



Research Note 2

Celebrating Women's Suffrage: Parity and Women's Rights on Space Settlements

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Introduction

2020 marks the 100th anniversary of the 19th Amendment to the United States Constitution which allowed women the right to vote. Which means that in the United States "... 1920 was the year women became full citizens."³ The 19th Amendment guarantees "The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex."⁴ 26 August is Women's Equality Day which celebrates and commemorates women's suffrage in the United States. To mark the occasion, the Centre for a Spacefaring Civilization is looking at what gender parity and women's rights on future space settlements. The history of women's involvement in space exploration provides little encouragement that life in space settlements will develop organically to be a utopia rooted in equal representation as popular culture has conceived. Women were excluded from NASA's space programme until 1983, 'as a fact of...social order.'⁵ The USA's reluctance to include women came despite the obvious success of Lovelace's 'Women in Space' programme which confirmed that women were perfectly capable of coping with the extreme environment of the space environment. Later research has furthered this with the claim that women are even better suited for the rigours of outer space.⁶ The study is retroactively cited as a 'trailblazing'⁷ effort to further women's rights. Yet Lovelace's study to prove women's extra-terrestrial suitability was itself motivated by the belief that they would be needed only to fulfil gender stereotypes as secretaries and nurses.⁸ As humanity edges closer to its first space settlements, it revives the question of what shape the role of women will take in these societies? Furthermore, prospective mission objectives such as inter-generational missions raise concerns that women's rights may be infringed and may even revive debates and misconceptions which are now well recognised as antiquated and discriminatory.

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³ Jennifer M. Piscopo, 'What Does It Take to Get Women Elected' (Boston Review, 3 August 2020) <http://bostonreview.net/forum/jennifer-m-piscopo-what-does-it-take-get-women-elected> > accessed 22 August 2020

⁴ The Constitution of the United States of America, 19th Amendment

⁵ John Glenn as quoted in Harrison Smith, 'Jerrie Cobb: Pilot who took a giant leap for womankind in her bid to be America's first female astronaut', The Independent <https://www.independent.co.uk/news/obituaries/jerrie-cobb-dead-mercury-13-pilot-space-programme-a8911251.html>>

⁶ Nadia Drake, 'Here's why women may be better suited to spaceflight', National Geographic <https://www.nationalgeographic.com/magazine/2019/07/space-travel-four-ways-women-are-a-better-fit-than-men/>

⁷ Margaret A. Weitekamp 'Lovelace's Women in Space Programme', NASA History, <https://history.nasa.gov/flats.html>

⁸ Harrison Smith, 'Jerrie Cobb: Pilot who took a giant leap for womankind in her bid to be America's first female astronaut', The Independent <https://www.independent.co.uk/news/obituaries/jerrie-cobb-dead-mercury-13-pilot-space-programme-a8911251.html>>

It is important that any type of space settlement – private, national, multinational, public-private, etc. -- must consider gender and race in order to bring the diversity of humanity to another world. This paper will only focus on gender, however issues such as race, religion, and disabilities are topics for future studies.

Space Law and Gender

Looking first at international space law to form a baseline of understanding of what is allowed within the Outer Space Regime (OSR), as it stands today, activities in space – including on celestial bodies such as the Moon or Mars – fall under the Outer Space Treaty (OST) and the subsequent space treaties. Article I, paragraph 2 of the Outer Space Treaty states:

Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.⁹

If we take ‘without discrimination of any kind’ and ‘equality’ here to also represent gender, then the OST understands that the exploration and use is non-discriminatory and met with equality. Additionally, “the Outer Space Treaty stipulates that States retain jurisdiction and control over their space objects and that they must authorise and supervise the activities of their nationals in outer space”¹⁰ which refers to Articles VIII and VI respectively. These articles include both State and non-State activity regardless of gender.

A non-binding international space governance instrument, the revised draft of the Space2030 Agenda¹¹, mentions gender in Paragraph 3.7 as such:

Promote [diversity and]/[equal opportunities]/[gender mainstreaming and gender parity]/[the participation of women] in space activities, including by strengthening the possibility for women to participate in science, technology, engineering and mathematics education.¹²

Though the Space2030 Agenda has not been finalized, it is promising that gender will be included in considerations if this revised draft shows the way forward. The caveat here is that it does not mention gender parity for space governance or leadership. However, the inclusion of the word ‘activities’ could potentially include all space activities which could include governance and leadership considerations.

