



Speaker	Mr Craig McCormack
Talk title	Can architecture exist in outer space?
Venue	PICA Bar
Time	Tuesday 29 October 2019, 7:00pm

Kate Wright

Good Evening Everyone and welcome to PICA Bar on a beautiful spring evening.

I have just got my little spiel to go through before I introduce the speaker for this session.

Tonight we have Raising the Bar and twenty-two academics are speaking in ten bars across Perth tonight. We did the same thing last but with only ten people, it was so successful that we have doubled the number of talks now.

At UWA we are excited to make education part of our cities popular culture through transforming local city bars into a place you can enjoy a drink while learning the impact that some of our research has on you and your community

To start with, however, I would like to acknowledge the traditional owners of the land, the Whadjuk Noongar people and pay my respects to the elders, past, present, and emerging.

So, if you are sharing Raising the Bar on social media, and we hope that you are, please tag, @UWAresearch or #rtbperth19. So we can share your posts.

Tonight's talks are being recorded and they will be published as podcasts on our social media channel and everyone who is registered will get a link to go to that channel so that you can listen to all of the talks should you wish to.

So, tonight we have Craig McCormack who is going to talk to us about Space Architecture.

Craig is a lecturer and a late-stage PhD candidate in the UWA School of Design's architecture area.

In 2016 Craig was a recipient of the Fulbright Western Australian Postgraduate Scholarship where he went to the US and studied at the Sasakawa International Centre for Space Architecture. His thesis research concerns the possibility of architecture in outer space, although he has said that he is no great rush to leave the Earth anytime soon to and live in outer space.

I will hand over now to Craig.

There will be time for questions later but I am sure if you have a burning question you can put your hand up and Craig will let you ask it.

Thanks very much. Over to you Craig.



Mr Craig McCormack

Thank you very much for that introduction Kate.

[clapping]

That's alright, excellent.

Thanks for coming out on a Tuesday night, you are obviously all alcoholics!

A couple of caveats, I am really jet-lagged, I got back from Houston, I think a day ago, maybe a day and a half ago and it's also my birthday today, I was also born in Ireland so I am in the right place.

I will give you a bit of an introduction, a bit of a background, to me and how I got here before we embark on the wonderful world, the wonderful adventure that is, the idea of architecture in outer-space.

As Kate mentioned, I was fortunate enough to be awarded a Fullbright Scholarship, so that saw me abandon my wife two weeks after I got married and moved to Houston for a year and I met Buzz Aldrin on my third day and met a bunch of interesting people.

I got driven out to NASA every second day and learnt a lot about the difficulty of living in space.

I am going to take you back a bit before that and how I got into it because I didn't wake one morning and apply for the FullBright.

I studied music and I studied art and essentially I have been institutionalised my entire life which is a good or a bad thing, depending on how you look at it.

I ended up in architecture and really enjoyed it.

I ended up in my final semester of architecture as a few of you have been in and I see few faces out there that I have taught and then in the final semester in architecture, I was doing and Honours program which essentially means its self-directed, you can choose a project that you are interested in pursuing.

A lot of people and I am generalising here, definitely focus on producing a folio to get employment and being a mature aged student, having worked for the majority of my life to support my institutionalisation, I wasn't too ... I wasn't massively in a hurry to get a job as an architect.

So, I thought I would have a bit of fun with it and one of the things that I had been told by my Professor and my colleagues was to choose a subject that you really love, because at three o'clock in the morning as we all know, well the architects students know, you need to really have to love something to keep you engaged with it.



I was going for a run one day, I do all my great thinking while I am running and to keep my mind off the running and I was thinking, what have I always liked, what do I really like, what am I passionate about that I should pursue for my final project and I decided upon Space Lego.

I had always liked Space Lego as a child.

I got home, had a shower, of course, jumped on the internet and typed into Google, “Space Architecture” and had never heard of it before, just put the two words together and low and behold, it was thing and so I designed a space station for my final Honours project which essentially involves watching a lot of science fiction movies and reading a lot of science fiction, playing science fiction games and watching documentaries on space station and things like that, which I pretty much do to this very day.

As Kate said, I am in my ... I have been in my last year of my PhD for about four years now.

[laughing]

Everybody’s threatening me. It's definitely my last year, yes, for sure.

That’s my wife, Hi!

