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The Social Lives of Plants, in Space

When I first came across NASA Astronaut Mike Hopkins' Twitter account in 2013, he was frequently posting photos from the International Space Station, his home at the time, and had an active community of 39,000 followers. [1] The photos he shared were a unique view into his life on the ISS. Many were of Earth from above – overlooking deserts, city lights, aurora, and spectra of refractions across our atmosphere. Hopkins also tweeted about other phenomenal encounters, his excited captions transmitting awe from each of his new experiences. Along with a photo of his space walk he tweeted: “*Wow...can't believe that is me yesterday. Wish I could find the words to describe the experience, truly amazing.*” Reflecting on a view of the Sahara he wrote: “*I never thought the desert could be so beautiful.*”

His posts on Twitter revealed insights into these otherworldly encounters, such as this tweet on September 30, 2013: “*Did you know space has a smell? Before ISS hatch to Cygnus was opened, small area between vehicles was at vacuum which left a distinct odor.*” Who wouldn't be in awe of such an experience? As his follower on Twitter, it was inspiring to share in discoveries like this – I never imagined I would receive a first-hand report on the *smell* of outer space. I began following Hopkins on Twitter as part of my exploratory fieldwork in the anthropology of space, the topic of my doctoral work. I was especially fascinated to find that by following

Hopkins online I was able to watch him engage not only with his fellow ISS residents and fans down here on Earth, but also with *plants* in space. As social scientists ostensibly studying humans in space, I wondered, how might we account for these engagements with plants and with other non-human life in our research? And what questions arise from considering these relationships?

Multispecies Relations

Since arriving on the station, Hopkins had grown sunflower and pumpkin seeds, and posted updates on the results. In one update he tweeted: “*New life on ISS. A sunflower sprout is now 2 days old. Another few days at this growth rate & it will need a new home.*” (Image 1)

Starting out in Ziploc bags, like elementary school science experiments, these sprouts were later photographed after being transferred into more complex containers, modules designed specifically for plants growing in space. But these tubes didn't *contain* the plants – the roots reached out, leaving the containers, looking for more. Hopkins tweeted “*It took a little help, but the sunflower finally broke free from its shell! Freedom at last.*” (Image 2)

Image 1: Plant seeds sprouting in a plastic bag.

Image 2: Plant sprout growing up out of container.

The Social Lives of Plants, In Space (cont.)

The 1977 NASA publication “Space Settlements: A Design Study” discusses possible roles for plants in a speculative future of human space habitation. Chapter 3, “Human Needs in Space – Appendix A: Psychological and Cultural Considerations,” describes plants as a necessary component for the psychological health of humans living in space, especially in preventing the dream-like state of “solipsism syndrome.” Plants are important in this regard, the authors argue, because they are to some degree outside the control of humans; they do things that are unexpected, and they require care:

The Solipsism Syndrome in Artificial Environment

Some environments are conducive to the state of mind in which a person feels that everything is a dream and is not real. This state of mind occurs, for example, in the Arctic winter when it is night 24 hr a day. [...]

This state of mind can be easily produced in an environment where everything is artificial, where everything is like a theater stage, where every wish can be fulfilled by a push-button, and where there is nothing beyond the theater stage and beyond an individual's control.

There are several means to alleviate the tendency toward the solipsism syndrome in the extraterrestrial communities: [...] 3. Something must exist which grows. [...] It is important for each person to feel able to contribute personally to something which grows, that the reality often goes in a direction different from expectation, and finally that what each person takes care of may possess increased wisdom, and may grow into something beyond the individual in control [...] it is important personally to raise children, and to grow vegetables and trees with personal care, not by mechanical means. It is also desirable to see plants and animals grow, which is facilitated by a long line of sight.” [2]

Hopkins' documentation of his plants and sharing of his experience on Twitter demonstrated this dimension of unexpected reality. One form this took was the failure of plants to survive: “*End of the road for my pumpkins. Not sure the cause of death, but I'll try again. Sunflower still growing, but slow.*” (Image 3)

Image 3. Plant with a few leaves, withering.

Hopkins tried again, starting a new seed: “*A new pumpkin is on its way! It took a week to reach this point from when I first put water on the seed.*”

As his follower on Twitter, I received Hopkins' public updates about these plants in space. I saw his photos of them sprouting, struggling to break through the seed shell, fighting to grow and thrive, or not. I watched his followers respond to the growth and death of the plants with sensitivity and shared concern. Watching this unfold, I couldn't shake the feeling that there was something both heroic and sad about these plants – small packages of life from Earth, brought into the vacuum of space, just barely protected in the ISS, where they seemingly have no long-term future. Looking at the images on Twitter I first thought how hopeless the plants appeared, tricked into emerging as if there would be sun and soil to grow in, pollinators to visit their flowers someday, animals to spread their seeds, fooled into living in a

place they don't belong. And if they did thrive, I wondered, how long could they grow on the ISS? Would they be cared for? Would they be allowed to live? (Image 4)

The Social Lives of Plants, In Space (cont.)

In my own home at the time, an apartment in New York City, I also had plants that I cared for. These plants, isolated in pots of soil within my apartment, many floors above the ground, in the concrete canyons of Manhattan – were, in some ways, not that different from those in the space station. Both were disconnected from the Earth, the complex ecosystem of the soil, but still dependent on that idea of soil, and on Earthly products from the ground below, on light approximating our sun. Many of my plants were also cuttings from friends or colleagues – so they were continuations of plants that had been in workplaces or homes under the care of others. They may never have known anything more than potting soil. Could the same thing happen in space? Assuming the plants Hopkins was growing could thrive, would they be accounted for in the atmosphere of the station? Would they take up or contribute resources? I wondered: How big could they get? Would they be in the way or a welcome change to the built environment of the ISS?

