

Spring 2021

Sex and the Stars: The Enduring Structure of Gender Discrimination in the Space Industry

Bronwyn D. Lovell
University of Adelaide, bronwyn.lovell@adelaide.edu.au

Follow this and additional works at: <https://digitalcommons.uri.edu/jfs>



Part of the [Other Feminist, Gender, and Sexuality Studies Commons](#)



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 4.0 License](#).

Recommended Citation

Lovell, Bronwyn D.. . "Sex and the Stars: The Enduring Structure of Gender Discrimination in the Space Industry." *Journal of Feminist Scholarship* 18 (Spring): 61-77. 10.23860/jfs.2021.18.04.

This Article is brought to you for free and open access by DigitalCommons@URI. It has been accepted for inclusion in *Journal of Feminist Scholarship* by an authorized editor of DigitalCommons@URI. For more information, please contact digitalcommons@etal.uri.edu.

Sex and the Stars: The Enduring Structure of Gender Discrimination in the Space Industry

Cover Page Footnote

This research was supported by an Australian Government Research Training Program Scholarship

Sex and the Stars: The Enduring Structure of Gender Discrimination in the Space Industry

Bronwyn D. Lovell, University of Adelaide

Abstract: Women have much to contribute to the worlds of science and technology, and the world is poorer for women's historical exclusion from such scientific endeavors. Although many industries exhibit gender discrepancies and continue to be shaped by sexism (e.g., banking, farming, mining, trucking, engineering, etc.), no other industry features so predominantly in our future-oriented visions for humanity as does science, and particularly space science. For women working in the male-dominated global space industry, space is a female frontier with a celestial ceiling. The United Nations (UN) reports that, in 2016, only 20% of workers in the space industry were women, and these figures had not improved in three decades. Women cannot defy the gravity of their situation without institutional change and a dramatic shift in cultural attitudes around gender. Science and human rights are linked; participation in science can improve a woman's education and independence, life opportunities, status in society, and basic human rights. On Earth, patriarchal ideologies punctuate daily life, but space presents a chance for humanity to start a new chapter.

Keywords: space studies, gender bias, space industry, sexism, astronaut

Copyright by Bronwyn D. Lovell

Introduction

Women have much to contribute to the worlds of science and technology, and the world is poorer for women's historical exclusion from such scientific endeavours. Diversity is key to a robust discipline, and science needs women. Although many industries exhibit gender discrepancies and continue to be shaped by sexism (e.g., banking, farming, mining, trucking, engineering, etc.), no other industry features so predominantly in our future-oriented visions for humanity as does science, and particularly space science. For women working in the male-dominated global space industry, space is a female frontier with a celestial ceiling. The United Nations (UN) reports that, in 2016, only 20% of workers in the space industry were women, and these figures had not improved in three decades (UNOOSA n.d.). Twenty percent is not an encouraging figure and yet, the situation for women in the space industry is even more dire when one considers the low-level roles women tend to play in the sector. For example, as of January 2019, NASA workforce information cubes indicate that it had almost twice as many male employees as female (11,343 as opposed to 5,884). However, looking more closely, there were more than three times the number of men employed in engineering roles than women (8,208 as opposed to 2,419). There were also more than five times the number of men in senior scientific roles than women (76 as opposed to 13) and more than double the number of men in senior executive roles than women (279 opposed to 119). Conversely, there were more women in general administrative roles than men (1,333 compared to 706). From these figures, we can see that even though women may make up 20% of the global space sector, they are far less likely to be in positions of privilege than men. Therefore, where women do participate in the space industry, they cannot, as a group, be said to be participating fully or equally.

Wertheim (2018) observes that “most science forums were invented by men, are headed by men, and maintained by men to sustain the interests of overwhelmingly male audiences.” However, as Maggie Aderin-Pocock (2018) argues,

science is [...] too important just to be left to the men. It needs a diversity of viewpoints. It is driven by creativity and new ideas and if these ideas are coming from a small gene pool it truly limits the potential of what we can do and achieve. Different perspectives improve all we do and in science this means progressing faster and achieving a brighter future. (6)

Significant efforts have been made towards encouraging greater gender inclusion in the space industry. Women in Aerospace (WIA), established in 1985, is an organization dedicated to “expanding women’s opportunities for leadership and increasing their visibility in the aerospace community” (WIA n.d.). The UN’s 1999 Vienna Declaration On Space and Human Development recommended that a mechanism be created “to facilitate the participation of young people throughout the world, especially young women and persons from developing countries, in cooperative space-related activities,” and that “all countries should be encouraged to provide their children and youth, especially females, with opportunities to learn more about and participate in space science and technology” (UNOOSA, 3). The 2015 Sustainable Development Goals (SDGs) similarly emphasized the importance of ensuring “women’s full and effective participation and equal opportunities for leadership” in all aspects of public life (UN Women n.d.). The UN has stressed that all seventeen of the SDGs are dependent on the achievement of “Goal 5: Gender Equality.” In 2016, the global innovation agenda of the International Astronautical Federation (IAF) announced its focus on fostering equality and “3G Diversity” (Geography, Generation, and Gender) in astronautics, recognizing that gender diversity “is still an area where strong progress needs to be achieved” (IAF n.d.).

Science and human rights are linked; participation in science can improve a woman’s education and independence, life opportunities, status in society, and basic human rights. The annual BBC list of “100 Women” highlights influential and inspiring women from around the world (BBC News 2018a). In 2018, the list included Alina Anisimova, a 19-year-old Kyrgyz computer programmer. Anisimova teaches at the Kyrgyz Space School — an all-female space programme aiming to build Kyrgyzstan’s first satellite and have it launched into space. The vision behind the project is to increase the status of women in a country where women have few vocational prospects beyond marriage and childrearing, and live in constant threat of gender violence. Anisimova argues that “it’s important that we do something revolutionary so that the girls’ situation in this country improves significantly” (BBC News 2018b). Lydia Verner — hydro-engineer and Anisimova’s grandmother — states that “women are not born to be forced into marriage. And then forced to give birth again and again, or to have to constantly wash and clean. That’s a slave’s life. A woman needs society, interaction and to live for herself too” (BBC News 2018b). Participation in the traditionally male-dominated realm of space science offers women in Kyrgyzstan an opportunity for autonomy and to rewrite their country’s dominant gender narrative; it presents the chance to re-conceptualize gender roles and challenge deep-seated beliefs about what women are capable of achieving and in what ways they can contribute to their country’s future.

Space Exploration and Gender in Popular Culture

Expansion into space is widely considered the ultimate goal for our success as a species. In US President John F. Kennedy’s famous Moon speech of 1962, he employed the metaphor of the frontier to imagine space exploration. He said, “What was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space.” Likewise, US President

Ronald Reagan referred to space as humanity's "next frontier" in his 1984 State of the Union Address (Launius 2010), and compared space to the "frontier of the American West" again in his 1986 *Challenger* eulogy (Launius 2013, 53).