So, I miraculously did pretty well with that final project and I got awarded a travel scholarship and I ended up doing what I now retrospectively refer to as my “grand space tour of North America.”

So I went to the States and survived in this thing for almost four months and I moved up and down the East Coast going to all the space stations, watching rockets take off from Cape Canaveral, just to make sure I really liked it and before I embarked on my PhD which I am still stuck on.

Then yes, eventually I applied, three times in a row before I got awarded the FullBright thing. I think they took pity on me and I was awarded the FullBright Scholarship, it was a pity, it was a pity! and I moved to Houston for a year.

I have literally returned from presenting a couple of conference papers with colleagues that now work at NASA, so that year at this place Sasakawa International Centre for Space Architecture, we all ... if you are in the space industry you make an acronym out of everything, right, NASA, SIXA – SIXA is the acronym for this place that I went to and I met an amazing bunch of people and every single one of them are now working for NASA or SpaceX or Blue Origin or Blue Moon if you are following the Space Dot and I am really good friends with them and they have taught some of my students together with me and I write papers with them as well.

I have just come back from presenting our designs for a Drone Service Bay in the upper atmosphere of Venus as an alternative to landing on Mars and a paper on the Destructive Diapology of the GeoDesic Dome which the engineers hated, so I count that as being successful.



And, so here I am tonight talking about space architecture to you.

My PhD, as Kate broadly outlined concerns the idea of architecture in outer space.

I am going to use my birthday and my jetlag as an excuse to refer to the questions that I wrote down a few months when I agreed to do this to make sure I have got some structure to my talk.

I am going to do some explaining and I can't use slides, so pay close attention. Focus.

There is a discipline called Space Architecture and then there is my PhD research which concerns the idea of architecture in outer-space.

So this is the only real education I am going to give you tonight but I can't help teaching because I am a lecturer.

So, space architecture is a discipline just like naval architecture, so think sub-marines, aircraft carriers and things like that but predominantly submarines.

Space architecture is like that, it is very much an engineering discipline. So the idea of engineering this built as an environment of earth.

I am interested in that, for sure. But that not architecture to me. Just in the same way as a submarine is in naval architecture, the idea is, for the most part, I am generalising here, is people aren't to live underwater forever, it's a temporary built environment to the temporary environment, if you will.

Space architectures, up until now has been a very temporary environment as well. So, for those that know about space architecture, you may have heard of the International Space Station. Hands up who has heard of the International Space Station.

The great thing is we are living in Western Australia if you look up in the right place and you get an app for your phone, you can see it whizz past us literally twelve times a day, so you can see it.

That is the pinnacle of space architecture at the moment. It is an engineered environment.

I am going to answer the first question that I have posed to myself.

Can architecture exist in the visual vacuum of space?

The answer to that is yes. It has been existing there since the Apollo Missions, I believe. But, it started out well before that. It has got military origins and essentially it started in the dreams and hopes and aspirations of people who used to look up to the thing called the Moon and the Stars and imagine it being made out of cheese and all sorts of stuff and it think even as recently as 200 years ago, people had telescopes and were looking at these things called the canals on Mars and they were imagining they could see people working on these canals.



And then, around about 1900 there was a bunch of crazy Rocketry Scientists in Russia and America, but mainly Russia, because they were crazier at the time, that made rockets with the idea that they could get into outer space and bring people, ultimately with them and the Russians had a very

interesting take on things, they ... science to them is certainly more of a religion than it is to the West and they thought that by sending people into outer space we could force our own evolution in anticipation of humankind.

They could become Gods I suppose.

And so, we had this thing called World War I and then World War II was an event and rockets really took off, pardon the pun, in World War II, specifically this thing called the V2 Rocket, the first kind of real inter-continental, so a rocket that could go a really long way and there was one particular crazy German, called Wernher von Braun and he was really instrumental in making this kind of rocket go all this way.

When World War II was won by the West, the US basically wanted this German genius and his idea of going into outer space and they employed him and all his fellow Rocketry Scientists to go to the US and they ultimately wanted to build a space station and the rocket was the way they would get there and that rocket turned into the Apollo Mission, essentially and that space station evolved into the International Space Station, eventually.

Now, to me, all this and there are a bunch of projects on the way, you might have heard of Skylab, you might have heard of MIA the Russian equivalent and you might have heard of the International Space Station.

