BBC-Future AMA: I'm Rachel Armstrong, Professor of Experimental Architecture at Newcastle University, UK. I examine the cultural conditions needed to construct a living habitat within a spaceship. AMA!

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Do you have any favorite sci-fi movies/series that you think show a (somewhat) realistic approach to starship habitats? What are your thoughts on SpaceX's plan to colonize Mars?

Flixi555

Hello! I'd like to respond to this part of your question … "What are your thoughts on SpaceX's plan to colonize Mars?" … [the starship habitats part is much more complex - but briefly on that, I think we need to invest a lot more into the issues of "ecopoiesis" in other words, we need to be able to build "environment" from scratch, not just habitable structure … but quickly on to Space X. So … with all due respect to Musk's vision of us becoming an interplanetary species, which is exactly the kind of challenge we need to meet … I don't actually see any "plans" for colonisation. What I see from Musk's provocation is that he can get us to the surface of the red planet for much cheaper than anyone else, and much more quickly. Once we're there though, there "are" no colonisation plans other than perhaps - crowd sourcing. Which given the hostile conditions on the planet isn't all that helpful and it would be really nice to know what - if any - infrastructure we can expect given that the air is unbreathable and its indescribably cold - for starters. So Musk is taking a typically "industrial" view of colonisation leaving it to the free market to decide - which is fine as long you have some basic resource conditions to begin trading on. That's not the case with Mars … But let me suggest this instead … so that we can actually flesh out the Space X details I'd like to challenge Musk to establishing the first city in Antarctica. That way, access to settlement is much more readily available … and we can figure out details. Again - like the starship the challenge is "ecopoiesis" how do we make sure there is air, water and fertile earth which can help build capacity for thriving … "business" is much further afield. Although we have many outposts in Antarctica none of them are actually cities … If we can organise those resources somehow, we start moving from some very big unknowns, and start responding to these challenges with things we can work with, improve upon and even reinvent.

Hi Rachel, thanks for taking the time for this AMA. My question goes to the historical side of the matter, namely: Is there something of value to rescue from the thousands of experiences of long trips on different kind of ships?

I'm talking about the voyages of the ancient Chinese around the world, the trips to the New World in Colombus' times, long submarine missions, old and current commercial cruises. No doubt their ecosystems were of great importance, specially social and cultural, even if we don't usually perceive them as "living ecosystems".

Is there something fundamentally different in interplanetary travel that requires a complete redefinition of the concept of voyage ecosystems? If so, how can we aspire to come up with something given the almost non existent manned interplanetary travel experience in the military/scientific sense, let alone the civil one? Seems to me a like a forced trial and error kind of experience, with almost guaranteed huge sacrifices, as everything in exploration. So, can this be "axiomatise" a way to minimise the risks of disaster?

Aedan91

Hello! This is a really great question although I'm going to be briefer than I'd like to be. What's really interesting about your analogy is that the "ship" is already imagined in an "open" resource context, and situated within a long culture of sea-faring, where let's politely call it resource-acquisition is part of the profession. My very quick point here is when it comes to "space" ships, they are imagined as CLOSED systems, which is very different to terrestrial vessels … particularly from an ecological perspective … but it's an absolutely fascinating question and doubtless there is much to be learned about sea-faring from the hunting of whales, to invasion of other lands and how the sailors deal with catastrophe etc. So … one thing I would observe then is how might our space ships become "semi-permeable" within the context of the voids and harsh environments of space. You see, if we only have air-tight vessels there is only so much time we can spend on them before they effectively become coffins … so, either we need to figure out how to build immortal closed ecosystems - which is going to be much trickier than we assume … or is there some way that we might (for example) use fusion systems to make elements, the way that stars for example, produce matter. Yes, I don't know how to build this experiment or trial it … but I think it's important to learn from the kind of observation that you're making so that we challenge our assumptions about the way we 'assume' things are and/or have to be. Great question.

Hi, as an architect who is interested in space and extraterrestrial habitat design, how can i get involved in this industry?

shartoberfest

I believe that we should treat every city as "if" it were a spaceship - an effectively closed ecosystem that must value and consider not only its people but the flows of matter through its site and what kind of experience this offers inhabitants. In other words, we could think of building spaceships on Earth and I would like to see every city build its own Biosphere so that we can have many on-world laboratories, where we can trial together the issues of generating modes of living and constructing that enliven our habitats, not deplete them. We're not "there" as an industry yet but there are some interesting companies around like Liquifer Systems Group http://www.liquifer.com and also the University of California plus the International Space University http://www.isunet.edu/prof-christopher-welch Icarus Interstellar http://www.icarusinterstellar.org and the Initiative for Interstellar Studies http://www.i4is.org all of these organisations are engaged in running projects, or educational programs related to some of the issues of constructing structures and colonies in space .. of course, you're very welcome to apply for an MSc at the University of Newcastle in Experimental Architecture too … but the practice is not yet formal although it's becoming increasingly important as the Apollo Orphans open up the non-terrestrial environment to civilians and private industry.