Currently the International Space Station (ISS) is the only location in space with a permanent human presence. It is also the best example of a multilateral endeavour in space. Therefore, if

⁹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (open for signature 27 January 1967, entered into force 10 October 1967) 610 UNTS 205

¹⁰ Thomas Cheney, ‘Space Settlement Governance: An Overview of Legal and Policy Issues’ (Centre for a Spacefaring Civilization, 2019), 15, <<https://www.spacefaringcivilization.space/space-settlement>> accessed 21 August 2020

¹¹ this agenda was in working group phase before the global pandemic hit and is now still in draft phase because the United Nations Committee on the Peaceful Uses of Outer Space and subcommittees have not had a chance to meet since February 2020

¹² United Nations Committee on the Peaceful Uses of Outer Space, Revised Draft Space2030 Agenda and Implementation Plan (13 February 2020) A/AC.105/C.1/2020/CRP.16

we take the ISS Code of Conduct as a potential model for a space settlement there are two paragraphs worth referencing. Regarding the leadership role during on-orbit operations,

the ISS Commander is responsible for and will, to the extent of his or her authority and the ISS on-orbit capabilities, accomplish the mission program implementation and ensure the safety of the ISS crewmembers and the protection of the ISS elements, equipment, or payloads.¹³

This generalist statement of what on-orbit commanding duties entails does not differ based on gender and does look to the safety of all crewmembers – also regardless of gender. Regarding the ISS Crewmembers and their conduct on-orbit,

ISS Crewmembers' conduct shall be such as to maintain a harmonious and cohesive relationship among the ISS crewmembers and an appropriate level of mutual confidence and respect through an interactive, participative, and "relationship-oriented approach which duly takes into account the international and multicultural nature of the crew and mission."¹⁴

While gender is not explicitly mentioned here, it is positive that the conduct aims for harmonious and respectful relationships which takes diversity into account.

Space Governance and Gender

It is still uncertain what governance would look like on a space settlement – whether on the Moon, Mars, or elsewhere – therefore it is important to look at various other isolated settlements (i.e. Antarctic missions, remote military missions, underwater missions, etc.) in order to extrapolate lessons learned and analyse what might be applicable to space. "It is sincerely *hoped* that, as humans gain experience forming societies in space, they will devise democratic solutions to the problems raised here."¹⁵ Taking this idea a step further, it is sincerely hoped that any democratic solution will take lessons learned from Earth and make the framework stronger regarding gender parity and overall diversity and inclusion. Therefore, it is not just gender parity that is needed when humanity sets off into space to create new societies away from Earth. However, as this article focuses on gender parity and will assume, very optimistically, that a liberal democratic society is the governance structure with both State and non-State actors that should be gender, race, sexual orientation, religious affiliation, knowledge diverse, and physically diverse as well as inclusive.

The first settlers may not have the possibility to return to Earth and the risk of death could be high. Additionally,

¹³ 14 CFR, Aeronautics and Space, Sec. 1214.403 Code of Conduct for the International Space Station Crew, <<https://www.law.cornell.edu/cfr/text/14/1214.403>> accessed 21 August 2020

¹⁴ 14 CFR, Aeronautics and Space, Sec. 1214.403 Code of Conduct for the International Space Station Crew, <<https://www.law.cornell.edu/cfr/text/14/1214.403>> accessed 21 August 2020

¹⁵ James S.J. Schwartz, 'Worldship Ethics: Obligations to the Crew' (2018) *Journal of the British Interplanetary Society*, Vol. 71, No. 2, 53-64, 58

... the essence of the problem is that in the instantaneously lethal environment in space, all life-giving resources – food, water, air – must be *manufactured*. Corrupt resource management, civil unrest, vandalism, and terrorism are all sources of disruption to these resources which could lead to the deaths of some or all citizens.¹⁶

While this may not seem like a gender issue, the gender disparity in data combined with the low numbers of women in leadership positions, means that something as critical as an instable governance structure could disproportionately and differently impact women and children. This is why it is pivotal that women have parity in leadership roles in any space settlement governance framework.