I have seen the hands, you all have.

This to me, its architecture, yes, but it's definitely, it is to me space architecture.

Its architecture, its vernacular architecture, that another big technical word but essentially, it means its architecture without architects.

So in the same way, as I can go to Bunnings and I can buy a shed or anybody that who is not an architect can go to Bunnings and build a shed, it will function but it is not necessarily going to make your life better.

Let me define architecture at least or in a very general way.

There was this crazy Grecko Roman guy called Vitruvius around about forty years before this fictional character called Jesus Christ existed, in my opinion, and he had this tri-factor that he used to define "what was architecture" and essentially it has to have certain strength to it, so it had to hold up to the last the test of time, it had to have a certain utility or function and to do what is supposed to do and it also had to look beautiful.



Now they are quite subjective things, but at least the beautiful part is and so architecture to me and I am generalising here, is a combination of all those three elements.

It needs to stand up, function correctly and also be beautiful.

Or, we could say it needs to make your life a little bit better. So, space architecture is kind of everything, it's your strength, it's your functionality but lacking the beauty.

It's an engineered space.

We have got lots of space to architecture but not much architecture.

So the answer to my first question that I posed myself, **Can architecture exist in the visual vacuum of space?** Yes, it can and it has been doing for some while. The International Space Station has been inhabited now since I think the year 2000 by at least three people, permanently up there and there are Chinese Space stations as well. I am not sure if you are aware, there has been two or three of those, so yes.

My next question:

Should space constructions serve any purpose beyond purely practical concerns?

So, space architecture up until now has been an engineered space. Really it's a case of keeping humans alive. Like a life support system.

Up until now, people have gone to the Moon which is about a three-day trip. Imagine a caravan as an equivalent or they have been staying in the International Space Station which although it's in outer space is not very far away.

It's actually not in outer space at all, it's in a lower orbit. It's only about between 250 and 300 kilometres away depending on where it is in its orbit, so it's quite close and they only stay there for six months at a time, maybe a year.

It hasn't had to be that comfortable.

But you may have a guy called Elon Musk, anyone heard of Elon Musk. A crazy guy as well and he had these plans a few years ago, back in 2016 to send one thousand people in one gigantic rocket to Mars, to live.

He has dialled those plans back because he has realised how crazy he is.

You are sending people, therefore, a really long time. It's not a three day journey, it's not a few hundred kilometres away, at best it will be a year and a half and at worst it might be three years to get there depending on how desperate you are and when you are going to launch.



That's a long time to be sending people to be living in a space that is built for survival and not a space that is conducive for a good life or for living.

My opinion, we need to consider these spaces and make sure they are not just engineered but they are good for living and life.

I think that yes, they should serve a purpose beyond purely practical concerns.

My next question and probably the one that's most pivotal to my Thesis research is:

How can architecture exist when the relationship of the human and its constructed environment is challenged?

One of the things that is interesting to me is the relationship of the body to this built environment. In outer space, we construct our complete environment. Essentially, it's removing a small part of the biosphere, sending it up into outer space at the moment is a giant Coke can and literally plugging us into it so we are systematised and reduced to being just like a water pump in an engine bay.

It's my birthday!

So one of my questions and the final statement if you have this brochure that says, "Come along and see if this man might answers".

My job is to ask questions and not necessarily be able to answer them, that's the crux of research.

The main question is, how do I define if it's actual architecture in outer space.

One of the things I have found and is through my association with Space Architects in NASA and engineers and people who actually design these spaces is that the body when it goes to space is in need of a life support system

It needs ... it's basically a water pump like I have said.

Essentially, there is a certain distance between the built environment that you create, to me, that makes something architecture or something in a machine or makes you a part of the machine.

So, if I go to space at the moment, I literally have to attach myself to the Space Station to go to the bathroom for instance and I think that potentially you need to have a bit of distance between you and the environment to call it architecture.

Kate Wright

Craig is now jetlagged and in his birthday state he is ready for questions and I going to ask one to start off with because I have got the microphone.



We have got this idea of architecture being functional and beautiful but if you have architecture in space ... I mean architecture also surely reflects the environment that a building is built in to a certain extent, I mean, you are not going to build a really, really well insulated house with lots of heating in an area that is very hot, so it's got to be functional in space, first of all, and I provide that living environment, so surely the beauty and ... if I went into space and had to live somewhere I would like it to be very beautiful as well, but that has to be a secondary consideration, surely to the idea of the functionality and the engineering of actually making it somewhere that you can survive in?