The popular conceptions of "conquest" and "westering" in the settlement of the American continent by Anglos has been a powerful metaphor for the propriety of space exploration and has enjoyed wide usage by advocates of an aggressive space program. It hearkens back to the most powerful and positive images of the American West and the frontier in speaking of what might be gained in the unknown of space. (Launius 2005, 131)

For a culture eager to move onwards and upwards at an increasing pace, space is often seen as the pinnacle of achievement. Due to *Star Trek's* deep impression on the public imagination, space is often referred to as "the final frontier" (due to the famous lines of the opening credits to the 1960s original series), but this Wild West, space-cowboy rhetoric marks space as a culturally masculine terrain. Lorrie Palmer (2019) relates that "most Americans believed that only men should go into space until the new frontier was made habitable for others to follow, creating a parallel of America's nineteenth-century westward expansion with its twentieth-century masculinist myth of space exploration" (32). Palmer and Lisa Purse (2019) argue that "the story of spaceflight omits women and people of colour in favour of a raced, gendered pseudo-utopia in which white men brave the wilderness" (1). Furthermore, Melanie Pryor (2018) contends that "men's experiences of interacting with wild landscapes are, largely speaking, more highly valued [...] than women's in a cultural context" (225). This is illustrated in relation to space by the fact that, when mothers became astronauts, the cultural value of space exploration and the symbol of the astronaut lost status and respect accordingly:

The role of astronaut, the role that defined masculinity like none other, was now open to young women, young *mothers*, even. To some people this meant an important barrier had fallen. To others, it meant that space travel was no longer exciting. (Lazarus Dean 2015)

Space and science occupy an elevated position in Western capitalist culture. We look up to space, both physically and figuratively. It has the unique quality of being a physical place as well as a realm of the imagination. No matter where you are on Earth, space is up. It is difficult to get there. The people who defy the odds to journey into space are admired as heroes. A lack of women in space might suggest we are acculturated to looking up to men and down on women.

Sally Ride, the first US woman in space, recognized the "connections between her history-making spaceflight and the state of American women in politics and public life" (Weitekamp 2017). She famously said "you can't be what you can't see" (Ride 2012), meaning that young girls could not set their sights on becoming astronauts when there were no women modelling that possibility — when there was no image of what success might look like for them to aspire towards. Ride (2012) said,

I never went into physics or the astronaut corps to become a role model. But after my first flight, it became clear to me that I was one. And I began to understand the importance of that to people. Young girls need to see role models in whatever careers they may choose, just so they can picture themselves doing those jobs someday. You can't be what you can't see.

Similarly, US astronaut Mae Jemison, the first black woman in space, was inspired to pursue a career in science when she was a girl and heard of Valentina Tereshkova's flight as the first female astronaut (Cavallaro 2015, 143). Jemison in turn became an inspiration and mentor for women in science (Newman 2018; Sainato and Skojec 2017) and she is involved in numerous initiatives to increase

science literacy in schools (Dorothy Jemison Foundation n.d.). Jemison says, “We look at science as something very elite, which only a few people can learn [...] That’s just not true” [...] “We have to change the way people look at scientists,” Jemison argues (Anderson 1994). This is why diverse representation is important.

Space Industry Institutions and Gender Statistics

In my own experience of undertaking an executive certificate in space studies in January 2019, run by the International Space University (ISU) and the University of South Australia, around three-quarters of course participants were male (34 out of 46, or 74%). Likewise, three-quarters of the core lectures were presented by men (29 out of 38, or 74%). Of the twelve women in the course, only two (26%) were mothers with one child each, while nineteen (56%) of the men were fathers – one male participant had three children, six had two children, and twelve had one child each. This was a very demanding five-week live-in course, running from 9:00 am to 10:00 pm most days, even on weekends and public holidays. The length and intensity of the course prevents the participation of most mothers, since they are often primary caretakers of children. Fathers, however, rarely face the same impediments to participation. ISU is renowned for its international, intercultural, and interdisciplinary diversity policy, but this philosophy fails to adequately address gender diversity, which is of extreme importance, especially given the sweeping influence that ISU wields in the space sector and has for some time.

An ISU degree in space circles is like a Stanford M.B.A. in Silicon Valley [...] alums have infiltrated nearly every key company and agency involved in space, often by getting one another hired. Once in place, they funnel deals to their fellow ISU alums. Grads and supporters call themselves the Space Mafia. (Schoenberger 2000)

Buzz Aldrin, former ISU Chancellor (2015–18) called the university “the top of today’s space education” (Aldrin 2015). Access to space education determines the next generation of leaders in the space industry and, if in 2019 intakes to these elite courses are around three-quarters male, and if the faculty is also predominantly men, then urgent affirmative action is imperative to ensure that women gain the knowledge, skills, and contacts they need to better participate in and contribute to the future of the space sector. ISU appointed its first female chancellor, Professor Pascale Ehrenfreund, in late 2018 – a positive move long overdue after three decades of delivering space education.

Ehrenfreund is also Chair (2015–) of the German Aerospace Center (DLR) Executive Board. At the 2017 International Astronautical Congress (IAC), she presented on gender diversity in the DLR. She reported that of the 7,959 staff members the DLR employed in 2016, 5,491 of them were men (69%), while 2,468 were women (31%). Of the 512 leadership positions, 80.5% were held by men while 19.5% were held by women. Of degree-qualified staff, 75% were men while 25% were women. Of those who held a degree in a STEM (Science, Technology, Engineering, Mathematics) subject, 81% were men while 19% were women. Of those who held a degree in administration, 52% were men and 48% were women. Ehrenfreund noted that she was the only female on the Board, with all her colleagues being men. She also observed that of forty institute directors at the DLR, only one was female. She said that while eleven German astronauts have flown in space, all of whom have been male, two female astronaut candidates were selected by DLR in April 2017 due to the ‘Astronautin’ campaign launched in 2016 by Claudia Kessler. The DLR has instigated many initiatives to improve gender balance, including quotas for female researchers, but Ehrenfreund says, “You always know that you have to do more” (2017).

At the same event, Professor Roberto Battison, former President (2015–18) of the Italian Space Agency (ASI), had vastly different figures to share. The ASI is a much smaller agency than NASA or DLR, with only 185 employees in 2017, but 118 of them were women. Battison reported that women dominate in both administrative and technological roles at the ASI (2017). The ASI’s first female Director General, Anna Sirica, has taken a number of concrete measures to increase conditions

for women, including allowing employees to work remotely part-time and to job share. The ASI also has a crèche, which was a first for an Italian research organisation. However, it is notable that of seven Italian astronauts, six have been male. Still, the ASI serves as evidence that women can participate in the space industry in greater numbers when they are provided with adequate support systems, especially in regard to working mothers' needs for childcare and flexibility.

