ROYAL AUSTRALIAN AIR FORCE

Podcast Transcript

***Conversations on The Runway* – Space Series Episode 4 – 'Diversity Doesn't Need Gravity'**

Host: Michael Veitch

Guests: Dr Cassandra Steer, Rev. Dr Nikki Coleman and Annie Handmer

Michael Veitch

Sharon Christa McAuliffe was by any measure an outstanding individual, highly intelligent, a devoted teacher, beloved of her colleagues and pupils alike, an innovator with a lifelong devotion to the principles of modern education, from a field of 11,000 candidates, and after an unbelievably rigorous process, Christa McAuliffe was selected to train as an astronaut, to be part of the space shuttle program slated for a mission named STS-51L. It was a very exciting moment in space history. Women had been in space before, of course. The first, was the Soviet Union's Valentina Tereshkova in 1963, and she remains still today the only woman to have gone up there and returned solo. The records bounce around a bit, but since then something in the order of 65 women have been in space, that's roughly 1/8th of the total of people who can claim that extraordinary achievement.

Christa McAuliffe was to be the first female civilian astronaut, her plans were to conduct classes to the children of the world live from orbit, and there was huge interest in her life, her story, and therefore in the mission of which she was to be a part. There's footage of McAuliffe boarding the shuttle, walking up the ramp at the Kennedy Space Centre along with her crew of seven, including another outstanding individual, flight engineer Judith Resnick. They were all smiling, excited, every one of them at the pinnacle of a life's achievement about to board the space shuttle Challenger on a cold, January morning in 1986. 76 seconds after lift-off, Christa McAuliffe and Judith Resnick would go down in history, tragically, as the first women to die along with their male colleagues on a mission into space.

I wanted to tell that story today to remind ourselves that women had been part of the space exploration story since the very beginning, and faced, as they have always faced, the same dangers and the same challenges as anyone who ventures into what will be an increasingly utilized arena of human endeavour. The world has changed drastically since 1986, but is space keeping up, or is it still primarily a place where if you're white, and your name is something like Chuck or Buzz or Todd, the path into orbit is disproportionately easy? Is there a glass ceiling in space? If so, boy, do you have to go a long way to reach it? The world is changing, is the race for space? On *Conversations on The Runway* this week we're talking diversity in space, because as we all know diversity doesn't need gravity.

We have three magnificent guests today, soon to be doctor, Annie Handmer from the University of Sydney is on the Advisory Council of the Space Industry Association of Australia, helps Questacon in Canberra on their Space Exhibit, has worked for the New South Wales government, and when she's not doing all that and much more she host her own really cool podcast, the Space

Executive Producer: SQNLDR Kath Kennedy, RAAF School of Postgraduate Studies, 20 Nov 20

Junk podcast, one episode of which is titled, wait for it, The Space Law of Building a Death Star - wow. Reverend Doctor Rev. Dr Nikki Coleman is a Senior Chaplain Ethicist at Royal Australian Air Force, and also please welcome back to the Runway, Dr Cassandra Steer, Senior Consultant and Lecturer specializing in Space Law and Space Policy at the Australian National University, I should say, College of Law and Mission Specialist with the ANU Institute for Space. My esteemed guests this afternoon, hello.

Dr Cassandra Steer

Hi.

Annie Handmer

G'day.

Michael Veitch

Well, I'm going to throw this one open, Cassandra, I think I finished with you last time, I'm going to start with you again. As the world changes socially, is space keeping up?

Dr Cassandra Steer

Space is out doing what we're doing socially, so-

Michael Veitch

Really?

Dr Cassandra Steer

I mean, in terms of economics, right? Given what's going on right now in the face of COVID shutdowns and social distancing, space is the sector, one of the few sectors that is expanding rather than shrinking, which is really exciting. Is space keeping up in terms of diversity? I don't think it is, although I would say there's probably more women, and more people of colour, and more ethnic, and even linguistic diversity than we're aware of, but it's not keeping up in the sense that ... we're still seeing the same very white, predominantly male faces in the leadership roles, in the leadership roles in industry, in the leadership roles in defence - when defence does space in the leadership roles, in space agencies around the world. And even in academia there are plenty of women, there's not so many people of colour certainly in the Australian landscape, in my area in space law, so are we behind? I don't know, maybe that's reflective of what's going on in other areas as well.

Michael Veitch

Annie, this would seem counterintuitive to the principle that if we are seeking to build human societies in space, which over the past few weeks we are seeing that we are, we should be embracing all of human society.

Annie Handmer

I suppose so, although I would say, personally, I remain unconvinced that plonking humans on Mars is the best idea. It's possible to do a lot of stuff using robotics. And to some extent, these questions of diversity often come down to representation, and trying to measure representation. Which isn't actually a good measure of a more intersectional measure of diversity, which could cover all sorts of things across race, background, education, generation, what country you come

from, what circumstances you grow up in, your economic background aside from gender itself. I think we have to be wary at pointing at ... I'm wary of people pointing at me as a young white woman, and therefore saying, "We've solved it," because it certainly isn't the case, I think.

Michael Veitch

Nikki, as another young white woman, is there something inherently different about space, than other spheres, where women need to be more greatly included?