Mr Craig McCormack

Yes, so you were saying that it has to ... ultimately the engineering of the survivalist aspect of the architecture has to take ... and I should also mention as well, typically I mentioned the word "space" that everybody assumes that I am knowledgeable about it all.

My research pertains to living, actually in space but not necessarily on planets either, it's a whole other thing as well.

I am interested in a body being in a very disoriented space, that's just interesting to me.

I think that architecture, in response to your question is a lot easier to produce in my mind on or with more material to work with.

So, if you land on the Moon or you land on Mars, you have some material and there you can respond to that environment and you can actually produce something, I think. I think that certainly there has been some pretty incredible designs recently as well, using things like the lunar soil and the Martian soil as well and they have responded in a way that produces architecture.

But my specific research is dealing with living in outer space so in a microgravity environment.

But certainly, I would say out of that tri-factor that I mentioned, that functionality, that strength and materials and that beauty, that subjective beauty, the functionality and the strength and materials are always of primary concern.

I think that ultimately, architecture as we know it down here, we can't have it up there in space until our technology is sufficiently advanced so that we can kind of, guarantee our survival.

I think there has to be a bit of space between up there and the space we have down here.

If you ... you are so close to the environment that you are a part of it, you don't have that separation and you ultimately can't have that architecture? That's my opinion.

Kate Wright

Now, do we have some questions for Craig?



I will just go over here first and then you are second.

Mr Craig McCormack

Let's see if I can do better with the response to the questions.

Audience

How much does science fiction drive architectural design?

Mr Craig McCormack

That's a great question.

Massively!!

Out of everybody that I have met that work at places like NASA and SpaceX and teach in the industry and all the engineers, science fiction, they all either read or they write it.

Now, you will find that most engineers that work as NASA, they all sell their own written stuff on Amazon and ... so they are massively into it and it certainly influences them.

I remember when I was at SIXA at the University of Houston and we would sit around with engineers that came into teach and we would pick apart science fiction movies. Science fiction films.

A lot of the technical advisory, they are ex-engineers that work in the space industry, I mean famously, 2001 Space Odyssey was probably one of the most incredibly realistic science fiction films because they actually had engineers that seconded from the Martial Space Centre at the time to actually help Stanley Kubrick on the set design and probably the last time that they had a certain degree of realism as well. I don't know if you have the 2001 Space Odyssey.

It's a movie the still make the astronauts watch before they go up there because it's pretty realistic and gives them some indication ... or at least it was ... and it gives them some indication of what life might be like.

But they engage with Boeing and Lockheed and IBM, famously as well and as they will say, contractors, to use the film as a vehicle to show off their latest designs, quite realistic designs as well.

That's not done for a variety of reasons, and one of the reasons was that IBM was presented in a really negative way. The computer that turned bad, HAL, once they had found out that their computer was going to be a bad character in the film they actually asked or requested that Kubrick remove all the IBM logos off anything IBM in the film.



If you are a huge film buff, it's worth watching because there is a few they missed but also they don't really tend to engage in that way because they give away their trade secrets.

I was fortunate recently, I came back from the States with a couple of papers and I actually met one of the Vice Presidents of Lockheed and he said there is no way they would engage in that way anymore, because would people know what they are up to.

But science fiction plays a massive role in it. It's a ... I mean ... there has been plenty of recent films as well that have engaged with NASA space engineers and space architecture and its already come a long way.

It's a really good way. NASA have openly stated this, but it's a really good way to engage with the public as well, because there is a fair degree of the public tax dollar, at least in the US going to supporting this program, so they need to make sure that the public agrees with what they are doing as well.

The Martian, that had people from NASA working on it and recently Ad Astra as well, had space engineers and space architects working on some of the interior design as well, especially in The Martian, planet as well.

So when NASA spends all their money, they are kind of behind it.

The only thing with science fiction ... sorry to interrupt myself ... there are a lot of problems that they gloss over and they seem to have solved like things like, being attached to the ground and not floating around, things like that but other than that, it definitely influences it.

Kate Wright

The Dark Star is one of my favourites.