Looking closer at what gender parity means specifically, when considering gender parity for space settlements there are many factors that need to be considered: the right to vote and hold office, labour, well-being and medical concerns including reproduction rights, sexual orientation, religious opportunities, social interaction and free time, intellectual growth and education, as well as safety regarding equipment and technology. In space and on other planets not designed for humans there will be no room for gender data gaps or being ill-equipped to support women on all accounts.

The Right to Vote and Hold Office

There are two slogans that can be found when talking about women's parity in politics and government: "Without women there is no democracy" and "More women, more democracy". This is key because:

...political rights are not just about voting, and in many countries the right to vote and stand for election have gone hand in hand. This broader definition of suffrage—the right to elect *and* be elected—guides contemporary understandings of citizenship since, without them, the promise of representative democracy remains unrealized.¹⁷

This is also important for closing the gender data gap that persists today. It is unfortunate that:

The system is skewed towards electing men, which means that the system is skewed towards perpetuating the gender data gap in global leadership, with all the attendant negative repercussions for half the world's population. We have to stop wilfully closing our eyes to the positive discrimination that currently works in favour of men. We have to stop acting as if theoretical, legal equality of opportunity is the same as true equality of opportunity.¹⁸

This seniority or favouritism towards men will not suffice in a space settlement where essentially the purpose of settling on another celestial body is for the progress and

¹⁶ James S.J. Schwartz, 'Worldship Ethics: Obligations to the Crew' (2018) Journal of the British Interplanetary Society, Vol. 71, No. 2, 53-64, 58

¹⁷ Jennifer M. Piscopo, 'What Does It Take to Get Women Elected' (Boston Review, 3 August 2020) <http://bostonreview.net/forum/jennifer-m-piscopo-what-does-it-take-get-women-elected> > accessed 22 August 2020

¹⁸ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 286

modernization of humanity or for humanity to start anew. Sadly, even today, on Earth, as society moves forward humanity still clings to antiquated notions of gender and gender roles.

In spite of all the progress one might point to, gendered role expectations are still deeply internalized. To be a good man is to exercise authority; to be a good woman is to follow authority. When women assert authority over men, they cross the fundamental gender boundary.¹⁹

It is important to stress here that these are ongoing concerns, in an age where significant legislation exists²⁰ to recognise discrimination against women and aims to create a unified platform for its dismantling. Although the space industry is a global and well publicised sector which was created with the explicit purpose of acting as a venue of unity and equal freedom of access for all²¹, the fact that the United Nations has had to call upon nations and reassert its own commitment²² to ending discrimination against women demonstrates that such equal freedom cannot be assumed. Crucial to the ending of this discrimination is the recognition that ensuring women's political participation is critically important 'in all contexts'²³.

There has been much discussion on gender parity and democracy. Looking at democracy as a whole, the presence of women in politics,

... points to the overall health of democracy, an outcome that matters regardless of whether one cares about women getting elected. Ensuring women have an equal amount of power can guard against democratic decay. Conversely, women's presence signals an ongoing commitment to democracy's ideals of inclusion.²⁴

This means that having women in leadership positions does support a stronger, healthier democracy which would be needed on a new space settlement where there are already so many risks, issues, and hazards to consider. Unequal or corrupt governance is not something that needs to be added to the list of potential issues in an environment not designed for human capacity. For a newly formed space settlement, there is nothing truer than the need for stability. The best of the best is needed which is why in the first days of U.S. spaceflight there was a saying that a person needed the 'right stuff' in order to become an astronaut. Astronauts are usually thought of as the 'best of the best', however perhaps they are only in terms of the pool of predominately Western, white males who have thus far comprised the astronaut corps and not the 'best of the best' of humanity overall. This is also probably true in politics and governance issues because:

¹⁹ Tali Medelberg and Christopher F. Karpowitz, 'Are Women the Silent Sex?' (11 April 2016) <<http://bostonreview.net/books-ideas/tali-mendelberg-christopher-f-karpowitz-are-women-silent-sex>> accessed 22 August 2020

²⁰ Convention on the Elimination of All Forms of Discrimination against Women, United Nations, Treaty Series, vol. 1249, No. 20378.