I'd like to know what cultural mechanisms could be placed to keep the ship society at a technologicaly advanced level (enough to maintain the ship) on a thousand year journey?

I am concerned that, on a voyage that long amd without new input there could be cultural stagnation which could lead to tech stagnation as well.

what an interesting topic btw! :)

mariocarreon

… love love love this question which is particularly relevant with the events of 2016. It's raising the question of starship philosophy as well as profound questions about how we live together and generate cultural diversity while maintaining a coherent idea of who we are as a people. This is a long standing question for humankind and I don't think there is any quick and easy solution for it. We have to work at every aspect of "being-in-the-world" a term that Martin Heidegger used, which is adopted more frequently in issues of cultural studies and debate. But just so I give you a shortish answer - or at least something to reflect upon - I'm going to draw on themes of idealised modes of living. Since the Enlightenment, which saw the rise of modern science we have followed the idea of Utopia (Thomas Moore) as an idealised way of thinking about culture and values and even technology - the historic treatise is of course Francis Bacon's New Atlantis c. 1624 … so, what characterises a Utopia is its conformity. Everyone aspires to the same principles of living … I think in an ecological age, this model (on which many science fiction narratives is based) is outmoded …. now that we have a globalised world, it's much harder and even unjust to expect everyone to be alike … so the model of existence for that idea - is Babel. Of course, the story goes that God punished the people of Babel for their knowledge and created many different languages so that they could no longer talk with each other. So, the culture fell apart. I think that our challenge - and at the heart of your question - is how do we make Babel work. How do we develop lots of different kinds of knowledge, discoveries, be many people and still keep a vibrant city together. In the Bible, it is proposed this cannot be done … but I think this is exactly what we MUST do … and I think this is a fantastic provocation that arises from your question.

Hi Rachel. We've actually met before, you spoke at a conference I organised in Birmingham last year. It was a really fascinating and insightful talk.

I was wondering, what are your updated opinions on the future of living architecture that repairs itself? For example structures and self maintaining electrical systems.

AstonVanilla

Hello! I remember!! Thanks for dropping me a line here. The work I am currently doing with the "living" brick as part of an EU funded H2020 Future Emerging Technologies programme with 5 European partners (University of West England -UK, CSIC -Spain, Liquifer Systems Group - Austria, University of Trento - Italy and Explora Biotech - Italy) currently looks at an "artificial" and "metabolically programmable" form of nature. In other words, matter is more than "smart", it's capable of metabolism and links to other metabolic networks. The issue then of how these technical systems can be considered is all about how far we can design with metabolism. How far from "natural" processes can we stray, and what are the limits - can biological systems make metals - like the bacteria that can deposit gold, and can we orchestrate these processes spatially so that we can choreograph useful "work". We are only at the very beginning of this kind of research - as you can see from the call, it's a high risk question we're asking and researching … I think from a narrative perspective we might think along the line of the Bitlong, from Philip K. Dick's Pay for the Printer … currently we're making platforms rather than products and the questions you're asking will help us refine and develop these experiments towards real-world applications. But "living bricks" … exist in prototype and we'll be working more with them … http://livingarchitecture-h2020.eu

What cultural conditions are needed to construct a living habitat within a spaceship?

Pogo4harambe

The shared vision that such a project is worth pursuing … currently the cultural condition would be that of the Apollo Orphans who believed in the space age and have invested in making the prospect of off-world living a reality. Once a community of people that are empowered in various ways believe in the value of this as something to pursue, then the actual construction of these spaces becomes possible as they will be funded and resourced.

What is the MOST important factor for the "ark" community?

The_Doctor07

The belief in the value of their mission and situation - that their lives and journey is worthwhile. This is at the heart of an "interstellar culture" … for example, Michael Mautner (astro/chemist) proposes that the mission served is seeding the cosmos with the community of life in the process of interstellar exploration … Not every community will have the same grand narrative but that's what keeps everything together … even if (heaven forbid) the mission is ultimately doomed … it all needs to be "worth it" … that's the most important thing - what makes it all "worth it".

Hello,

What is the current technology that would provide the most return in regards to self-sustaining ships if we invested into it today? How easily translatable would any of these technologies be to life in cities?

Thank you again.

KnowL0ve

Understanding how we might build life or ecosystems from scratch - in other words, understand the transitions needed to go from inert to living systems … that's the "philosopher's stone" … that's the big pay off. If we can actually "understand" what it necessary to "make" life, we'll understand the conditions needed to support it, make the technologies and infrastructures we need, and potentially this could even turn around the fate of our own planet, which is currently steeped in ecological crisis and collapse. Using prototypes we can translate these principles anywhere - I'd point at Arup's BIQ house whereby algae are living inside building claddings and making biomass that stops the building overheating by the solar thermal effect and can (at a later date) also be used as a fuel source http://www.arup.com/homepage_imagining_buildings_of_the_future/biq_film