Rev. Dr Nikki Coleman

I would say that space is just as difficult for women, in particular because it's a STEM field. It's another area of engineering, of science and technology for example. And so similar barriers for women in those traditionally male dominated areas also apply to space. However, I think in some ways space has an advantage because in some ways, particularly in Australia, we're starting from a new place. There has obviously been an Australian space industry for a very long time since we were launching rockets at Woomera, but there's been a resurgence of interest in space. So, there's actually been an opportunity to do things differently and not work on the old boys' network as much. So, we're really lucky the first head of the Australian Space Agency was a woman. And there are other women who are speaking into the discussion, but I think there's still more to be done for many, many reasons.

Michael Veitch

To those barriers, Cassandra, you've argued that much of current space law contains many powerful remnants of the Cold War Era, could you speak to that, please?

Dr Cassandra Steer

Yeah, absolutely. I mean, it's something that I use a lot in my writing about space, is to really understand about space law and space policy. Is to really understand that it comes from ... the framework we have is inherited from the Cold War Era. So, it's about the competition between the two big powers, which was a competition that was technological, it was ideological, it was military, and it was a competition just because of being a product of its time that was dominated by the West, and by white men, they were the ones who were ... the leaders and the decision-makers. And so, the treaties that we have were negotiated predominantly by men around the table, they weren't, women weren't welcomed at those negotiating tables.

We have political remnants, some people say, "Well, the Outer Space Treaty is more of an Arms Control Treaty, it doesn't really deal with 21st century activities in space." To which I always say, "Well, it still is our framework treaty," and it has to be understood in that way, but it does have to be understood as a product of its time. So, if we're talking about diversity in space, and I've written a piece that is ... it's called the Province of All Humankind. It's a feminist analysis of space law, because one of the key terms in the Outer Space Treaty is that space is the province of all mankind, and so we have to understand what that means.

It's a bit of a vague term legally speaking, the intention of it is to say, and there are other terms in the treaty that explain that there is freedom of access to space, there's freedom of use in space regardless of economic developments, so there was a kind of aspiration towards diversity in that sense. No state can claim sovereignty in space, so is it a Global Commons? So, all those really wonderful aspirational ideas about a shared common pool - but who's really sharing in that? What I argue in my piece is that it's still dominated by the greater powers, which tend to be the Western Powers, or obviously there's a big competition going on, and it is still dominated by men. The fact

that it's called the Province of All Mankind should be problematized, we can't just assume that that includes all states, all cultures, and certainly not all women, and for a long time under the American program you couldn't even become an astronaut unless you were a fighter pilot, and you couldn't be a fighter pilot if you're a woman. So, you were literally barred from the profession for a long time.

Michael Veitch

You do touch on that notion, which of course goes way beyond space, I mean, it goes to the progress of humankind in general, that power of language, and how those touchstones of language are very important because it does create this kind of ... these myriad unconscious assumptions. We talk about manned space missions, we talk about all sorts of things, we can wander off into the weeds with all that, but is it that in a particularly new era such as space, is there a chance to reset that, if you like, for future generations?

Dr Cassandra Steer

Yeah, and I argue it is, and I argue that language matters. Language matters because we construct our reality with language. And language matters to me because I'm a lawyer, we construct whole cases around a turn of phrase or a comma, or exactly interpreting a single word. Language matters. And so when we have ... We can't change the terms of a treaty that we've inherited from the 1960s, nor do I think we should, because you wouldn't want to open up and start renegotiating all sorts of things, but it is important that we don't keep using that language which has an impact. When we hear people talk about manned missions or unmanned flights because it's robotic, that is recreating a history of it only being a sector that's open to men. So, it's really important that we talk about piloted or crewed missions, or unpiloted.

It's really important that we talk about human exploration in space, and human settlements in space, and what that means for humankind, and not mankind because we have to, as our good friend Alice Gorman has said, "Women have to think their way into expressions," which talk about mankind. Men are automatically included in that, and we're not, and it's a false statement to say, "Yeah, but we mean to include you," when the fact of the matter is we're not. In fact, the only unmanned mission in space was when Valentina went up and flew for three days on her own as a woman, as a solo woman pilot in space.

Michael Veitch

Annie, what would you like to add to those observations of Cassandra's?

Annie Handmer

Firstly, I'd like to agree with Cassandra most empathetically on the matter of language being important, because I agree, I think these treaties we have in space law are important from a linguistic perspective, also philosophically, and also socially. There are networks of people who negotiated these things, and continue to negotiate them, and so diversity through generation is very important to be able to pass on those interpretations and understand them beyond just what's written on the page. But, the one thing I would add that I think is a hopeful thing, is that the Outer Space Treaty and the other treaties come in a number of different languages, and each of those languages is as valid as the next. So, if you go and you read the Chinese version, you'll find that it isn't gendered, and if you read the French version, you'll find they don't talk about a manned base, they talk about a base that is habité, that is inhabited.

I think this is a challenge to Western practitioners like ourselves coming from an Australian context, obviously it's right that we should quibble with the English translation of these principles, which is what we read as the treaty. But we also should be open to engaging with other languages, engaging with other ways of thinking. I know that Professor Steven Freeland has done some work also on the interpretation of particular words around liability versus responsibility, and how in the Arabic version of the treaty that isn't a distinction that can be made. So, when we look at the language we have to engage on a cross-cultural way, and that requires having an open mind in terms of diversity of language, and diversity of cultural background as well. And that can be a path forward for other forms of diversity like gender if we want it to be.