Mr Craig McCormack

The Dark Star is fantastic.

One of the things that I have become an expert on, is science fiction.

I don't know if have seen The Dark Star but The Dark Star actually is precedent for Alien and I think they started filming early and Dark Star sued them until they got some money for stealing the story.

Yes.

Audience



Often on Earth with architecture, we are concerned with making a building look beautiful from the outside and having someplace to live inside and also have good views outside and still enjoy the view.

But architecture outer space would be quite different because there is not really ... you can't really float around outside very often, so you mostly out at the view which is probably Earth, or something nice outside, do you reckon that would be like a bit of an imbalance, so you would have a very utilitarian outside but you would really be thinking about what the view is and how to look and to get the best view?

Mr Craig McCormack

Great question and it is the literal topic of I was searching for and I had a mental blank earlier.

The interior, yes or the corridors as I refer to it.

I am not sure how familiar you are with outer space but it a pretty bloody dangerous place to be, right?

One of the reasons why it is so difficult to produce any architecture, ultimately you can't just go outside and build stuff and make stuff and it think that a lot of people assume that once they create a space station or they put a gigantic base on the Moon or Mars that, they will be going out every day. It just won't happen, not in a million years, we just don't have the technology at the moment.

Architecture in outer space and Space Architecture and the engineering discipline is one interiority and it really is one of the corridors.

So, if you imagine the International Space Station at the moment, the International Space Station has been made up of the innards of a Rocket which essentially is a gigantic Coke can, about 100mm thick some aluminium honeycomb there to avoid micro-meteorite impact but all it is.

And once they put a bit of storage in there, you end up with this rectilinear corridor or this collection of corridors and that's pretty much all it is.

I don't know if you are familiar with the Skylab Space Station that was built back in the 70s but Skylab was the precursor to what we know now as the International Space Station.

Essentially it was one of these single modules and there was this crazy designer called Raymond Loewy, who designed the Lucky Strike logo for the cigarette brand back in the day and he got involved and championed the inclusion of a window.

The engineers were saying, "You know what, no, you don't need a window, we will put cameras outside, we will many cameras as you want and as many TV screens as you want but you are not getting a window, it's too dangerous."



Raymond Loewy fought and fought and fought and actually he made it a public issue and once it was a public issue and the public were like, hang on a minute, you are going to send people to outer space and you are not putting a window in, so we can look down, that's ridiculous.

So they put a window in, they caved to pressure and they put a window in.

And so we have now what's known as the Kerppola which is a really gigantic window in the International Space Station and it actually connects the astronauts back to Earth and they orient the space station so that window faces downwards and the astronauts, whenever they have free time, they lie there with their Canon Camera and they take photographs of the Earth and it connects and orients them back.

But the idea of the outside of the space station being used is certainly one that has been taught by engineers because there are a lot more windows now.

Certainly, in space stations, they are all safer than they used to be back in the 70s and there has been talk of putting stuff outside the space station so that they can look at things like artwork or sculptures and things like that or when they go outside they can see their colleagues.

But it is one of interiority. It is one essentially of a bunch of interconnected corridors and it's not going to change anytime soon.

Kate Wright

More questions please for Craig.

Audience

Cheers. A really interesting talk mate.

At the start, you mentioned something along the lines of the Drone Docking Stations and [inaudible 1:59:27] Venus.

I am not sure if you can tell us a bit about, I guess a practical application of space architecture?

Mr Craig McCormack

Yes, I certainly can. I can talk about that particular project that I was involved with.

I have a really good friend and colleague who taught a few here tonight, called Taylor, Taylor Phillips-Hungerford and he is a NASA space architect and we wrote a bunch of papers together about some pretty serious stuff that people don't really think about as options to things like settling Mars.

So, you have all heard of this red planet called Mars, it's been in popular culture and the popular imagination for a long time. It's a real planet, but it's a dead planet. It's been dead for a very long time.

We will get to the Venus part in a second.



There may have been life on Mars, there's none. They will not find any now at all. I have spoken to a lot of people and some pretty serious people with some pretty serious credentials and they will not find life there at all, it's a dead planet.

Have you all seen the movie, Total Recall, I am assuming you are all science fiction buffs but essentially the premise to Total Recall is that there is a lot of ice trapped underneath the surface and they can melt all that ice and create an atmosphere.

