Space Enthusiasts, Power, Kinship and Unpredictability: The Human Journey to the Cosmos and Outer Space Ethics

Katrina Ince
BA (HONOURS) GRADUATE, SOCIAL ANTHROPOLOGY
YORK UNIVERSITY, TORONTO, CANADA

Humans and their robotic emissaries are launching into space in ever greater numbers. While the technological aspects of these missions are prioritized and ongoing, the social aspects and ramifications of this movement into a new arena of exploration and exploitation leave questions unanswered. How does this look from the perspective of those interested in space, and are people interested in the quest to travel to space or is it a small privileged few whose voices dominate? These lead me to ask through the use of interviews how people feel about space, and if obligations to act ethically override other factors (scientific, financial, cultural as examples) for going there? Will humanity learn lessons from other historical instances of exploration and colonization on Earth that led to genocidal harm as we travel away from it and move into new areas, or perpetuate elitist, nationalistic and/or capitalist paradigms that prioritize the business or country over the human, and sociocultural beliefs? Or can humans work more inclusively, and collaboratively, to include the social sciences as part of this process, and in so doing, continue the work of decolonization? So called "space colonization" is an arena that could benefit from an increase in regulatory oversight and collaboration.

KEY WORDS colonization, environmental protection, hegemony, outer space, regulation, sky culture

When we think of humans going to space, we might think of Neil Armstrong taking that first step for humanity on the Moon in 1969. Or a scene from science fiction; a Star Trekesque captain warping off into space to perform acts of derring-do, encountering alien life that also somehow has two arms, two legs and one head. However, right now nations and private spaceflight companies are taking steps towards a human off-world existence, turning the theoretical and fictional into the actual. While most people may not be aware of this new area of exploration, it affects every person on the planet, and our global environment. Humanity and the social sciences need to become more involved in the planning and implementation of this action, learning from our history of colonization, to prevent future social and ecological harm, and solicit input from a multitude of diverse cultures.

Focus

For the purposes of this short-term research project (one academic semester, or approximately three months), interlocutors were solicited from a Canadian astronomy

Contingent Horizons Volume 8, Issue 1 (2022-2023), ISSN 2292-7514 , online ISSN 2292-6739.

club and charitable organization with a mandate in astronomy education and citizen science; the RASC (Royal Astronomical Society of Canada) and CosmoquestX, a United States based educational and citizen science organization produced out of the Planetary Science Institute, a 501(c)3 non-profit "dedicated to exploring our Solar System and Beyond"[1].

To maintain privacy, interlocutors are assigned star name pseudonyms in this ethnographic report (Albireo, Mira, Sirius, Procyon, Polaris, Castor, Deneb, Rigel, Pollux, Canopus, Capella, Antares and Betelgeuse) in interviews that were performed online.

The following questions were asked. "Please tell me your space story" as a general warm up. Follow up questions were "Does the human journey into space interest you?", "Do you think about how humans use the sky/outer space? Followed by "Do changes in its appearance bother you?" "Do you think about groups not represented in space/in the space industry (for example, racialized people, working class, non-English/Russian speakers)?", "Do we need regulations to protect people/the environment in space industries?" and ultimately "Is going to space an inevitable step in future human evolution?"

Liftoff

"I believe that space exploration in our expansion of our knowledge has had positive societal benefit. A lot of things would not have been developed had it not been for our desire to develop these things for space exploration", says Sirius. We've known each other for many years. We're friends, and we've had many astronomy adventures together; we've seen two shuttle launches together, so I know he's interested in human spaceflight. However, what he said shortly after wasn't what I expected. "I think we really should be having a hard look at what we're doing on our spending that money to clean up our climate and do the right things, so we don't have a need to expand beyond Earth."