Dr Cassandra Steer

Can I add to that really quickly? Because that is actually ... I've used the example in the piece that I wrote, that the French, they don't say the Province of All Mankind, they say that space is, "[French language 00:14:25]," that's the prerogative of all humanity, and the…

Michael Veitch

Oh, you're showing off now. You're showing off now. But fair enough.

Dr Cassandra Steer

It happens to be one of the languages I speak, and then the Spanish say that it's, "[Spanish language 00:14:36]," it shall touch all humanity, so they're really different expressions, which is what I meant by we create reality with our language. If you think space is something that touches all humanity that's a really different aspirational statement to have in an international treaty.

Michael Veitch

The fact that different - I'm glad we mentioned different nations, the fact that different nations are now players in space, and will be increasingly so, one would assume that the kind of diversity of space is increasing rapidly, is this necessarily the case? It can be open to anyone. Nikki.

Rev. Dr Nikki Coleman

Predominantly yes, absolutely. So, we're seeing a huge explosion in space activity and industry around the world. For example, in India, in the UAE, well, already in Europe, which has been around for a while in America, and Australia. Yay, go Australia! But there are still some countries however ... So that means that we've actually quite got a larger, more diverse base to draw upon technically, but also in regards to policy, and I love those examples that Cassandra gave about touching humanity, and different ways of interacting with space within language. But we also need to consider those countries that actually currently don't have space operations.

So, Cassandra and I were at a conference last year over in America, a military space ethics conference, and there was a gentleman there from Africa, and he actually was fascinating. He was talking about how his country has given up, and America is so big, and China is now big, and Russia, and Europe that they feel they will never catch up, and so they're not even talking around how they can actually insert themselves into discussions around them being users of space. It's actually really problematic, because they feel like they've just given up. Now his mission is to try and encourage them to think further ahead and say, "Look, if we're not in the discussion now we're going to be left out." So, whilst there has been a huge increase in the cultural diversity that we actually look at in regards to space we could do better.

Michael Veitch

Is there one country that we should be looking towards, who is leading the way? Is someone out there setting an example? Perhaps it's not one of the more traditional players. I'll throw that open to anyone.

Dr Cassandra Steer

I wish I had a really good answer to that. It's happening incrementally, isn't it? So, we...Megan Clarke, as Nikki said, the first head of our new Space Agency is a woman (about to step down). Canada just recently appointed its first woman head of the Space Agency. I know in the UAE there are actually ... there's a program ... I had a woman reach out to me actually, interested to come and do study here, because her government is funding her, and they have whole programs in place to fund women to build their capacity in space. So maybe it's not the countries that we think of, and it's happening incrementally, but I think a program like that makes an even bigger difference than having a woman as the head of a Space Agency because it's about building from the bottom up.

Rev. Dr Nikki Coleman

New Zealand is interesting because from a cultural-

Michael Veitch

New Zealand is always interesting. Always.

Rev. Dr Nikki Coleman

Let's just name it for what it is. Australia has a Space Agency because New Zealand got a Space Agency, and we didn't want to be left behind, so just name that elephant in the room. So New Zealand is really interesting from an ethics perspective, from a cultural diversity perspective, not necessarily gender diversity, because they're actually doing an enormous amount of work with the local indigenous people. And so, they are actually ensuring that they're actually working not just about paying the right amount of money, but also having important conversations about cultural uses of land, about how they interact with space, that it's culturally appropriate for the Maori people. It's been fascinating to watch that from the sidelines, and they have a whole heap of other... so, this is Rocket Labs, who is based, largely based in New Zealand, and so a lot of their practice is leading the way. I'd love to actually delve into, are they leading the way in other areas in regards to, say gender? But I haven't heard anything specific so I can't really speak to that.

Michael Veitch

I want to talk about, for want of a better word, are there any kind of pin-ups in the female space? Actually, that’s a terrible phrase, heroes, heroes.

Annie Handmer

Start again, start again, Michael.

Michael Veitch

Who's inspired? I mean, who's ... I mentioned the kind of tragedy of the Challenger earlier, but who else has come along that's inspired generations of women to be the first, really, to have an interest in space? Annie, I'm sure you can talk to that.

Annie Handmer

Well, I just want to say we've got to go beyond women as only being relevant as inspirations to other women, I think we really have to look ... and I'm sorry to quibble on this point, but I can't sit and let this one go passed. The purpose of a woman in an organization is not just to be a face of the organization that makes it look more diverse, more inclusive. We have to allow for the fact that there are women who would like to work in the space sector and be invisible. In the same way that a man who works in the space sector isn't held responsible for the fates of all men. There's this idea that as a woman you then have to be a good example to everyone who comes after you, and that's a huge amount of pressure to put on a person.

I think that we need to think beyond fixing women. And I was reminded today that a 100 years ago Virginia Woolf wrote about this, and we still haven't quite ... Yeah, yeah, I mean if you look at a room on one's own, the whole point is you can't just say, "Oh women need to be go-getters," because without structural elements in place, without the cultural elements, without the economic security, in her case, women are not able to produce fiction. Because you need that stability to be able to do the thing. I think what we have to do is look at the space industry and say, "If we're not seeing a huge influx of women, if we're not seeing it mirroring other areas of society in the way that we want it to, what are the structural elements?" The same goes for diversity of all sorts, whether it be sexual orientation for transpeople, for people of colour, for people from indigenous backgrounds, there's all of these different things that need to be taken into account.