²¹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (open for signature 27 January 1967, entered into force 10 October 1967) 610 UNTS 205

²² UNGA, Women and political participation: resolution adopted by the General Assembly, 19th December 2011, A/RES/66/130

²³ *ibid*, preamble, p.2

²⁴ Jennifer M. Piscopo and Shauna L. Shames, 'Without Women There is No Democracy' The Boston Review (20 May 2020) <<http://bostonreview.net/politics-gender-sexuality/jennifer-m-piscopo-shauna-l-shames-without-women-there-no-democracy>> accessed 20 August 2020

...when you exclude half the population from a role in governing itself, you create a gender data gap at the very top. We have to understand that when it comes to government the ‘best’ doesn’t have to mean ‘those who have the money, the time and the unearned confidence from going to the right school and university’. The best when it comes to the government means the best as a whole, as a working group. And in that context, the best means diversity.²⁵

Therefore, looking at the bigger picture of governance from a gender-inclusive perspective means looking at what is best for the whole of society and not just half the population. As societies are seeing today,

the push for quotas and now parity comes from a belief that the more women in office, the less chance their voices can be marginalized by those who have traditionally made the rules. The more women, the thinking goes, the more power itself is democratized.²⁶

This means allowing governance frameworks to be patterned in such a way as to be inclusive of the views of women and men – equally. Unfortunately, this does not happen in a majority rule scenario.

Group decisions are often made by majority rule, which means not only that the majority preference wins, but that the majority social category in the room is the higher-status category, entitled to set the tone for the meeting and hold sway. Women being in the majority signals that women are entitled to exercise power in the group, and that women are to be equally valued.²⁷

This means more women are needed in the meeting and need to hold the majority in order to sway the vote. As it stands today this is an unfortunate and unlikely situation therefore the governance framework needs to adapt away from the majority rule toward another form of decision-making. A consensus or unanimous decision-making model better supports gender equality in governance. It has been found:

...that where women are scarce, the best format is some kind of consensus process in which every voice is invited to speak. Floor time is guaranteed and equally distributed. Furthermore, the group signals a basic respect for every member. Decision-making takes into consideration the needs of all. Of course, to paraphrase Oscar Wilde, consensus can take up too many evenings. But in small, recurring groups, it is easy to adopt some of its procedures: taking turns, signalling equal respect to all present, inviting universal participation, and displaying support at the moment of speech—without having to actually reach consensus.²⁸

²⁵ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 285

²⁶ Jennifer M. Piscopo and Shauna L. Shames, ‘Without Women There is No Democracy’ *The Boston Review* (20 May 2020) < <http://bostonreview.net/politics-gender-sexuality/jennifer-m-piscopo-shauna-l-shames-without-women-there-no-democracy> > accessed 20 August 2020

²⁷ Tali Medelberg and Christopher F. Karpowitz, ‘Are Women the Silent Sex?’ (11 April 2016) <<http://bostonreview.net/books-ideas/tali-mendelberg-christopher-f-karpowitz-are-women-silent-sex>> accessed 22 August 2020

²⁸ Tali Medelberg and Christopher F. Karpowitz, ‘Are Women the Silent Sex?’ (11 April 2016)

And furthermore, it has been found that with this approach toward unanimous decision-making, that it can “... boost women’s speech participation ...”²⁹ and “... mitigate against their minority position ...”³⁰ With the caveat that consensus or unanimous voting can be a lengthy procedure, in a small space settlement where all voices need to be heard, this could be the best solution to gain equal footing for a new governance framework, in a new society, on a new world.

Considering that decision-making will also be pored with existing international law, international space law, and perhaps even non-binding international law it is important to remember that, like the International Space Station (ISS) Code of Conduct for the ISS and its crew, international laws do still apply. Therefore, since the Outer Space Treaty 1967 operates in tandem with general international law³¹, whatever form political governance assumes in space settlements must also push to operate through the express inclusion of women in policy and decision-making.³²

Insisting on the need for women’s political participation goes beyond creating what the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) termed ‘equality of results’³³, especially in space settlements. Given the distance between Earth and Mars, it would not be implausible to classify space settlements as a rural community under CEDAW³⁴ since while many aspects of space settlements will concern innovation, they will primarily be scenes of development, meaning that the women present will face increased risk of discrimination or disadvantage since access to services or training may initially be rudimentary³⁵. Nevertheless, as CEDAW stipulates, actions should be taken to ensure that efforts are made to rectify any such shortcomings and while it is difficult to wholly predict what aspects of discrimination or disadvantage may arise from the limited viewpoint we currently have of space settlements, it remains that services and training should not be limited due to nature of life style.