And yes, you could melt all that ice and you could create an atmosphere for a small or a short amount of time.

If you ... the problem is though with Mars it's got a dead planetary core.

So the great thing about the Earth and the reason we are all alive right now and have a thing called the atmosphere, is we have a spinning molten core.

Imagine a volcano it's very hot with molten liquid, that spinning creates a certain amount of gravity, extra gravity, beyond the mass of the planet and that keeps things like our atmosphere.

Mars dies a long time ago, it potentially could have been very like the Earth, in fact, there are a lot of people who think there was a lot of life there, potentially far more successful and lasted for a lot longer than we are going to last, they are quite realistic.

But, if you were to melt all the ice that's in Mars, it would be just the same as pumping up a bicycle tyre with a gigantic hole in it, you would melt all that ice and would just disappear in the ether and you would be left with a dead planet.

If you wanted to revive Mars you would literally have to crash another planet into it and then wait about 5 billion years and hopefully the same sort of thing as happened here and life could be created.

So, long story short, my friends and I would be looking at alternatives. The thing Mars is, it's been in the popular imagination in the mythic, romantic part of our brains for a long time.

Like I said earlier, people used to look, Mars, see the canals and imagine they could see people working alongside it.

Mars is too easy to see, it's the Red Planet it has some Grecko Roman mythological relation as well, so for some reason, we are fixated on Mars, there is no real point to going there, you may as well go to the Moon.

You are not going to sustain life there, you might certainly be able to set up to a human genetic SEA bank so in case the Earth gets destroyed you will have a couple of people in the Stasis Chamber, but you are never going to have the same sort of life we have down here.

So, Venus, though. Venus is an interesting planet, it's very large, it's a bit closer so it's cheaper to get to, the only problem with it is if you go to the surface, you will die instantaneously because it is



extremely hot, the pressure is fantastic so you would be crushed to death, but and this is a big but, if, if you could airbrake after you enter the atmosphere and not get to the ground and stay a kilometre about Venus's surface you could actually step outside.

Admittedly the winds would be very fast but essentially you could potentially something like a cloud city from the Empire Strikes Back and you would actually be able to if you could whirl around and imagine a gigantic inflated zeppelin, I suppose, and you could actually have a better quality of life, you could go outside.

You could talk to your friends, you just couldn't go to the surface, ever in a million years.

But it would be cheaper to get to because you wouldn't have to land and take off.

So, Venus is potentially from an engineers perspective, more viable than going to Mars.

Audience

Wouldn't you say Venus is cheaper and going to Mars is impractical, would then building a base on the Moon be still cheaper and more practical because it has one-sixth of the Earth's atmosphere and takes less fuel to get off the actual surface and so, if we were to do outer solar system, not adventures but exploration to launch from the Moon would be cheaper and more viable than launching from Earth or Mars.

Mr Craig McCormack

Absolutely. Yes.

So essentially we haven't been off the Earth to another body, lunar, planets or otherwise since 1978, it's a long time.

All the missions sent to Mars have resulted in a 50% failure rate which is pretty significant. You going, will I make it, will I not make it, it's maybe not worth going.

Mars and Venus, they are equally impractical.

The Moon is the next step and I don't know if you have been keeping up with space news and things like that, but everybody has headed there.

The Chinese are well ahead of the West at the moment and it would be a pretty smart move to go back to the moon.

They have lost a lot of information. At the moment, if you wanted to actually launch a rocket and go to the Moon and land people there, nobody could do it, they have lost all that information.

They haven't stored it, all the people who used to fly the stuff have died or they too old and they literally used to land it manually.

We just wouldn't take that sort of risk nowadays.



We are quite risk-averse.

So, yes everybody I going back to the Moon.

What they are doing and I was really lucky to be snuck, illegally into NASA and I know this is being recorded and I probably shouldn't say this but I have seen quite a few examples of what is coming up.

And essentially they are going to make a new International Space Station, it's going to be called Gateway and this relatively public knowledge and they are going to put that into orbit around the Moon and they are going to use that essentially as the gateway either onto the Moon or further afield.

As you have rightly mentioned, one of the biggest issues we have is getting off this planet. It has this amazing thing called gravity which have evolved under and it has allowed us to proliferate and become the amazing individuals we are as a species but it also literally, quite literally, physically holds us back and we spend 95% to 98% of the energy to leave here.