Rev. Dr Nikki Coleman

One of the things that I'd like to say is space ethics is a really interesting example of this. When I started in space ethics about seven years ago there were a few really great men working in this area, but they were working in a more theoretical field. I decided then that I wanted to be a small part of something big, rather than a big part of something small, and so I deliberately chose to grow the area. I also decided that I didn't want to be around, this is going to sound awful because I am one, philosophers, who were aggressive in the way that they interacted with each other. I wanted to build a community of people who actually nurtured and supported each other without stabbing each other in the back.

So, what has happened interestingly is that space ethics as a discipline has grown quite a lot in the last seven years and it is actually, at the moment, for the moment anyway, predominantly female. Part of that has been because women have been drawn more to collaborative work, have been drawn more to having the hard discussions but in a really respectful way. Which sometimes is missing in mainstream philosophy. It's been really interesting that we actually do have men who work in this space as well because they are interested in space, but also because they're interested in working in a different way. The great thing about starting space ethics from the ground up effectively as an applied subject, as opposed to a theoretical one, is that we could actually talk very openly about how we wanted to operate as ethicists in the space field, and be not combative, but collaborative.

Dr Cassandra Steer

I think it's really important too ... I also want to answer the question - there are women who are inspiring women, and that's really important. So, Sally Ride was America's first astronaut. A couple of decades after the Russian sent a woman into space the Americans finally went, "Oh, maybe we'll do it too." So, Sally Ride was the first astronaut, and she was an astrophysicist and an engineer, she was all these amazing things, but it was when she became the first female astronaut that people suddenly went, "Oh, that's what you do, that's why you're inspiring." And she actually...

to go to Annie's point about it, it's not just about doing it to inspire other women, although it's important that girls can see women in those roles, to know that they can do it.

But one of her frustrations upon returning, particularly in the months, but also the years that followed her first mission, was that the media always asks her about being the first woman in space, and what it was to be a woman in space. And no one talked to her about her amazing expertise to operate, to pilot complicated machinery, to do space walks - no one talked to her about that. They talked to her about being a woman in the position, and so it's really important to have those inspiring women. It's really important to have modelling of ... and that goes for all diversity, we need to see people of colour in these roles so that children of colour can go, "Oh, I can do that too." We need to have gender diversity, sexual diversity, we need to have that, and that's because diversity matters. It's not because we want to tick the box, like Annie said - it's not about ticking a diversity box, it's about the impact of diversity versus the impact of homogeneity.

Michael Veitch

The media gave lots of attention to what was to be the first all-female spacewalk recently, which didn't go to plan, who'd like to tell us that rather pathetic story?

Dr Cassandra Steer

Well, it goes to what I was just saying about why diversity matters, it's not about ticking boxes. So, NASA made a big deal about the fact that it was going to happen around, not exactly on International Women's Day in March, but around that date to celebrate, to mark International Women's Day - the first all-female spacewalk. These two female astronauts had trained for it on the ground, they were prepared to do it on the day, and then there were enough space suits to fit both of them, they had one medium, and one small, and they needed two smalls. And there was an uproar about this.

So NASA said, "Look, they trained in different sizes, your body changes in space," all of these things which are entirely quite likely, and justifiable, but the point is when you have a majority of male engineers, and space suit designers, and a majority of men in the control room, and a majority of men organizing all of these things then the assumption is that the male thinking, and the male body, and the male experience is the norm. And so, the assumption is you will also fit space suits that are made for the male body.

So, lack of diversity actually leads to problems. This was a problem that cost them money, it cost them time, it cost them reputation. If you have diversity in all of the areas planning these things, designing these things, funnily enough they have already come up with new space suit designs just in the last few months of this year realizing, "Oh, we need to have things that are more adaptable." And so, diversity can actually solve problems, and save money, and save time, it's not just about ticking the box.

Michael Veitch

Does something like the ISS work on some kind of balance, gender balance or not? Is it simply just whoever's up there? Because with the five nations that actually support that institution being up there whizzing over our heads every night, is that part of their agenda? Yes, Nikki?

Rev. Dr Nikki Coleman

I would say, no, it's not. Astronauts are allocated to the ISS based on the amount of money that they pay into the program rather than other factors. So, for example, Canada took a really long time to ... there was a really big gap between the two astronauts that they sent in between because

they don't spend as much money on the ISS as other countries do. And so, it is literally the best person for the job that they send up, they don't take gender into consideration at all.

They do take into consideration how many days of radiological exposure astronauts have been exposed to before they go, and how long they can then stay in space. And that is different for women, and for men. So I would argue that that is obviously an area where gender does need to be considered, but the majority of the time it's just who is the best person to send up, who is from X country, who is an engineer in a specialization for fixing this on the outside of the ISS, because that is going to be the mission for that particular ... next shuttle, oh, not shuttle, not that we use that anymore... for that particular phase.