Studies have shown that in order to gain gender parity and to incorporate the voice of the whole population the way in which decisions are made must change. Therefore, perhaps this modernized form of a governance framework would suffice on a space settlement in order to truly support all citizens without the stigma of gender differentiation.

Provided that space settlements remain under the remit of state jurisdiction, the obligations created by the OST and therefore international law, it ought to be relatively easy to minimise

<<http://bostonreview.net/books-ideas/tali-mendelberg-christopher-f-karpowitz-are-women-silent-sex>> accessed 22 August 2020

²⁹ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 283-284

³⁰ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 283-284

³¹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (open for signature 27 January 1967, entered into force 10 October 1967) 610 UNTS 205, Article III

³² UNGA, Women and political participation: resolution adopted by the General Assembly, 19th December 2011, A/RES/66/130 s. 6(o)

³³ United Nations Women, Asia and the Pacific, ‘Frequently Asked Questions (FAQ) About CEDAW’ <<https://asiapacific.unwomen.org/en/focus-areas/cedaw-human-rights/faq#:~:text=CEDAW%20takes%20a%20concrete%20and,results%E2%80%9D%20between%20men%20and%20women.>> accessed 22 August 2020

³⁴ CEDAW, Art. 14

³⁵ Ibid, (b), (d)

discrimination through the deployment of temporary special measures.³⁶ Despite the past struggles endured by women's suffrage, and the continuing fight to ensure women's political participation amid patriarchal and general societal bias, the allowance of temporary measures to rapidly increase efforts towards equality provides plenty of room for optimism in space settlements, provided a proactive approach is taken. Since these measures can be employed with the specific aim of accelerating the achievement of equality, their usage would assist to achieve an approximation of the long assumed utopianism, meaning the long campaign of women's suffrage would not have to be replicated in outer space.

The Right to Equal and Non-Gender-Specific Labour

The need to have women as representatives is compounded by the likelihood that the early settlers will comprise of astronauts or people with STEM-related careers (science, technology, engineering, math), given the heavy research orientation surrounding the reality of life in space and the task of establishing and expanding the settlement for a wider populace. Women in STEM are well recognised as struggling both with implicit bias and being expected to adopt traditional gender roles, including being responsible for childcare and domestic chores in addition to their actual workload³⁷. Being tasked with occupying multiple roles creates ample opportunities for increased role-conflict³⁸. This is an issue that both men and women already face in space due to the restricted amount of space in crafts limiting the number of crew in turn. But if the domestic roles are designated by default to women, this creates an imbalance which could further strain women's mental health, when space is already recognised as placing increased strain on psychological well-being. Recognition of the issues that women, especially in STEM careers, face has not led to progress in resolving these inequalities due to a lack of company awareness or concern³⁹. Recent research illustrates that working in male dominated industries may actually exacerbate the issue further by creating the pressure upon women to 'correct' for this violation of gender roles by assuming such domestic responsibility.⁴⁰

Though STEM-related jobs are the first thought of for space travel and settlement, this is not true of functioning societies.

It is essential to learn all that can be learned about human populations and how they adapt to the space environment. Efforts to support interplanetary space settlements will provide invaluable models and examples for learning about human flourishing in space. This is not merely an engineering or technological problem awaiting an inevitable engineering or technological solution. It will require indispensable input from anthropologists, biologists, sociologists, ecologists, economists, political scientists, and ethicists, among many others.⁴¹

³⁶ CEDAW, Art. 4

³⁷ Jean, V. A., Payne, S. C., & Thompson, R. J. (2015). Women in STEM: Family-related challenges and initiatives. In M. Mills (Ed.), *Gender and the work-family experience: An intersection of two domains* (pp. 291-311). New York: Springer, p.6

³⁸ Ibid

³⁹ See further Menez, R., Munder, I., & Töpsch, K. (2011). Personnel recruitment and qualification in the IT sector: First results of the online study BIT-S.