Sexism and Sexual Harassment in the Space Industry

In 2014, cosmonaut Yelena Serova was preparing to be the first Russian woman in space for seventeen years, as well as the first Russian woman ever to board the International Space Station (ISS). This would also mark the first time that more than one woman would be part of the ISS crew. As the only female cosmonaut in service, she faced a number of gender-related questions at the press conference before her launch (Malpas 2014; see also Cavallaro 2017). The press enquired as to how she would do her hair and make-up, and how she would maintain her relationship with her eleven-year-old daughter while she was in space. No such questions were directed towards her male colleagues. As space journalist Megan Gannon observes, astronaut mothers are predictably asked about spending time away from their families but “it’s hard to imagine the same being asked of their male counterparts or splashy headlines about an ‘Astronaut Dad’” (Gannon 2016). Igor Marinin, a prominent male space journalist, made some obdurate statements at Serova’s press conference:

The Soviet Union wanted to win the space race with Tereshkova but then rejected the use of women for many years because they were seen as not physically strong enough, said Igor Marinin, the editor of Russian magazine *Space News*. “In space, it’s men’s work. The leadership then were military, they decided not to take women as cosmonauts anymore,” he said. The choice of Serova was made personally by the then head of Russia’s space agency, Vladimir Popovkin, Marinin said. “We are doing this flight for Russia’s image”, he said. “She will manage it, but the next woman won’t fly out soon”. He voiced concerns over the gender balance, saying: “Six months with five men in a confined space is complicated. Lena is a charming, attractive woman”. (Malpas 2014)

This belittling of the physical capability of women and preoccupation with Serova’s appearance highlights the fact that female cosmonauts are not taken as seriously as their male counterparts, and their work as scientists and their contribution to missions is severely underestimated. Despite the worldwide negative press prompted by this sexist treatment of Serova, the following year, when a group of six female scientists were scheduled to undertake an eight-day simulated moon mission, “Luna 2015,” the press conference was a similar debacle, with questions again focusing on the women’s hair and make-up (Grush 2015).

The sexist questions faced by Serova in 2014 and the Luna simulation scientists in 2015 have not evolved greatly from the questions faced by the first US woman to travel to space, Sally Ride, in 1983. She was also asked what make-up she would take to space, how she would manage the bathroom facilities, what would happen if she got her period in space, whether her reproductive organs would be affected, whether she would become a mother and whether she weeps when things go wrong in simulator training (Calderone 2016; Ryan 1983).¹ Given the controversy caused by her gender, Ride lamented (some thirty-five years ago) that it was “too bad that our society isn’t further along” (Sherr 2014, 148). It is still too bad. The director of Moscow’s Institute of Biomedical Problems (IBMP) Igor Ushakov wished the Luna 2015 women “a lack of conflicts, even though they say that in one kitchen, two housewives find it hard to live together” (Cox 2015). This was likely an attempt at light-hearted humor, similar to the presentation of a floral apron to Svetlana Savitskaya in 1982 when she boarded the Salyut 7 Space Station and her male colleagues told her she could start work in the kitchen (Burns 1982). However, sexist “jokes,” especially from people in positions of authority or influence, are never harmless, because they perpetuate the naturalization of sexism in contemporary culture and bely its seriousness as an issue.

In 2016, Donald Trump was running for president when a damning tape exposing his disrespect of women emerged. On it, he said:

I'm automatically attracted to beautiful — I just start kissing them. It's like a magnet. Just kiss. I don't even wait. And when you're a star, they let you do it. You can do anything [...] Grab 'em by the pussy. You can do anything. (2005 *Access Hollywood* tape transcript in *The New York Times* 2016)

Incredibly, Trump was right. You can even become the President of the United States amid multiple allegations of sexual assault (ABC News 2016; Conti 2017). This kind of talk from men in influential positions normalizes sex offenses and emboldens other men to likewise feel entitled to “do anything” they like to women.² Also, it isn't being “a star” that enables this power as much as being male. Several female stars of film, television, and theatre have come forward through the Me Too and Time's Up movements to express, “the heavy weight of [women's] common experience of being preyed upon, harassed, and exploited by those who abuse their power and threaten [women's] physical and economic security” (Time's Up 2018).

While Trump has presumed that being a “star” affords him power over women, former NASA astronaut Mike Mullane notes in his memoir, *Riding Rockets: The Outrageous Tales of a Space Shuttle Astronaut* (2007), that being an astronaut is perhaps an even more powerful sexual position for men, allowing both married and single astronauts alike to romp in a “potpourri of pussy” (Mullane 2007):

I had been in enough officers' clubs in my life to know that aviator wings had more babe-attracting power than Donald Trump's twelve-inch wallet. The Navy SEAL insignia had the same effect. One SEAL told me that some of the young women who frequented their officers' club were nicknamed Great White Sharks because they had swallowed so much SEAL meat. The male TFNGs were learning there was an even more powerful pheromone than jet-jockey wings and the SEAL insignia: the title “astronaut.” (52)

Mullane was one of the class of thirty-five astronaut candidates in 1978 nicknamed the “Thirty-Five New Guys” (TFNG) — the first intake to include women. NASA selected six white women, four men of color and twenty-five white men. The acronym TFNG was a military in-joke, because FNG stood for “Fucking New Guy” — a term for a rookie, someone yet to prove their worth. This was also the first intake to include astronaut candidates from non-military backgrounds, but the military presence and influence in NASA was, and remains, strong.

Mullane recalls an incident with a TFNG from the Navy that illustrates the sexist attitudes common within the armed forces at the time; attitudes that consequently infiltrated the astronaut corps.

We were standing outside Sally Ride's office. She was absent and I took the opportunity to point out the bumper sticker on the front of her desk. It read, “A woman's place is in the cockpit”. My Top Gun companion looked at the sticker and chuckled. “A woman is a COCK pit”. That was exactly how most of the military astronauts saw women in general and good-looking women in particular. (39)

In this way and many others, the Thirty-Five New Guys, or The Fucking New Guys, proved themselves to be mostly the Same Old Fucking Guys. It is thus not surprising to learn that Trump's self-confessed habit of forcibly kissing women, a habit corroborated by sexual assault allegations (Stewart 2018), is exactly the kind of behaviour that Canadian astronaut candidate Judith Lapierre was subjected to when she entered the space simulation Sphinx-99 near Moscow on 3 December 1999. Lapierre was the only woman in a crew of seven when one of the men, Vasily Lukyanyuk, the mission commander no

less, tried to manoeuvre her out of view from surveillance cameras and “aggressively kissed and manhandled her twice, even as she protested loudly” (Oberhaus 2015). When she appealed to the Canadian Space Agency for help, “Lapierre was told that such behavior was normal for Russians and that it would be considered taboo within the culture of the host country to complain publicly” (Oberhaus 2015). Feeling vulnerable, Lapierre hid all the knives on board with the assistance of two of her colleagues, and those managing the experiment eventually agreed to install locks between the Russian and International modules of the spacecraft after she called for greater safety inside the simulation (Oberhaus 2015). The program’s scientific coordinator, Valery Gushchin, later claimed that Lapierre had “ruined the mission, the atmosphere, by refusing to be kissed” (Oberhaus 2015). The forced tongue-kissing took place during New Year’s Eve celebrations and was excused on account of “cultural differences” (Cockell 2016, 80). However, the disrespect of women that patriarchal attitudes enable is a worldwide cultural commonality.