Dr Cassandra Steer

Why are there different days for women than for men? When they were studying putting women ... when NASA was looking at putting an all-women crew together the argument was actually women would be better suited because we're smaller, and we ... you know.

Rev. Dr Nikki Coleman

No. We are smaller, so we're cheaper to get into space, I'd just like to say, so we're more cost-efficient, but no...so, I've done a little bit of work with the Radiological Protection Association internationally, and it's not just around sex organs, women actually absorb more radiation than men, so we are actually limited in the number of days, men are limited as well, but our number is slightly less.

Michael Veitch

Annie, you've studied extensively in the area of space cooperation, are these the principles needed to bring diversity forward?

Annie Handmer

Well, I think when we think about diversity in international cooperation in space, and also in other areas of extreme locations, what's really key is the individuals involved. And there needs to be a cross-pollination of ideas and individuals. What doesn't seem to work is just plonking a bunch of people together. I think the ISS has been a really shining example of how international cooperation can be achieved, but I want to point out that most of space stuff actually doesn't happen in space. Most of it isn't astronauts. We talk about astronauts all the time, female astronaut did this, someone did that. That is a tiny percentage of the economy, and the people working in the sector. If we bring it back to Earth, when we look at what's happening on Earth we have huge amounts of international cooperation happening at all times on things like astronomy projects. And there are systemic things in place to make that happen. But there are also ways that individuals can meet each other and establish these contacts.

One of the things that I like to do in non-COVID times is go around to conferences, and witness this international collaboration happening. As a sociologist, I love nothing better than to study people getting drunk together, and then planning some ... I'm not joking, and then planning some sort of astronomical program, offering some space on their telescope, offering some data from their satellites, simply because they're sitting across the table together drinking vodka. Now, this is something that goes beyond diversity as a broad blanket system and term, and goes more to that point of international cooperation at an individual level between diverse individuals coming from different backgrounds, bringing something to the table together. So establishing diverse teams,

and allowing opportunities for that mixing of diverse teams working from different areas can allow that to happen in a really constructive way.

Michael Veitch

You mentioned of course that astronauts are the most visible, but perhaps the smallest, it's the kind of the tip of the edge, isn't it, of people actually working in the sector in space agencies around the world. Some of the important decisions that are made, are there many prominent women behind the scenes in agencies around the world, in those very important executive positions that make those decisions?

Dr Cassandra Steer

I think it depends on the organization and the size of the agency, right? So Australian Space Agency being only two years old, and still kind of establishing itself is still very small, but there's actually a fairly large proportion of women in executive level positions with various expertise. I'm a space lawyer, and there is space policy experts, and there's a whole career trajectory in there for people who are interested in governmental relations, international relations, law and regulation. And there's a large number of women who are interested in those particular areas as well. You see that in a Space Agency there's people who are assistant engineers, there are people who are actual space engineers, there are people who understand government processes, they've got a very typical Australian public service career, and now they've landed themselves in the Space Agency, and so they're gaining expertise in space there. You see it in space industry there's people with all sorts of different skillsets and they're decision-makers.

There's a lot of companies in Australia which have women in executive positions as well, so again, that's not necessarily a reflection of policy, and I would be happily surprised to know that there's a Space Agency somewhere around the world where that policy has been implemented. I think it really is more a reflection of the culture across the board, as Annie said, you only see women or people of colour, or really diversity across the board in those senior level positions if that is what's happening culturally across the board.

Michael Veitch

There are myriad organizations that are not space agencies that work in space, many telecommunications agencies were putting satellites up, and expanding being much a part of the story of humanities expansion into space. I imagine many of those contain women in important positions that will affect how we come to interact with space going into the future today.

Rev. Dr Nikki Coleman

I think those groups have less women, to be honest, [inaudible 00:34:03], having been ... They do exist, women are there, but they're not there in large numbers.

Michael Veitch

Just jump in, Annie.

Annie Handmer

Sure, yeah. So, while we're on this kind of ... the issue of organizational structures, and whether women are involved in them. I wanted to raise also, that it's not just within the company, there's also an increasing focus in government and in organizations on consultation. And that means engaging with local communities, particularly indigenous communities around the world on space

projects. The reason is just that space projects tend to be big and expensive, and they tend to occur at places that are of significance to indigenous communities. This has been seen in Hawaii with the big telescope there, you can go look that up. But if you have a place that's high up, and therefore good for a telescope, it's likely that it's going to be of significance to a group who have a prior, kind of, claim to it in that sense. But, one of the issues of consultation is not only you have to bring in a diversity of opinions, you have to leave yourself open to the likelihood or risk that the answer from your consultation will be no.

And for a colonialist or post-colonialist society like Australia, this is a particular challenge as we go forward into new space, because as we set up launch sites and so on, we have to be aware of our history. And we have to be aware of the fact that we may be asked to curtail our ambitions at a government level, or a private sector level by the wishes of people who we consult with. That's something that I think, in terms of diversity it's that next step where you go towards equity or ethics, and Nikki will probably have things to say. But I just wanted to raise it because for the listeners of this particular podcast, it's not particularly likely that astronauts are going to come into the radar, but it is quite likely that some sort of Air Force program may involve a location or site that is of cultural significance to someone. Engaging with that diversity of thought does require a very different approach, and that goes beyond gender to just viewing everybody as humans.