⁴⁰ Aliya Hamid Rao, 'Even breadwinning wives don't get equality at home', *The Atlantic* (12 May 2019) <https://www.theatlantic.com/family/archive/2019/05/breadwinning-wives-gender-inequality/589237/?utm_medium=offsite&utm_source=yahoo&utm_campaign=yahoo-non-hosted&ypr=yahoo> accessed 22 August 2020

⁴¹ James S.J. Schwartz, 'Worldship Ethics: Obligations to the Crew' (2018) *Journal of the British Interplanetary Society*, Vol. 71, No. 2, 53-64, 63

This means prior to space travel as well as once settled, there will be a need for various academic and knowledge-based backgrounds to support the society as a whole, not just because it is in space or on another celestial body. This will be important because it will come to pass that a space society will not be able to rely on a mission control in the way space activities have now and in the past. There will need to be people of leadership, law, business, teaching – essentially humanities, arts, and social sciences will be just as necessary as STEM. This means that women should have opportunity to be placed in jobs that are not gender-specific but are based on their knowledge and academic background.

It has already been noted with analogue missions that women are going to be well-suited to living in space.

In the few studies that have been done to identify factors in long-duration missions' success or failure, scientists observed teams that experienced stressful Earth analogs such as desert survival treks, polar expeditions, and Antarctic winter-overs. They found that men tend to excel in shorter-term, goal-oriented situations, while women are better in longer-term, habitation-type circumstances.⁴²

This exemplifies the idea that women are a necessary and positive component to space settlement and are more than just domestic workers or carers. They will be able to work in an extreme environment for the long duration.

Another point to consider is if everyone within the settlement has been given a primary and secondary job this does not leave much room for knowledge transfer or additional learning. Also, if the one person in the settlement is trained and has the job relating to one specific objective falls ill or even dies who assumes that role if no one else is qualified. There must be overlap of job-based knowledge and this must not be dictated by gender but rather by actual competencies.

Looking at women and their unpaid work, things will need to change on a space settlement where mental and physical resources are most likely drained at a faster rate than on Earth. As it stands today, “globally, 75% of unpaid work is done by women, who spend between three and six hours per day on it compared to men’s average of thirty minutes to two hours”⁴³. Unfortunately, this is not shocking given that women are still seen as in charge of domestic issues and caregiving. However, when women have, say, a STEM-related job, this does not change.

A 2010 US study on the imbalance between the amount of unpaid work done by male and female scientists found that female scientists do 54% of the cooking, cleaning and laundry in their households, adding more than ten hours to their nearly sixty-hour work week, while men’s contribution (28%) adds only

⁴² Nadia Drake, ‘Here’s Why Women May Be the Best Suited for Spaceflight’ National Geographic magazine (July 2019) <<https://www.nationalgeographic.com/magazine/2019/07/space-travel-four-ways-women-are-a-better-fit-than-men/>>accessed 21 August 2020

⁴³ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage)

half that time. The women in their data set also did 54% of parenting labour in their households, while male scientists did 36%.⁴⁴

For women to have genuine parity and be seen as competent and knowledgeable humans, they must not be thrust into only domestic or caregiving roles once in a space settlement. This moving off Earth, should give women the opportunity to start fresh with regards to their work and the role that they play in society. This means equally sharing the domestic and caregiving work between genders so that everyone can support the new society without bias.

Aside from work, it will be necessary that all settlers have hobbies and free time in order to unwind, interact, or for some people recharge their batteries with quiet alone time. This is not a gender-specific requirement. Women will need this just as much as men which means the time taken for unforeseen or unpaid domestic and care work must be equally distributed across gender.

The Right to Well-Being, Medical Needs, and Sexual Orientation

One of the biggest issues in women's rights is the right to choose. A woman's body is hers and hers alone. However, it is still being debated today whether women must reproduce, if they have a right to abort a pregnancy, and what impact these have on her well-being both mentally and physically. This topic will be exacerbated when talking about women traveling through space and living on another planet because the risk and uncertainties will be even greater. Additionally, sexual orientation means that not all women, or persons identifying as women, will want to reproduce.