Ours is “a world that assigns a different value to men’s and women’s work” (Nelson and Robertson 2018, 11), just as different values are assigned to men and women. To claim that the highly elite work of a cosmonaut is “men’s work,” as Marinin did in 2014, is to confirm that men are more culturally valued than women due to socially constructed gender roles, not because of any biological barriers preventing women from participating in spaceflight. In 2005, a member of the Russian Academy of Sciences and the Presidential Council on Sciences and Education cited similar archaic understandings of gender differences for why women would not be chosen as candidates to travel to Mars.

Exploring Mars is a priority, but a prominent Russian professor of space medicine, Anatoly Grigoryev, says it will be a male-only flight, because women are “too weak” to make the trip. Professor Grigoryev spoke to students at Moscow’s International University, stating that women were fragile and delicate creatures, which is why “men should lead the way to distant planets and carry women there in their strong hands”. (Gibson 2014)

The idea that men should brave the frontier of space and women should follow later is based entirely on outdated gender ideologies and disregards scientific evidence to the contrary (Drake 2019). The most concerning thing about Grigoryev’s rhetoric is that it received an audience at a university, and this is not an isolated incident.

Women are Not “One of the Boys” in Space

The 2015 Flinders University annual Investigator Lecture was held on 18 November at the Adelaide Convention Centre and was entitled, “How to Live in Space.” Special guest Professor Alex Akulov from Russia’s Yuri Gagarin Research and Test Cosmonaut Training Centre spoke about the rigorous testing and gruelling physical challenges that cosmonaut candidates must pass in order to earn their right among the few who will be selected for active space service. A female audience member posed the last question for the evening, asking how many women made it through this demanding training program. Akulov hesitated before giving his answer, “There is no discrimination, but it is objectively not a job for women” (2015). The MC for the event, space archaeologist Dr Alice Gorman, quickly diffused this inflammatory statement by reminding everyone that the first woman in space was Russian cosmonaut Valentina Tereshkova and celebrated this fact before wrapping up the event without further controversy. However, the disappointing take-home message, especially for the young children who attended, was that “How to Live in Space” was, first and foremost, by not being a woman. It is difficult to accept Akulov’s answer to the audience member’s question as either “objective” or accurate, and yet, presumably to avoid an uncomfortable scene or any potential embarrassment for this

distinguished guest, no one challenged the sexism inherent in his statement. This incident illustrates the fact that there are men in positions of high authority in the space industry today who continue to promote the kind of sexist notions typical of 1950s science fiction, despite overwhelming evidence that their assumptions about what women can and can't do are scientifically unfounded.

Also in 2015, I attended a lecture presented by the American Institute of Aeronautics and Astronautics (AIAA) called, "Perspectives from Space," supported by the Melbourne branch of the Royal Aeronautical Society. Former NASA astronaut Dr Sandy Magnus (who was also the Executive Director of the AIAA at the time) gave the lecture on 21 May 2015 at RMIT University in Melbourne. When a young girl in the audience asked what it was like being the only woman in a crew of six aboard the ISS, Magnus replied, "You just become one of the boys." Magnus seemed overtly eager to dismiss gender as irrelevant, and she quickly invited the next question. But is being the only woman in a crew of six really a non-issue? What exactly does it mean to be "one of the boys?" Did Magnus adjust her behaviour to fit in with "the boys?" Was she, like many women in male-dominated professions, acting the role of "conceptual man" (Ranson 2006)? These distinctions are important. Female astronauts are understandably reluctant to admit gender differences. Judith Resnick, the fourth woman in space, resented being labelled differently to her colleagues by the media and famously declared, "I am an astronaut. Not a woman astronaut. Not a Jewish astronaut. An astronaut" (Penley 1997, 29). However, aspects of identity do not exist in a vacuum. A complete self travels to space. These issues remain important and require further consideration and discussion. As long as women are so outnumbered on space missions that they cannot just as easily be "one of the girls," there remains a problem.³ Sally Ride said in 1983, "I wish that there had been another woman on my flight. I think it would've been a lot easier" (Calderone 2016). Research suggests so, too — women are happier and enjoy better health when working with other women (Qian 2018). To be the only woman is to be the exception — the 'special' woman, the 'token' woman among a majority of men, fielding all the "dumb chauvinistic questions" (Ryan 1983).

There is another compelling reason why becoming "one of the boys" may not be in the best interests of women in male-dominated workplaces — an increased risk of sexual harassment. This has been termed "the 'manly jobs' problem" (Chira 2018). Susan Chira (2018) explains that "some jobs are 'male' — not just men's work, but also a core definition of masculinity itself. Threatening that status quo is not just uppity — it can be dangerous." Gender harassment "appears to be motivated by hostility toward individuals who violate gender ideals" (Berdahl 2007, 425; see also Denissen and Saguy 2014) and "a desire to punish women who do not conform to prescriptive sex stereotypes or to beliefs about how women should behave" (Berdahl 2007, 426).⁴ For this reason, "women in male-dominated occupations, especially those in male-dominated work contexts, are sexually harassed more than women in balanced or in female-dominated ones" (Berdahl 2007, 427; see also Parker 2018). Jennifer Berdahl (2007) determines that women in traditionally male workplaces face barriers in their career progression since they tend to be "dismissed and disrespected if feminine but scorned and disliked if masculine" (435). Berdahl concludes that "acting like 'one of the boys' by being assertive and leader-like may not be the best strategy for women who wish to succeed in male-dominated occupations" (435). Thus, if male-dominated workplaces like NASA can achieve gender balance, especially in their leadership, they will become safer spaces for women.

In 2017, I wrote a presentation for the Three-Minute Thesis competition called "Space: The Female Frontier" and I delivered it to high school students at the South Australian Certificate of Education (SACE) Research Project Student Expo at the Adelaide Showgrounds on 9 August. I was pleased when two girls' schools took most of the seats. I spoke about the gender discrimination women faced during the space race. I explained that women only make up around 11% of the total people to have gone to space (Drake 2019). I also spoke about the gender imbalance in science fiction space narratives and how imagination is crucial in the process of changing science fact. When the Chair of the session opened the floor for questions, I hoped one of the female students might put up

their hand. Instead, a male student approached from the back of the hall, walking towards the stage as he called out his question, “You said most astronauts have been male, right?” I said, “Yes, that’s correct.” He responded, “Is that a problem?” After a sharp intake of breath, I replied, “Yes, it’s a problem.” He asked, “Why?” I was a little shocked by this question and a little dismayed that he seemed to have missed the point of my presentation, but I explained that the reason there have been more men in space has to do with cultural ideas about men and women’s roles in society and not because women have not always been absolutely capable and willing to go. Then he said, standing directly in front of me while the girls still sat quietly in their seats, “But waste is a problem in space, right? And don’t female bodies produce more waste, because of their periods?” I gaped. Here was a young male from the next generation denouncing the “leaky bodies” (Shildrick 1997) of women and questioning their suitability for space travel. “Well,” I said, “it’s interesting you mention menstruation because that was one of the arguments against women going to space, since the menstrual cycle was thought to make women’s performance unreliable, but that has long since been disproven.” The boy insisted, “But isn’t it true that the female body produces more waste?” It was now clear that he was not asking a question but making an accusation. He was already convinced of the answer. When I replied firmly, “Absolutely not,” and the female Chair hastily called an end to the session, he skulked away looking sceptical and frustrated. The Chair and the other two women on the panel turned to me in disbelief. We were all shocked and disturbed by the confrontation.