So the gateway means that essentially we are going to send or we are going to make a platform in space so that it will be cheaper, easier, more effective, safer as well to leave from.

Kate Wright

More questions for Craig.

Come on there are things you want to know about space.

Mr Craig McCormack

This could be tough.

Audience

I am just curious if you can talk a bit about your project with the students and how that fits in your research?

Mr Craig McCormack

Which project?

Audience

Well the next project for example

[laughing]

Mr Craig McCormack



One of the things that I am a huge fan of is making sure that we do try to engage architects in this kind of problem and even though you might study architecture and go and study and there is a mate in school in the US and get employed by NASA or SpaceX, it doesn't necessarily mean you can actually produce any kind of real architectural designs and so one of the things I am a huge fan of is making sure I kind of sneak all this architecture in if I can and at least try to get people attention with it [inaudible 2:07:18] NASA.

And so, I have got a few students who I taught last year for their final Masters studio and I actually engaged three space architects with the studio to make sure that we could produce a pretty realistic project of high enough fidelity that it would be taken seriously and actually get architects to be involved in the design process.

Kate Wright

Do we have any more questions for Craig?

Mr Craig McCormack

Please.

This gentleman down here.

Audience

Thanks, Craig, it's a really interesting topic, best of luck with the rest of the writing.

I am really interested in what kind of people is architecture in space seeing to serve?

Are we talking about military-grade astronauts or are we talking about everyday people?

Mr Craig McCormack

Really good question.

And that is probably one of the reasons, well one of the other reasons that architecture is being taken seriously now in the industry.

Back in the day, we will say the Apollo era when they were basically looking at and winning the cold war, the technological war between the former USS Orion and the West, we will say the West, the really just wanted to win the war and so they wanted military fighter pilots to fly these things, well pilot these things, they didn't know what it was going to be like and they weren't going to be sending civilians, they needed people who had experienced, I suppose flying these fighter jets and things like that. I wasn't there, but I certainly know that people like Neil Armstrong, it was down to the skill as a terrestrial, we will say fighter pilot and that allowed them to land safely.

They are not looking for that whatsoever.



Now, we have, the human race, society, as we know it, are seeking much more scientific, humanitarian information.

Most of the satellite information that we are getting processed and getting sent back now in regards to mapping weather, changes in climate, things like that.

Telecommunications is a very small part, but it's all peaceful good stuff.

We don't need military personnel up there anymore.

Certainly I think that maybe when, God, it's going to be at least twenty years, or I will eat my hat, we go to Mars or somewhere like that, we will probably be sending people with some military experience or some flying experience to deal with situations that we will say civilians or scientists and things they don't want to deal with but at the moment, currently astronauts are far less militaristic and with a far more scientific and humanitarian outlook and that's the spaces are also, the architecture is really important as well because I have never been to the army but I imagine if I was a military individual I could put up with a lot more hardship or I would expect it as well.

I am sure your average scientist might not appreciate being in space and put up with it, they are looking for a much conducive space to exist in and the length of time that humans in outer space as well.

From my perspective as an architect I want to be designing spaces, I want to make sure they are living in spaces that are kind of good to live in, not tough, they can actually enjoy life and have a life up there.

In terms of the actual personnel and people, they are far more diverse, far less military oriented and the idea behind Elon Musk's amazing mission that he outlined back in 2016 is to send civilians to, I mean in his words, unfortunately he did use the word "colonise" I would choose something a little less historic and cultural baggage and negativity, I would say maybe to settle on Mars.

He was talking civilians, people like ourselves although you would want to be crazy to go there at the moment.

Kate Wright

The last man on the Moon was actually a geologist so not a military person at all, but a scientist.

Okay, so I think we are all thinking we will take pity Craig and let him get on with his birthday celebrations and his very jetlagged state and nobody will be expecting him to do anything very clever, least of all tomorrow.

Mr Craig McCormack

No.

Kate Wright



Thank you, Craig, that was really fun and great, very good talk.

[clapping]

Thank you all for coming, it's been great, I hope you have all enjoyed what you have heard tonight and as I said you will get a message that will give you access to the podcasts of all the talks and we hope that you enjoy it and come back again next year when we do the same thing.

Thanks a lot and enjoy your evening.

[clapping]