Reproductive freedom and respect for gender identity and sexual orientation need to remain possible, therefore population size needs to be sufficient to avoid forced or mandatory reproduction being necessary.⁴⁵

Studies are underway to ensure settlers' fertility remains intact against the hazardous space environment,⁴⁶ enabling them to have children and in so doing provide for multi-generational missions.⁴⁷ This clear expectation for children immediately casts the women involved, 'being central to every aspect of pregnancy'⁴⁸ as mothers. Beyond the significant implications this raises for bodily autonomy and fertility rights is the question of what impact this predicted motherhood will have on women's role in society for these settlements more generally?

The understanding of the space environment's impact upon pregnancy and foetuses is rudimentary at best, meaning that pregnant settlers would be something of an experiment and

⁴⁴ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 72

⁴⁵ Thomas Cheney, 'Space Settlement Governance: An Overview of Legal and Policy Issues' (Centre for a Spacefaring Civilization 2019), 21, Retrieved online 21 August via: <https://www.spacefaringcivilization.space/space-settlement>

⁴⁶ Abigail Tabor, 'Micro-11: Do sperm squirm the same in space?', NASA, 2nd April 2018, <https://www.nasa.gov/ames/micro-11>; Joseph S. Tash, 'Spaceflight-Induced Motility Activation and Fertility-Dependent Responses in Sperm', NASA, https://www.nasa.gov/mission_pages/station/research/experiments/explorer/Investigation.html?#id=1922.

⁴⁷ Cameron M. Smith, 'Estimation of a genetically viable population for multigenerational interstellar voyaging: Review and data for project Hyperion', *Acta Astronautica*, Vol. 97, April-May 2014, 16-29, p.16

⁴⁸ Christine Overall, (2012) 'Why have children?: The ethical debate' The MIT Press p.8-9

integral to research. This both reduces women's involvement to their reproductive capabilities and could even remove their capacity to work within the settlement if women are required, if not forced, to take extensive maternity leave to further protect the pregnancy. Even if a different length of maternity leave is recommended to better enable healthy pregnancies, this cannot justify any limitation to women's political participation.⁴⁹

More importantly, if increasing population density is an established mission objective, would abortion as already a divisive issue, be criminalised within these settlements? Even when abortion is medically necessary, having children is often seen as 'morally desirable, psychologically "normal," and generally seen as a laudable life choice.'⁵⁰ Yet in the modern era, when technology exists both to facilitate and prevent reproduction, this issue may require new consideration. While mission objectives would likely be abandoned or certainly modified if they infringed human rights or endangered life, fertility and the decision to procreate are integral aspects of the vision for settlements and humanity's progress.

Along with reproductive issues, is the issue of intimate relationships. Women should not only be seen as reproducers or as wives or mothers. Sexual rights mean "forcing a person to participate in reproductive activities, or forcing a person into an intimate relationship, are absolute wrongs that should not be tolerated ..."⁵¹ Rape or forced intimacy will not be tolerated. There will need to be rules in place within the governance framework that give women and children safety against rape or forced intimacy. Criminal processes will need to be in place and adhered to in a space settlement in order to give every citizen the right to a safe and equal life in an already harsh and risky environment. James Schwartz sums it up by stating:

There will be people that want children; there will be people that do not want to have children; there will be gay people; there will be bisexual people; there will be transgender people; there will be agender people; there will be queer people; there will be people that identify in as yet unconceptualized ways; there will be people that desire as yet unconceptualized varieties of intimate relationships; and there will be people with mental and physical disabilities. No society incapable of including, respecting, and caring for all such individuals is worth promulgating.⁵²

This provides a clear example that, in whatever form of governance is installed on Mars, or any other space settlement location, it will be vital to ensure that women are fully represented therein, since mission objectives may directly impact their lives and vice versa. The benefits of including appropriate representation for specific groups can be seen in the way that NASA began to include the presence of an astronaut on Mission Control to act as an experienced mediator between astronauts on-orbit and Mission Control's ground-based authority. Although this inclusion was initiated to minimise conflict rather than prevent discrimination, its success in furthering communication provides empirical proof that a disparity between the expectations and reality of human space activity exists. By acknowledging this point in relation to mission