In 2019, at the Southern Hemisphere Space Studies Program on 29 January at the University of South Australia, I attended a lecture called “Cultural Rationales for Space Activities” by space historian and PhD candidate Kerrie Dougherty. Dougherty displayed a series of famous quotations about the overview effect⁵ in her PowerPoint presentation. One of these was from Chinese American astronaut Taylor Wang:

A Chinese tale tells of some men sent to harm a young girl who, upon seeing her beauty, become her protectors rather than her violators. That’s how I felt seeing the Earth for the first time. I could not help but love and cherish her.

This quotation was shared as an inspirational example of the power of the overview effect, which was presented as a cultural rationale for space activities. On the contrary, I found this quotation highly alarming and offensive. It is disturbing from a feminist perspective on multiple levels. First, it introduces the story of a group of men who set out with the intention of violating a young girl, as if this is routine and acceptable behavior. Second, it shows the men, who did not value the girl before, suddenly assigning worth to the girl based purely on the attractiveness of her physical appearance. Third, a male astronaut who is in the technologically advanced realm of space, looks down and genders the Earth female, thereby perpetuating problematic associations between nature and femininity, which are both presented as being grounded, below him. If Wang can be said to have undergone a paradigm shift that inspires a newfound passion for environmentalism, he cannot be said to have achieved any illumination on the subjects of patriarchal oppression, sexism, or ecofeminism.

During another of the space studies course lectures, titled “Hazards of Space Exploration” (23 January 2019), physician Dr. Gordon Cable detailed the negative impacts of space travel on the human body. A male audience member enquired about gender differences in the tolerance of space travel. Cable replied that, given the small percentage of women to have travelled to space, no significant evidence for gender differences can be ascertained. He said it was a good question though and, “if we’re going to colonize and we’re going to reproduce, it’s an essential question.” The underlying assumption at work in such a statement is that women are not astronauts — that, in line with the frontier myth, men are braving the fraught new territory of space and that, when it stabilises, women and children will follow. Cable assumes that the probable need to reproduce in space sometime in the future makes gaining better data on women important, but that it is not as yet “essential.” Cable fails to consider that

women are more than their wombs, that female astronauts are increasingly common, and that accurate data on how space travel affects their bodies is crucial for their safety and wellbeing now. This is what Caroline Criado Perez (2019) calls “the gender data gap.” Perez claims that “the consequences of living in a world built around male data can be deadly,” and if this is the case on Earth, it must be of urgent concern to women working in space.

Conclusion

On Earth, patriarchal ideologies punctuate daily life, but space presents a chance for humanity to start a new chapter. Lack of gender diversity in space is the reconfiguration of patriarchy in a new location, and the masculinisation of the greater universe has already begun. As a species, humanity has gendered space as far as astronomical instruments allow us to see. This is a direct consequence of historical traditions in which women were denied education, excluded from the sciences and therefore unable to fully contribute to the development of the fields of astronomy and space science. Colonization of other planets will require establishment of Earth-like conditions so that humans can survive there. Any Mars colony will be an Earth-like bubble, an extension of Earth culture. With NASA planning human Mars missions from the 2030s and private companies like SpaceX hoping to go even earlier, every effort must be made to ensure that the gender discrimination that is currently entrenched in the culture of Earth as a patriarchal planet is eradicated, and not taken further into space to contaminate new worlds.

In the early 1960s, through privately funded research, a group of thirteen female pilots passed the same physiological and psychological tests as the seven male pilots selected for NASA’s Project Mercury (NASA History n.d.). These women, who called themselves the First Lady Astronaut Trainees (FLATs) and have since come to be popularly known as the Mercury 13, proved, through exhaustive assessments, that they were fully fit for and capable of spaceflight. Jerrie Cobb placed in the top 2% of all astronaut candidates including the men (NASA History 2008) and had more hours of professional flight experience than any of the Mercury 7 men (Weitekamp 2005, 78). Still, the women were denied the chance to go to space because of their gender, which precluded them from military service and hence prevented them from meeting the guidelines for astronaut candidates, which required that they be military test pilots. All that those aspiring female astronauts sought was “a place in [their] nation’s space future without discrimination” and the right “to participate with seriousness and sincerity in the making of history” (Sington and Walsh 2018). Jim Hart, son of Jane Hart, one of the Mercury 13 women, encourages us to “imagine how much more telling and significant it would have been to have a woman step onto the moon” (*Ibid.*) Jane Hart’s daughter, Ann Hart, believes that if a woman could have walked on the Moon, it would have symbolized a new era for women in society and inspired significant change in gender attitudes and the state of the world:

It was a very seriously missed opportunity. This really could have changed lives hugely. Not just in terms of little girls getting engineering degrees, but moving into positions of real power implementing practices and policies that might have represented that humanitarian component of woman, as opposed to the bellicose boys. (*Ibid.*)

A vision of a woman on the Moon at that critical time would have made a deep impression upon the public imagination — and imagination is the spark, the fuel that fires authentic change. In 1998, NASA also missed the opportunity to make a gesture that would have gone some way to making amends for its gender discrimination against Jerrie Cobb and the Mercury 13 women; the agency could have flown Cobb to space for the first time at the age of sixty-seven, but instead sent John Glenn to space again at the age of seventy-seven (Smith 2019). The space industry, for all its grandiose vision, still habitually

fails to demonstrate the progressive imagination and moral leadership required to commit itself to creating new cultural stories in relation to gender.

Space is a hostile terrain built for neither men nor women. Or rather, humans are not built for space. Much space industry infrastructure has, however, been specifically designed for men. When women's fitness for space travel was first tested in the late 1950s, not having a G-suit like their male counterparts was a major disadvantage in the centrifuge. The women were not allowed G-suits to aid them in staying conscious as the G-forces increased, because they were not military personnel (Ackmann 2004). Wally Funk dealt with this creatively by donning a cinching girdle, borrowed from her mother, and thereby putting the incredibly restrictive nature of women's undergarments at the time to good use (Ackmann 2000). With the recruitment of women to the US astronaut corps in 1978, NASA engineers were initially worried that the toilet on the space shuttle might be damaged by female urine, which they suspected had a higher mucus content (Foster 2011, 147). The toilet was fine. The first female astronauts laughed that off, and countless other sexist assumptions. In April 2019, the first all-female spacewalk was cancelled (and rescheduled for October 2019) because there were not two medium-sized spacesuits that were in a functional condition on the ISS (Dreyfuss 2019). There are large and extra-large suits, but no small ones, so some female astronauts have no possibility of ever spacewalking due to their smaller stature (Grush 2019), or more accurately, due to space agency failure to cater for female bodies.