Dr Cassandra Steer

So, Pat Turner gave an amazing presentation just yesterday at the National Press Club, just yesterday being the 30th of September, because I know that this podcast doesn't air on the day that we record it, but talking about the need for indigenous voices really to be heard, and that this is a moment in history where there are greater steps toward it. So there's a new national plan on closing the gap that is all about not just consulting with community groups, but having indigenous voices on the decision-making bodies, and that is absolutely what's got to happen with the expansion of the space sector in Australia, 100% for the reasons that Annie just outlined. An enormous amount of our ground base space infrastructure is already, and is going to be, on indigenous country. And you see like we've got the Centre For Appropriate Technology in Central Australia. We got Koonibba involved with the South Australian launch site.

The launch site that's going to be up in East Arnhem Land is also an indigenous country, the Yolngu country. And there is consultation, and there's always agreements about, "Yes, we're going to create jobs," but exactly, if you're really going to talk about diversity and space it's got to be about including those perspective of governance as well like, "What is it to be thinking about who we are as Australia in space? Who are we in terms of our sense of responsibility to the future users of space? Who are we in terms of how are we going to regulate space activities, both civil and defence? Who are we in terms of interacting with the people, and whose country those activities are taking place? What does that governance look like?"

Michael Veitch

Nikki, you're a member of our Air Force, how does Australia's Air Force ... Do we understand the benefits of a diverse workforce, in your opinion? We're recruiting female space ethicists such as yourself, and the Australian Space Agency also has a majority female executive, what would you give us as a scorecard?

Rev. Dr Nikki Coleman

I actually think the Air Force is doing really well in this area. When girls come to me and say they're interested in having a career in space, I actually recommend that they join the Air Force.

Obviously, I'm biased because I'm in the Air Force, but there are so many different roles from engineers, from satellite operators through to intelligence analysts, through to people like me who are... is a space ethicist, through to ... we have space lawyers, we have space policymakers. Apart from astronauts, which is not going to happen in Australia anytime soon, the Australian Air Force is actually doing really, really well in this area, and is actually working quite hard to develop diversity not just around women, but also diverse views, and backgrounds as well, so I actually think we're doing pretty well.

One of the saddest pictures I have ever seen is a painting in the South Australian Museum which is actually of a rocket launch from Woomera, and it's an indigenous painting, and it's actually of the rocket. It's not accurate because we didn't launch rockets with people in them from Woomera, but the painting itself is of a rocket with white people inside the rocket, and the indigenous people around the bottom as peripheral to the decisions. It's obviously historic now, but it's actually one of the saddest things I've ever seen, and I think we need to do better.

So, one of the great strengths that the RAAF has is that we have a rather large and diverse workforce, and part of that is that we have some people with professional mastery who we have as indigenous liaison officers. I think that's actually one of the great strengths of the Air Force, is that we have those people available, and are able to draw upon them to actually engage with the local indigenous people that might be helping to launch our rockets, but also to ensure that we are taking an indigenous viewpoint, and a diversity of opinion into how we, as an Air Force, are using space as well. I think that's actually a really positive thing that other Air Forces around the world actually don't do. We actually lead the world in that way.

Michael Veitch

Annie, your educational path, one would assume that would be heavily kind of ... with anyone who had an interest with working in anything to do with the space industry, heavy maths, heavy science, but you're interesting, history and philosophy of science, history, sociology, so it's not perhaps just the kind of a standard educational path that one would suspect.

Annie Handmer

Did you have a question?

Michael Veitch

You don't just have to study maths and science, is where I'm leading.

Annie Handmer

I was like, "Yes, that is my background," but I don't what that's ... Yup, okay, cool, cool, cool. For my own part, growing up I was very much sold a vision of space that was telescopes and rockets, and astronauts and planets, and in my case my oldest brother went on to work at JPL, where he now does that vision of space. But for myself I felt quite excluded by that. I worry a bit that our language around choosing STEM for young women in particular, you know you have to choose STEM, you have to build your mathematical ability is somewhat exclusionary because in my case I was really interested in STEM, but I also had a great passion for music, and art, and English, and Latin. So going on to university I chose to study the subjects I wanted to study, and I came to space in a roundabout manner, and was thrilled to discover that there was a whole community of people working in space behind the scenes, if you will, in the areas such as space law, space ethics as we've seen here, so there's two great examples here, but also other areas.

I've met space artists. I've met a space psychologist indeed, whose job it is to select people to go on these missions, and decide who goes, and then manage them through that process. Space

geographers. The whole gamut. You can just pick any field and put space in front of it, and it does exist. And part of what I wanted to do through my podcast series is highlight those people, and show that space isn't just about astronauts. It isn't just about choosing STEM. You can be part of the space world and do very different things within that, and that's acceptable.

Through my role with the Space Generation Advisory Council I sit on the Ethics and Human Rights Project Group. But I was also part of the delegation last year that went to Washington D.C. to develop recommendations to the UN on sustainable uses of space. And through that I've met with people from around the world, young people who are in all of these different areas of space expertise. And what's really thrilling is that for all of us it takes a little while to get each other's language, but once I sit down with an engineer, and I understand a little bit of what they're talking about, they understand where I'm coming from, we can be really constructive.