Canopus says that "one that learning about astronomy ...has taught me is that what really is out there is not what we think it is whenever we look and find; the personal touch makes a better experience when the humans go (to space)." Deneb has a "concern about space exploration (and its) use of resources". Betelgeuse likewise questions current motivations in a new era of private spaceflight. "Is this to make already rich people, richer, or to better humanity?" Polaris describes humans going to space as "desirable, because there's a ton that we can learn from doing space. Whenever we push the edges of what humans are capable of going, we learn a great deal". Pollux says, "I always felt like a Martian who was just here among other humans, and we're somehow related, but I can't quite figure out how...didn't we all come from space?"[2]

We'd come a long way from that time, in 2008, when Sirius and I along with two other friends traveled from wintry Toronto to sunny Florida to watch humans launch into space. The mission of STS-122 involved using the shuttle, and its large cargo bay,

Image by author, 2008 Feb. 7, Causeway Kennedy Space Centre, just before the launch of the shuttle Atlantis STS-122. The rocket is circled in red, just before liftoff. The orange external tank attached to the rocket is just visible. [3]

to deliver the European Space Agency's Columbus module to the International Space Station (ISS). Many geopolitical and environmental events have occurred since then, and of course we're older. 38% of my interlocutors described being inspired by existing space missions as a reason they became interested in space.

Watching the shuttle from the causeway at the Kennedy Space Centre was a sensory experience that has the potential for many unpredictable events. Rockets explode occasionally, usually without people on them, but the Challenger accident from 1986, when all seven crewmembers died during launch, is seared into my memory; that tragic, lumpy, bifurcated uncontrollable contrail that denoted disaster. Ditto the shuttle Columbia disaster in 2003, when all astronauts died upon re-entry at the end of their mission (these are not the only spaceflight related deaths). Scrubs (when a launch is temporarily delayed) can also happen unexpectedly (technical issues, weather issues, range issues such as a boat too close to the launch area). Hence, if I see a rocket launch (regardless of nation), I hold my breath. As I re-listen to the audible cues from that countdown (the shuttle program was retired in 2011) and it sends me back in time, to relive that moment in Florida when I saw seven humans in a human built machine rise from sea level to low earth orbit (approximately four hundred kilometres altitude in this case) in 8 minutes.

The causeway at the Kennedy Space Centre (KSC) is a strip of land situated in the Merritt Island National Wildlife Refuge[1] on Florida's Atlantic coast (this refuge would not exist without the space program). We faced the launchpad, and in between us and the rocket was a manatee and alligator occupied estuary. It's a moment of incongruity and the antithetical. The natural, and the technological. These things don't always coexist well, but here they do. Buses bought us from the KSC exhibit area to the causeway, and the noise of these buses was omnipresent. Bus engines stayed on for the purposes of air conditioning. Should an explosion of the rocket occur, toxic materials would be released. While the main external tank of the shuttle contained non-toxic liquid hydrogen as fuel, the strap on Solid Rocket Boosters (SRB) which provided 85% of the thrust at liftoff contained toxic ammonium perchlorate (oxidizer) and atomized aluminum powder (fuel). Once the SRB's light, they cannot be shut off. In the case of an accident, people would be swiftly ushered back onto the buses for their safety.

Wildlife officers were seen prowling along the waterfront, to keep an eye out for alligators or people getting close to the shore. It takes hours for a countdown to transpire, with many steps and built in holds along the way. Would we see the launch that day? No one knew for sure. Everything had to go right. With a couple of hours to go until launch, we settled in to wait. We could hear the com checks from the control room to the astronauts in the vehicle, being broadcast over the loudspeakers. They had been strapped in their seats; they were checking communications. The launch director told the crew that they were not working any issues and they "are a go for launch". Launch countdown resumes. They finish fueling the rocket, the flurry of acronyms that leads to the "candle" (rocket) being lit are read aloud. Anticipation continues to build. We are all prowling now, albeit in our heads as we all stare at the rocket.

At two minutes to launch, the nose cap on top of the external tank rotates away. Launch is getting closer. If they were going to scrub, it's likely they would've done so by now. Already, it's the last minute of the countdown. Everyone around me is silent, staring, waiting. The sound suppression water system kicks in, flooding the area underneath the rocket with over a million litres of water in 41 seconds; this helps to absorb acoustic energy generated by the launch, while also creating the very large smoke plume we will shortly see at liftoff. We're waiting for the last ten seconds. They read aloud "ten, nine, eight……", "Go for main engine start", "main engine ignition" "three, two, one… liftoff!" One of my friends has ear protection on, concerned about the sound from the rocket launching ten kilometres away. It takes a few seconds for the shockwave to hit us, light traveling faster than sound. We see the liftoff before we hear it; the human made rocket on the human made cloud, rising upward, with humans on it. I cannot speak. People around me are whooping and hollering, but I just look up through my binoculars, not wanting the moment to end. I look briefly at another friend – he is smiling at me, with his hand on his head – he cannot believe it either.