Although the astronaut is a symbol of individual autonomy, the reality is that astronauts cannot reach great heights alone — their journeys are supported by a team of professionals and years of preparation, communal labour and government funds. Without such an extensive support system, no astronaut could ever launch. Women in contemporary society, especially mothers, lack an adequate support system. Women cannot aspire to the same heights as men as long as systemic inequality insists on keeping them grounded, sometimes pushing them rock bottom. Women cannot defy the gravity of their situation without institutional change and a dramatic shift in cultural attitudes around gender.

Significantly, NASA's Artemis program aims to put two US astronauts on the surface of the Moon again by 2024 — “the first woman and the next man” (NASA n.d.). The Artemis program is named for Apollo's twin sister in Greek mythology. During the Apollo program, twenty-four men travelled to lunar orbit and twelve men walked on the Moon. No woman has ever been further than low Earth orbit. It would be fitting for the first two humans in fifty years to step on the Moon to both be female. There has never been an all-female space crew (unless one counts Valentina Tereshkova's solo flight in 1963). Although NASA flew all-male crews for decades, and despite all the Apollo missions having been crewed exclusively by men, NASA is ensuring yet another “very seriously missed opportunity” by not flying an all-female crew on Artemis 3. A small gesture of affirmative action in this instance would go a long way — in fact, to the Moon and back.

Acknowledgements

This research was supported by an Australian Government Research Training Program Scholarship.

Notes

1. It is notable that in 1967 when astronomer Jocelyn Bell Burnell became famous for discovering the first pulsar signal she also faced sexist questions from the press, including “how many boyfriends she'd had, and her height in relation to Princess Margaret, Queen Elizabeth II's glamorous sister” (Nature 2017).

2. Special Agent Michael Hopkins of the FBI reported that a man arrested for groping a woman on a flight in October 2018, Bruce Alexander, stated that, “the President of the United States says it’s OK to grab women by their private parts” (Schwartz, 2018), and so Alexander had felt within his rights to do so. This kind of sexual assault on planes has been increasing yearly at an “alarming” rate according to the FBI (De Diego et. al. 2018).

3. In 2010 there were four women on board the ISS together for fifteen days due to the space station crew merging with the crew of visiting shuttle STS-131 (NASA, 2016). The shuttle had three women on board out of a crew of seven and the ISS had one woman on board out of a crew of six. Therefore, even though this was cause for celebration, there were still more than twice as many men onboard (nine), and women remained the minority. There has not been as many women included in a shuttle crew since.

4. Hannah Gadsby argues that a man beat her up on the street because he identified her as a “lady faggot,” and although this man prided himself on not hitting women, he felt entitled to hit Gadsby because she was not “gender normal.” Gadsby claims that this was not simply homophobia. She explains, “that was gendered. If I’d been feminine, that would not have happened. I am incorrectly female. I am incorrect, and that is a punishable offense” (Olb and Parry 2018). The masculine feminine is perceived as threatening to heteronormative masculinity and it attracts violent attacks.

5. The ‘overview effect’ is the name given to the psychological shift in perspective experienced by astronauts when viewing the Earth from space (White 1987). This cognitive shift has caused astronauts to become involved in political efforts to protect the planet and its unique environments, after gaining an appreciation for the fragility of life on Earth (Jenner 2019). Many astronauts have been quoted speaking about their experience of the overview effect.

References

- ABC News. 2016. “US election: Donald Trump Pledges Lawsuits against Women Accusing Him of Sexual Assault, Inappropriate Behavior.” October 23. <https://www.abc.net.au/news/2016-10-23/trump-legal-action-against-sexual-assault-allegations/7957642>.
- Ackmann, Martha. 2000. “Losing Their Place in Space and in History.” *Los Angeles Times*. July 2. <https://www.latimes.com/archives/la-xpm-2000-jul-02-cl-46931-story.html>.
- . 2004. *The Mercury 13: The True Story of Thirteen Women and the Dream of Space Flight*. United States: Random House.
- Aderin-Pocock, Maggie. 2018. “Foreword.” *Women Invent the Future: A Science Fiction Anthology*. United Kingdom: Doteveryone.
- Aftab, Kaleem. 2018. “I Used to Hate the Western – but Now Women Are Riding in to Save the Genre.” *The Independent*. April 13. <https://www.independent.co.uk/arts-entertainment/films/features/western-movies-films-white-privilege-power-women-directors-save-genre-lucrecia-martel-a8302676.html>.
- Akulov, Alex. 2015. “How to Live in Space.” Flinders University Annual Investigator Lecture, Adelaide, November 18.
- Aldrin, Buzz. 2015. “Dr. ‘Buzz’ Aldrin Becomes the New Chancellor of the International Space University (ISU).” *buzzaldrin.com*. October 19. <https://buzzaldrin.com/dr-buzz-aldrin-becomes-the-new-chancellor-of-the-international-space-university-isu/>.
- Anderson, Jon. 1994. “New Camp Backs Idea that Science is Fun, Learnable: International Science Camp.” *Chicago Tribune*. June 27. https://greensboro.com/new-camp-backs-idea-that-science-is-fun-learnable-international/article_35de30ae-567c-5b76-8bf6-213c3a760485.html.