⁴⁹ UNGA, Women and political participation: resolution adopted by the General Assembly, 19th December 2011, A/RES/66/130 s.6 (m)

⁵⁰ Theixos, H., and S. B. Jamil. "The Bad Habit of Bearing Children." *IJFAB: International Journal of Feminist Approaches to Bioethics* 7.1 (2014): 35-45. p.36

⁵¹ James S.J. Schwartz, 'Worldship Ethics: Obligations to the Crew' (2018) *Journal of the British Interplanetary Society*, Vol. 71, No. 2, 53-64, 60

⁵² James S.J. Schwartz, 'Worldship Ethics: Obligations to the Crew' (2018) *Journal of the British Interplanetary Society*, Vol. 71, No. 2, 53-64, 60

objectives which may directly impact women, and the need for specifically female representation it should help to further prevent discrimination.

This section does not expand on other issues such as mental well-being or other medical issues affecting women, such as gender data gaps in the pharmaceutical industry, however, this section is meant to offer a first discussion point on two of the most critical and political aspects of women's well-being those of the right to choose and the right to sexual orientation. Leaving the other aspects for future analysis.

The Right to Equipment and Technology Applicable to the Female Physique

In 2019 when NASA wanted to have the first-ever all-female spacewalk it was initially changed to one man and one woman specifically because of the size of the operational spacesuits needed to complete the Extra-Vehicular Activity (EVA). Two women needed size medium EVA suits while one man and one woman need a large and a medium EVA suit respectively. This example leads to the idea that women are not first (if ever) considered where equipment is concerned. Typically speaking this is a man's world where man is the default and woman is the other.⁵³ Unfortunately, "this one-size-fits-men approach to supposedly gender-neutral products is disadvantaging women"⁵⁴ and will not be adequate for space travel and space settlements.

When a woman is pregnant, she will need a spacesuit or other necessary equipment that will work with her growing body and to ensure the safety of her child. Additionally, she will need to consider what types of equipment and elements she is working with in her given job. Pregnancy limiting women's movements, workloads, and tasks could be especially likely given the significant involvement of STEM in space exploration, which itself can be a dangerous field due to working with toxic chemicals or physical exertion.⁵⁵ Unless measures are taken for astronaut suits to be adapted for maternity wear, women would no longer be able to participate in EVA, which could severely restrict their movements and could also pose a huge safety risk if an emergency evacuation of a habitat is necessary. However, the lack of properly fitting Personal Protective Equipment (PPE) for women in fieldwork is already a well-established issue for the detriment it causes women's ability to perform.⁵⁶ Space exploration is not exempt, as illustrated by the delay it caused to the first all-female spacewalk.⁵⁷

Conclusion

What can be seen here is that gender parity is absolutely paramount for space settlements. Though the right to religious affiliation and the right to intellectual growth and education were not touch upon, this does not mean they are less important factors. These factors will need to be discussed and analysed in future work. With humanity leaving the cradle of Earth and venturing forth into space and other celestial bodies it is imperative that women have an equal

⁵³ Read more about data bias in: Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage)

⁵⁴ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage) 157

⁵⁵ Jean, V. A., Payne, S. C., & Thompson, R. J. (2015). Women in STEM: Family-related challenges and initiatives. In M. Mills (Ed.), *Gender and the work-family experience: An intersection of two domains* (pp. 291-311). New York: Springer, p.10

⁵⁶ Chris Bell, 'One Small Step for Man, but Women Still Have to Leap' BBC News, BBC Trending (28 March 2019) <<https://www.bbc.co.uk/news/blogs-trending-47717937>> accessed 22 August 2020

⁵⁷ Chris Bell, 'One Small Step for Man, but Women Still Have to Leap' BBC News, BBC Trending (28 March 2019) <<https://www.bbc.co.uk/news/blogs-trending-47717937>> accessed 22 August 2020

voice and role in this next step for human life. For, “... getting to grips with the reality that gender-neutral does not automatically mean gender-equal would be an important start”⁵⁸ and this will need to be understood before humanity decides to leave Earth and begin society again on other worlds.

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⁵⁸ Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (2020 Vintage)