So I'd actually say young people, particularly through the Space Generation Advisory Council, and there's a new program, the A double ... so it's the Australian Youth Aerospace Association Astra Program, which is coming up soon. We're really harnessing that diversity, and trying to encourage people to have a level of facility across all of these different areas, not just get headed into one lane. But you can be an engineer and still know what you're talking about when it comes to space law, and in fact, you probably have a responsibility to ethically.

Michael Veitch

Did your brother show you around the JPL, the Jet Propulsion Lab at NASA? How that would have been exciting if you were able to get an in there.

Annie Handmer

Yeah. So, when I was doing my onus research on Lake Vostok in Antarctica, and the international cooperation between the Soviets, Americans, and French during the Cold War, I went to JPL to speak to the team. A guy called Dr. Kevin Hand, who is developing a little robot that was going to go into Lake Vostok at one time, so I went there to meet the robot, and meet these people, and meet the team, and I got a tour of JPL, and the Mars Yard, and the rover, and all of that. I also got a tour of SpaceX while I was at it. So, I've been very fortunate in that respect, and it was a very exciting experience.

Dr Cassandra Steer

I think it's really cool, Annie, that you ... I can't believe how much you've done in such a short span on this Earth, but if you're talking about inspiring women, we have one right here, but it really is...you're speaking to the three of us, Michael, about diversity and space, none of us are STEM women, we've all come from a diverse range of backgrounds-

Michael Veitch

And have very rounded educations, all of you.

Dr Cassandra Steer

Yeah, and I think humanities is particularly important in being able to talk across those disciplines. We're going to need more and more people who are trained in the ability to speak multiple languages, both in terms of actual linguistics, but also multiple disciplinary languages, speak across in terms of ethics, speak across in terms of ... Collaboration requires different kinds of training. So, STEM is one very important part, and obviously it's important to keep encouraging

girls to go into STEM, and to encourage indigenous kids to see a career path for themselves as well in STEM. But that's only one career path into space.

I also had a roundabout way. My background is public international law, and the law of armed conflict, and international criminal law. So, my PhD was looking at how we can hold political people responsible for mass atrocity crimes. I never thought about space because mass atrocity crimes, thank goodness, are not taking place in space, but the technology of how welfare is fought is inherently caught up in space. And so I became really interested in space security, and through international security studies then space security became my specialization, and space law. So, I work very closely with different militaries around the world. I work closely with five eyes partners, with military lawyers, with space operators.

I've led a consultancy team last year, which was made up of people who are coders, who are writing software, with people who had classified level knowledge about space capabilities, with people who are linguists, and with people who were deterrents theorists - so much around the policy side. And so, we're really bringing together ... all of us working in space, bringing together really different disciplines and training, so there's kind of ... As Annie said, any interest that you have, sustainability, climate change, absolutely any interests you have you can stick space on it and there's a career path there.

Michael Veitch

Well, that leads to what I was going to ask, what would be the one piece of advice, the salient piece of advice you would give to a girl who approach you saying, "Look, I really want to follow your steps. I really want to work in this field, and I'm willing to do any sort of educational path to get there," what would you tell them?

Michael Veitch

I knew that would happen. Nikki, I'll start with you.

Rev. Dr Nikki Coleman

So currently UNSW Canberra has an interesting Masters of Space Operations, and part of my day to day was actually talking to them. It's been an interesting space day, and likewise I know that Cassandra's university is also providing educational opportunities. There's also the International Space University, which is actually a real university, even though it sounds kind of dodgy it's actually a real university, and it runs a program here in the Southern Hemisphere in our summer. So, there are interesting places to go for that.

Michael Veitch

Annie?

Annie Handmer

My advice to any young person would be, and particularly young women, but also young people who, gender non-binary for example, I don't want to exclude them. My advice would be to ignore what your parents say, ignore what your teachers say.

Michael Veitch

Kids love that sort of advice.

Annie Handmer

You are best placed from your perspective to see where the world is going, and where you feel that you can best contribute to that world. And not only do you have the right, you have, I think an ethical obligation to contribute to this world the best of yourself that you possibly can. And that means ignoring your parents, and teachers when they tell you to take safe paths, so take...

Michael Veitch

Did you?

Annie Handmer

Absolutely, every step of the way, I ignored them all. You have to, because they're based on a generation with a different ... they're running different software, and that's not a criticism. My parents are incredibly supportive, but it's very important that as a young person you trust your own software, you trust what you see in the world. You trust what you see as the opportunity, and you go for that even if it's what everyone says is a ridiculous thing to do.

Michael Veitch

You've just made me feel very, very old. Over to you, Cassandra.

Dr Cassandra Steer

I really want to echo that, so I'm ... I don't consider myself old at all, but I'm certainly not of the millennial generation and so I love teaching 20 something year-olds here at the Australian National University, who I think ... they're digital natives, right? I have nieces who are in their teens, and a nephew who's really quite young, they're absolutely digital natives. They see the world differently, and they connect issues much faster than my generation, and certainly faster than my parent's generation. So, when I try and walk them through, "Well, if you're concerned about climate change, we need satellites to track that, and you can use technology from space to impact that." They go, "Oh, of course, so now we need to work together on people who have these skills or those skills, and now we need to be talking to Government, and we could do a start-up." They just connect ideas so quickly.