- Badinter, Élisabeth. 2012. *The Conflict: Woman and Mother*. Translated by Adriana Hunter. Melbourne: Text Publishing.
- Battison, Roberto. 2017. "ASI and Women." Presentation at the International Aeronautical Congress. International Astronautical Federation (IAF) International Platform for Diversity and Equality in Astronautics (IDEA) & Women in Aerospace Europe (WIA-E) Joint Breakfast. September 28. Adelaide. https://www.youtube.com/watch?v=6y1_-JUTHQc.
- BBC News. 2018a. "BBC 100 Women 2018: Who is on the list?" November 19. <https://www.bbc.com/news/world-46225037>.
- . 2018b. "The women launching Kyrgyzstan's first satellite". November 27, 2018. <https://www.bbc.com/news/av/world-europe-46347757/the-women-launching-kyrgyzstan-s-first-satellite>.
- Berdahl, Jennifer. 2007. "The Sexual Harassment of Uppity Women." *Journal of Applied Psychology* 92, no. 2 (March): 425–437. <https://doi.org/10.1037/0021-9010.92.2.425>.
- Burns, John F. 2018. "An Apron for Soviet Woman in Space." *The New York Times*. August 29. <https://www.nytimes.com/1982/08/29/world/an-apron-for-soviet-woman-in-space.html>.
- Cable, Gordon. 2019. "Hazards of Space Exploration." Lecture, International Space University Southern Hemisphere Space Studies Program. January 23. Adelaide. <https://www.youtube.com/watch?v=5sNZFXCLZfk>.
- Calderone, Julia. 2016. "The First American Woman in Space Said This Was the Dumbest Question the Media Ever Asked Her." *Business Insider*. February 2. <https://www.businessinsider.com/sally-ride-sexist-questions-media-gloria-steinem-challenger-2016-2/?r=AU&IR=T>.
- Cavallaro, Umberto. 2017. *Women Spacefarers: Sixty Different Paths to Space*. Germany: Springer International Publishing.
- Chira, Susan. 2018. "The Manly Jobs Problem." *The New York Times*. February 8. <https://www.nytimes.com/2018/02/08/sunday-review/sexual-harassment-masculine-jobs.html>.
- Cockell, Charles. 2016. *Dissent, Revolution and Liberty Beyond Earth*. Germany: Springer International Publishing.
- Conti, Allie. 2017. "Democrats Can Weaponize the Sexual Assault Allegations Against Trump." *Vice*. December 16. https://www.vice.com/en_us/article/bjdv43/democrats-can-weaponize-the-sexual-assault-allegations-against-trump.
- Cox, Carolyn. 2015. "Women Start All-Female Moon Mission Test, Are Warned by Lead Male Scientist Not to Catfight in the Kitchen." *The Mary Sue*. October 28. <https://www.themarysue.com/moon-mission-misogyny>.
- Criado Perez, Caroline. 2019. *Invisible Women: Exposing Data Bias in a World Designed for Men*. United Kingdom: Random House.
- De Diego, Javier, Omar Jimenez, Rene Marsh and Juana Summers. 2018. "FBI: Sexual Assaults on Flights Increasing 'at an Alarming Rate.'" *CNN Politics*. June 21. <https://edition.cnn.com/2018/06/20/politics/fbi-airplane-sexual-assault/index.html>.
- Denissen, Amy and Abigail Saguy. 2014. "Gendered Homophobia and the Contradictions of Workplace Discrimination for Women in the Building Trades." *Gender & Society* 28, no. 3 (June): 381–403. <https://doi.org/10.1177/0891243213510781>.

- Dorothy Jemison Foundation. 2017. "Dr. Mae Jemison." <http://jemisonfoundation.org/about/mae-jemison>.
- Dougherty, Kerrie. 2019. "Cultural Rationales for Space Activities". Core Lecture No. 31, International Space University Southern Hemisphere Space Studies Program. January 29. Adelaide.
- Drake, Nadia. 2019. "Here's Why Women May Be the Best Suited for Spaceflight." *National Geographic*. July 2019. <https://www.nationalgeographic.com/magazine/2019/07/space-travel-four-ways-women-are-a-better-fit-than-men>.
- Dreyfuss, Emily. 2019. "The Failure of Nasa's Spacewalk Snafu? How Predictable it Was." *Wired*. March 28. <https://www.wired.com/story/nasa-spacewalk-spacesuit-snafu-predictable>.
- Ehrenfreund, Pascale. 2017. "A Gender Diverse Space Workforce: A Key for Unlocking Imagination, Fostering Innovation & Strengthening Security." Presentation at International Aeronautical Congress. International Astronautical Federation (IAF) International Platform for Diversity and Equality in Astronautics (IDEA) & Women in Aerospace Europe (WIA-E) Joint Breakfast. September 28, 2017. Adelaide. https://www.youtube.com/watch?v=6y1_-JUTHQc.
- Foster, Amy E. 2011. *Integrating Women into the Astronaut Corps: Politics and Logistics at NASA, 1972–2004*. Baltimore: John Hopkins University Press.
- Gannon, Megan. 2016. "Why It's Still a Struggle to Put Women in Space in 2016." *Atlas Obscura*. April 18. <https://www.atlasobscura.com/articles/why-its-still-a-struggle-to-put-women-in-space-in-2016>.
- Gibson, Karen B. 2014. *Women in Space: 23 Stories of First Flights, Scientific Missions, and Gravity-Breaking Adventures*. United States: Chicago Review Press.
- Grush, Loren. 2015. "Russian Female Astronauts Asked How They Would Cope in Space without Men and Makeup." *The Verge*. November 1. <https://www.theverge.com/2015/11/1/9648718/russian-space-agency-women-cosmonauts-moon-mission-sexism>.
- . 2019. "Why Today's Spacewalk Is Not the One the World Wanted." *The Verge*. March 29. <https://www.theverge.com/2019/3/29/18283712/nasa-spacewalk-all-women-change-anne-mcclain-christina-koch-nick-hague-space-suits>.
- International Astronautical Federation (IAF). n.d. "IAF '3G' International Platform for Diversity and Equality in Astronautics (Idea) – 3G Geography – Generation – Gender." Accessed December 1, 2020. <https://www.iafastro.org/activities/iaf-3g-international-platform/>.
- Jenner, Joseph. 2019. "Gendering the Anthropocene: Female Astronauts, Failed Motherhood and the Overview Effect." *Science Fiction Film and Television* 12 (1): 103–25. <https://doi.org/10.3828/sfft.2019.06>.
- Kennedy, John F. 1962. "Moon Speech." Rice University. September 12. <https://er.jsc.nasa.gov/seh/ricetalk.htm>.
- Launius, Roger D. 2013. "Escaping Earth: Human Spaceflight as Religion." *Astropolitics* 11: 45–64. <https://doi.org/10.1080/14777622.2013.801720>.
- . 2010. "Evolving Public Perceptions of Human Spaceflight in American Culture." *History of Rocketry and Astronautics: Proceedings of the Thirty-Sixth History Symposium of the International Academy of Astronautics*, Houston, Texas, 10–19 October 2002. AAS History Series, Vol. 33. Univelt.
- . 2005. "Perceptions of Apollo: Myth, Nostalgia, Memory or All of the Above?" *Space Policy* 21, no. 2 (May): 129–39. <https://doi.org/10.1016/j.spacepol.2005.02.001>.
- Lazarus Dean, Margaret. 2015. "A Brief History of Spacefarers." *Paris Review*. May 19. <https://www.theparisreview.org/blog/2015/05/19/a-brief-history-of-spacefarers>.