These ISS seedlings seemed to have the same precarious relationship with survival that house and office plants do, they depend on our care, on human attention for survival – but they are also threatened by it as we control their growth and reproduction – decide whether to care for them or not, where they will be, how long they will live. Were Hopkins' space plants going to live or die? Online followers of space science were recently able to watch live as NASA streamed the first harvesting and consumption of plants grown for eating on the ISS. Watching this live-streamed event, I wondered what human relationships with plants in space might become in the future.

Interdisciplinary Futures

Colin Milburn describes science fiction as a “repository of modifiable futures” for science. [3] Keeping this idea in mind, I turn to the speculation of the sci-fi repository to consider questions about human (and plant) futures in space. Recently plants have played a central role in human survival in speculative fiction, appearing as oxygen gardens for long term space voyage in the film *Sunshine* (2007), and as a cyborg-forest-oxygen-factory in spaceships on the television series *Doctor Who* (2010). (Image 5)

Image 5. Cyborg factory and oxygen forest. (*Doctor Who*)

that may have hitched a ride on the ISS? Are there microbes living on the seeds, the leaves, or in the roots, or on the humans? Perhaps there must be, in order for the plants and people to survive. Can plants survive in the

Image 4. Sprout with seed still attached growing out of metal container.

In today's actual world of tentative steps toward longer-term space habitation, the roles of humans and plants are somewhat reversed. Humans care for plants and the plants live or die in our hands – much like those under the care of a space dwelling botanist in the 1972 film *Silent Running*. On a small station such as the ISS, I wonder: what role might these plants play aside from that as subject in scientific experiments? How do the crew experience the plants? How are they considered? Cared for? Are they part of the crew?

Despite not being intended as an “oxygen garden” the plants on the ISS are still exchanging carbon dioxide for oxygen, they are still engaged in an intimate relationship of the breath with the humans on the space station. What about other life

long-term without the microbial ecosystems and networks of fungi that make up our Earthly soil? If they do, what kind of life, what kind of experience is it for a plant to be disconnected from the Earth and the soil, the insect, fungus, and microbial communities of the Earth? What kind of experience is it for a human to be disconnected from these same fungal and microbial worlds? (Image 6)

Image 6. Tending the biodome ecosystem.
(*Silent Running*)

In *Silent Running*, space freighters carry biodomes full of plants. The plant arks and their precious cargo are cared for by a live-in ecologist with the help of robot companions. In this imagined future, all plant life on Earth is extinct and these plants are preserved to later repopulate Earth. In the film, however, orders come from Earth to destroy the plants and put the freighters back into service transporting commercial goods. Disobeying the orders, the hero botanist sets out into deep space to continue caring for the plants. These themes from *Silent Running* re-appear in *WALL-E* (2008), an animated film in which a waste disposal robot discovers a sprout growing on the long-abandoned Earth. The discovery of this sprout means the planet may once again be suitable for humans after a previous generation's consumerism made it uninhabitable. (Image 7)

Image 7. The robot finds a sprout. (*WALL-E*)

It was unlikely that astronaut Mike Hopkins' adventure with his plants would end as *Silent Running* does, with Hopkins setting out into deep space to protect his seedlings. Hopefully our current era of anthropogenic climate change and environmental destruction won't end as the film *WALL-E* begins, with the Earth made uninhabitable. There is, however, a similarly intimate multispecies relationship in Hopkins' plant posts on Twitter – he cares about these plants, shares something with them and this is something worth attending to. In the future, such care – the acts and experiences of plant caretaking – may become central to human lives as we move into space and onto other worlds. Social scientific research on human futures in space can benefit from the inclusion of recent interdisciplinary scholarship on plant sensoria [4] and multispecies engagements.[5] Considering life of all kinds in our work ensures we conduct research in terms of the full range of experiences implicated in being here on Earth while remaining open to possible encounters and existences elsewhere.

A proposal from NASA Ames in 2013 describes the first Lunar plant experiment in which a self-contained seed germination test unit would be placed on Earth's moon. The project would rely on corporate ventures, hitching a ride on a Google sponsored Lunar X-Prize trip. Such plant experiments could provide valuable data about whether plants can grow in the radiation on the moon, but they also serve as analogs for human experience across several registers: "As seedlings, [plants] can be as sensitive as humans to environmental conditions, sometimes even more so".[6] Aside from fighting solipsism syndrome, cleaning our air, or serving as salad ingredients – perhaps plants, with their many sensitivities, will also be sympathetic companions for humans living in space who, like them, are coping with life in a hostile new environment – far from home.

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Notes

1. <https://twitter.com/AstroIllini>
2. Johnson, Richard D. “Space Settlements: A Design Study. NASA SP-413.” *NASA Special Publication* 413 (1977), 29.
3. Milburn, Colin. “Modifiable Futures: Science Fiction at the Bench.” *Isis* 101, no. 3 (September 1, 2010), 568.
4. Myers, Natasha. “Conversations on Plant Sensing: Notes from the Field.” *NatureCulture*, no. 3 (Forthcoming).
5. Kirksey, S. Eben, and Stefan Helmreich. “The Emergence of Multispecies Ethnography.” *Cultural Anthropology* 25, no. 4 (November 2010): 545–76.
6. NASA. “LPX First Flight of Lunar Plant Growth Experiment.” *NASA*, June 7, 2013.