So, I really would echo the world, the 21st century, which we're almost ... we're almost a quarter into it now - we're well into the 21st century. And we are now in a world that is going to be permanently impacted by what's been happening with COVID. So, we have different problems, we need different solutions, and we need, which is why we need diversity, and we need people who are following what sparks them, what interests them, and not following any career path that existed pre-2020. It makes no sense anymore, any degree ... In fact, the universities are having to rethink how they're teaching, "What is a degree?"

We can't keep offering degrees that were built for 21st ... for 20th century world in a 21st century job market, where you had one career path. We need to be, and we're talking about having, if we're going to do a space masters, or if we're going to do something that the Air Force is doing, we need to be using the thinking of the people we're trying to teach, to think across those disciplines. So, I would just echo that. You just have to do what inspires you, and create career paths from that.

Rev. Dr Nikki Coleman

So, another education perspective there would be, for example undergraduate degrees such as engineering, logistics, all sorts of different areas, but there is also a really interesting space ...

Operations Masters at the moment happening at UNSW, and I know ANU has the Space Masters as well. The thing to know about a Masters is that, yes, if you've got an undergraduate degree it's easier to get in, but it's not essential because often universities will take people who've had life experience, particularly operational experience in the RAAF. Particularly people working in the RAAF in areas of space operations into the Space Masters.

Michael Veitch

That makes sense, doesn't it? Because like so many areas that are expanding, we need more broader ways of thinking, a broader education. To get back to the first topic we discussed today, was that if we're attempting to, in the future envisage human society in space we need to embrace all of human society. Just quickly before we wrap up, and give Annie's podcast a decent plug, which we will do, optimistic or pessimistic? I'd like to go to you, Cassandra, first, how do you see 10, 15, 20 years' time? Is it going to be a better situation up there or are we treading water?

Dr Cassandra Steer

Optimistic, 100% optimistic, and that's because we're having these kinds of conversations. This is part of the conversation about space, which is excellent and necessary. Optimistic also because like I was saying, I think people who are starting their university careers now, or people who are mid-career and considering pivoting careers, or considering what happens next in a post-COVID world are creative thinkers, and that's going to make a big difference. There's a real sense of humanities entering another stage in the 21st century, we're expanding our activities in space. We are going to be expanding human presence in space, it's an exciting time. So, I'm a 100% optimistic. Although, I don't think we can assume just the fact that there are more career opportunities for girls, or for people of colour, or indigenous people, that diversity will take care of itself. I think we have to keep pushing for that being part of the organizational structures.

Michael Veitch

Nikki, what does your crystal ball tell you?

Rev. Dr Nikki Coleman

I'm so excited that space is cool again, because people are really interested in space again. So it's actually driving a whole leap of innovation and investment, and people exploring different ways of using space. And I am exceedingly positive about the future of space, but also like Cassandra, I think we need to be actually intentional to make sure that we don't repeat the problems of the past.

Michael Veitch

Annie Handmer, you will be joining us very soon for another Conversations on the Runway Podcast about Space Junk. Before we discuss your extremely high qualifications to talk about that, what is your crystal ball saying about when you're, something like my age, which is many, many, many, many years from now, what will the space environment from your sociologist's perspective look like?

Annie Handmer

I think I'm cautiously optimistic. I want to be clear that I think there's a role for everybody who is listening to this podcast, and everyone they talk to, to play in this process that it does require us to learn from people who've gone before us. I'm incredibly fortunate to have mentors who went ...

who came up through old space, many of them men, many of them even white men, and many of them in the category we would consider the old white men - shock horror. And there's very important role to be played here for people to reach out to each other across generations, across backgrounds, and work together, and help each other towards a really good future. So, I am optimistic, but I would really like us to see each other as resources, and to work together consciously. I hope throughout my lifetime, towards a really positive future in space, and on Earth looking at space.

Michael Veitch

Looking at Space Junk, give us a plug for your own podcast series about all the bits and pieces that are flying up around there, Annie.

Annie Handmer

Yeah, sure. My podcast is called the Space Junk Podcast, it's really just a collection of conversations I've had over cups of teas with various people I've encountered over the last few years in the space sector. There's a range of options you can ... even if you're into aeroplanes here ... probably the worst episode ever recorded during an air show on an airfield, in a tent, with aircraft going over, and it's quite appalling to listen to, but it's a very good experience. No, I'd really say feel free to check it out, and also feel free to get in contact if you want to talk about any of this stuff. My name is unique to me, so if you Google me you'll find ways of contacting me, and I'd love to have a chat.

Michael Veitch

Thank you, the soon to be doctor, and absolutely unique Annie Handmer from the University of Sydney, the Reverend Doctor Rev. Dr Nikki Coleman, and Doctor Cassandra Steer - it's been wonderful speaking to the three of you, and getting such inspiring vision about what that extraordinary arena of space going in the generations might look like, and what an interesting time it is to be alive. This is, as you said, Cassandra, it's so good that we can actually have these sorts of conversations, and for them not to be taken as sort of completely way out there, and ridiculous because it's not, because that is what it's all about. Thank you so much for your company on Conversations on the Runway today.

Annie Handmer

Thank you.

Rev. Dr Nikki Coleman

Thank you.

Dr Cassandra Steer

Thank you.