- Lovell, Bronwyn. 2017. "Space: The Female Frontier." Presentation at South Australian Certificate of Education (SACE) Research Project Student Expo. August 9. Adelaide.
- Magnus, Sandy. 2015. "Perspectives from Space." Presentation at RMIT University. May 21. Melbourne.
- Malpas, Anna. 2014. "Russian Cosmonaut Blasts through Gender Barrier." *Rappler*. September 25. <https://www.rappler.com/world/global-affairs/70209-russian-female-cosmonaut>.
- Mullane, Mike. 2007. *Riding Rockets: The Outrageous Tales of a Space Shuttle Astronaut*. United States: Simon and Schuster.
- NASA. n.d. "Artemis: Humanity's Return to the Moon." Accessed December 1, 2020. <https://www.nasa.gov/specials/artemis/>.
- . n.d. "Workforce Information Cubes for NASA." Workforce Profile Cube. Profile Data as of Pay Period Ending January 19, 2019. Accessed February 7, 2019. https://wicn.nssc.nasa.gov/wicn_cubes.html.
- . 2016. "Four Women Astronauts Pose for Photo Aboard the Space Station." 16 November. <https://www.nasa.gov/image-feature/four-women-astronauts-pose-for-photo-aboard-the-space-station>.
- NASA History. 2008. "Jerrie Cobb and the Mercury Project." March 23. https://www.nasa.gov/multimedia/imagegallery/image_feature_492.html.
- . n.d. "Lovelace's Women in Space Program." Accessed December 1, 2020. <https://history.nasa.gov/flats.html>.
- Nature News. 2017. "Pulsars Still Dazzle after 50 Years: The Universe's Flash Machines Have Proven Their Scientific Value." Editorial. *Nature* 547, no. 7661 (July): 5–6. <https://www.nature.com/news/pulsars-s-till-dazzle-after-50-years-1.22243>.
- Nelson, Camilla and Rachel Robertson. 2018. *Dangerous Ideas about Mothers*. Perth: UWA Publishing.
- New York Times, The*. 2016. "Transcript: Donald Trump's Taped Comments about Women." October 8. <https://www.nytimes.com/2016/10/08/us/donald-trump-tape-transcript.html>.
- Newman, Katherine. 2018. "First Black Female Astronaut, One of Many Who Inspire Chicago Youth." *Citizen Weekly*. March 21. <http://thechicagocitizen.com/news/2018/mar/21/first-black-female-astronaut-one-many-who-inspire->.
- Oberhaus, Daniel. 2015. "Sexism in Space." *Motherboard*. April 2. https://motherboard.vice.com/en_us/article/539498/sexism-in-space.
- Olb, John and Madeleine Parry, directors. 2018. *Hannah Gadsby: Nanette*. Guesswork Television.
- Palmer, Lorrie. 2019. "Untethered Technology in Gravity: Gender and Spaceflight from Science Fact to Fiction." *Science Fiction Film and Television* 12 (1): 29–51. <https://doi.org/10.3828/sfftv.2019.03>.
- Palmer, Lorrie and Lisa Purse. 2019. "When the Astronaut is a Woman: Beyond the Frontier in Film and Television." *Science Fiction Film and Television* 12 (1): 1–7. <https://doi.org/10.3828/sfftv.2019.01>.
- Penley, Constance. 1997. *NASA/TREK: Popular Science and Sex in America*. United Kingdom: Verso.
- Pryor, Melanie. "Wild Landscapes of the Self: Embodiment, Eco-Autobiography, and Contemporary Memoir About Place." Unpublished PhD thesis. Flinders University. 2018.
- Qian, Yue. 2018. "Women Feel Better When They Work with Other Women." *The Conversation*. November 27. <https://theconversation.com/women-feel-better-when-they-work-with-other-women-105104>.

- Ranson, Gillian. 2005. "No Longer 'One of the Boys': Negotiations with Motherhood, as Prospect or Reality, among Women in Engineering." *Canadian Review of Sociology* 42, no. 2 (May): 145–66. <https://doi.org/10.1111/j.1755-618X.2005.tb02459.x>.
- Ride, Sally. 2012. "Sally Ride." Interview by Alison Beard. *Harvard Business Review*. September 2012. <https://hbr.org/2012/09/sally-ride>.
- Roddenberry, Gene, creator. 1966–69. *Star Trek: The Original Series*. Paramount Television.
- Ryan, Michael. 1983. "A Ride in Space." *People* 19, no. 24 (June 20). <https://people.com/archive/cover-story-a-ride-in-space-vol-19-no-24>.
- Sainato, Michael and Chelsea Skojec. 2017. "Mae Jemison, First Black Woman in Space, Celebrates 25th Anniversary of Her Flight." *Observer*. November 9. <https://observer.com/2017/09/interview-with-dr-mae-jemison-first-black-woman-in-space-on-25-year-anniversary>.
- Schoenberger, Chana. 2000. "The Space Mafia." *Forbes*. April 17. <https://www.forbes.com/forbes/2000/0417/6509104a.html#1ac0446f5ced>.
- Schwartz, Drew. 2018. "Man Accused of Groping Woman on Flight Said Trump 'Says It's Ok.'" *Viceland*. October 23. https://www.viceland.com/amp/en_us/article/vbkamj/man-gropes-woman-on-flight-trump-says-its-ok-southwest-vgtrn.
- Sherr, Lynn. 2014. *Sally Ride: America's First Woman in Space*. United States: Simon and Schuster.
- Shildrick, Margrit. 1997. *Leaky bodies and Boundaries: Feminism, Postmodernism and (Bio)ethics*. United Kingdom: Routledge.
- Sington, David and Heather Walsh, directors. 2018. *Mercury 13*. Fine Point Films.
- Smith, Harrison. 2019. "Jerrie Cobb, Decorated Pilot Once in Line to become First Female Astronaut, Dies at 88." *The Washington Post*. April 22. https://www.washingtonpost.com/local/obituaries/jerrie-cobb-decorated-pilot-once-in-line-to-become-first-female-astronaut-dies-at-88/2019/04/22/a0993b0a-6445-11e9-8985-4cf30147bdca_story.html.
- Time's Up. 2018. "Letter of Solidarity." January 1. <https://www.timesupnow.com/home>.
- United Nations Office for Outer Space Affairs (UNOOSA). 1999. "The Space Millennium: Vienna Declaration on Space and Human Development." The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). July 19–30. <http://www.unoosa.org/pdf/reports/unispace/viennadecle.pdf>.
- . n.d. "Space for Women Project." Accessed December 1, 2020. <http://www.unoosa.org/oosa/en/ourwork/topics/spaceforwomen/index.html>.
- UN Women. n.d. "SDG 5: Achieve Gender Equality and Empower All Women and Girls." Accessed February 7, 2019. <http://www.unwomen.org/en/news/in-focus/women-and-the-sdgs/sdg-5-gender-equality>.
- Van Loon, Julianne. 2017. "'Spouses and Children are Not Allowed': Gender Equality, Unconscious Bias and the Legacy of Romanticism in Elite Writers' Residency Programs." Presentation at Climates of Change: Australasian Association of Writing Programs Conference. December 1, 2017. Flinders University. Adelaide.
- Weitekamp, Margaret. 2017. "Sally Ride: Women's Firsts in Space and Politics." Smithsonian Air and Space Museum, Space History Department. February 27. <https://airandspace.si.edu/stories/editorial/sally-ride-womens-firsts>.
- . 2005. *Right Stuff, Wrong Sex: America's First Women in Space Program*. United States: John Hopkins

University Press.

Wertheim, Margaret. 2018. "SpaceXX: Space Exploration in Film is Overwhelmingly Male, Metallic and Hard-edged. Could We Get Further with More Women on Board?" *Aeon*. December 19. <https://aeon.co/essays/what-would-space-exploration-look-like-if-it-starred-more-women>.

White, Frank. 1987. *The Overview Effect: Space Exploration and Human Evolution*. Boston: Houghton Mifflin.

Women in Aerospace (WIA). n.d. "Mission". Accessed December 1, 2020. <https://www.womeninaerospace.org/about/mission.html>.