 2015: 5). I have outlined how STS may analyze this area of endeavor that exemplifies humanity’s dreams, desires and hopes of technoscientific futures.

### **Biography**

Richard Tutton is Senior Lecturer in the Department of Sociology and co-Director of the Centre for Science Studies at Lancaster University. His research interests are in future-making in science and technology.

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## Notes

1. In an effort to secure these funds, Mars One restructured its organization, dividing into two entities: (i) the not-for-profit Mars One Foundation based in the Netherlands and (ii) Mars One Ventures, which holds the monetization rights from the Foundation's activities.
2. The joint Faculty of Arts and Science and Lancaster University Management School research ethics committee approved this research. All interviewees provided written consent to participate in the research.
3. "Orphans of Apollo" is a reference to Michael Potter's film of the same name, and refers to those who express disappointment that the promise of space exploration faded after the Apollo Program (see Valentine 2012).

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