The shockwave of launch hits my body (a very tangible feeling of vibration) and then a few short minutes later Atlantis became smaller, and smaller as she rose into space. There are people on that little dot; I wonder what they are feeling. I see the solid rockets fall away from the main rocket to eventually fall in the ocean (later to be retrieved), and then she was lost to my eyes.

Humans can do amazing things when they set their mind to something. Putting a human on the Moon, rovers on Mars, creating a vaccine for a life-threatening pandemic in record time, the discovery of electricity, genome editing, to name but a few scientific discoveries that have improved life for the better. Sirius saw this launch with me, and yet is now is more ambivalent about human spaceflight. Perhaps this is the "psychosocial resilience" that Howell and Peterson speak of in terms of healthy ageing (2020, 113). Perhaps he's wiser now.

There was a wistful nostalgia of fun times in the past, and also a bittersweet feeling of my naiveté in that moment before private spaceflights, before the war in Ukraine, before anthropogenic climate change was fully taking hold, before this horrible Covid-19 pandemic changed all our lives. I really felt spaceflight was for the betterment of our species, due to the positive uses of much of the spin off technology and research being done on the ISS that directly affects human health (research on infections, bone density issues, cancer, vision issues; it is a long list[5]). I still feel the net effects to human society from spaceflight have been positive, but now that spaceflight has moved from the governmental (representing the people) to private companies (representing profit but more flexibility in decision making), I fear the motivations have changed. If, however, private space companies are doing this also for the betterment of our species, they need to include more of our species in decision making processes.

Impact

While doom scrolling recently, Space Theoretician Dr. Natalie B. Treviño's tweet succinctly said what I had been struggling to find the words to say about a prevalence of colonialist knowledge and worldview that is prioritized over an Indigenous worldview. Non-Indigenous people seem slow to learn the lessons that Indigenous people have been teaching for millennia (if only everyone would listen), including the popular concept in space studies called the overview effect, whereby astronauts report being transformed by their sight of the Earth into space. Ambivalent one moment, ardent environmentalist the next. They realize how precious the Earth is, and from that vantage point notice there are no borders, and that our little problems are insignificant. Dr. Treviño says "With all due respect, can we stop with this bullshit? Why do white dudes need to be shot into space to understand what Indigenous peoples have been saying since forever?"[6]

In Minnesota, Dr. Annette Lee of the Native Skywatchers teaches astronomy education (in many cases online, accessible to anyone who wants to see it[7]), carrying on the work of elders who have passed away in some cases. She seeks to "remember and revitalize indigenous star and earth knowledge, promoting the native voice as the lead voice" (Lee 2019, 1). The key word here is "lead", insofar as whose voice is heard in colonized communities. Hegemonically, Indigenous communities don't always get to lead; they've been forced to adapt and follow while under threat of genocide. In Canada,

decolonialization and reconciliation are important concepts in society and anthropology. Albireo mentions that "Indigenous communities have been so under threat". However, as Mira says, "nobody is talking to each other".

Helen Sawyer Hogg was a twentieth century astronomer and a RASC member; "The Stars Belong to Everyone"[8] was the title of her popular book on observational astronomy. And the general assembly of the RASC in 2021 had a logo of the same name. It sounds egalitarian at first glance, but it doesn't fit everyone's worldview. For example, as University of Toronto Mi'kmaq astronomer and invited speaker Hilding Neilson explained to attendees, in his culture, the skies belong to no one (not everyone). He was working twice as hard than other speakers at his presentation. That is, he gave his talk, and then also educated us about his culture. Further, he has taken it upon himself to speak up for the rights of other Indigenous peoples (Neilson 2019, 312) while also undertaking his work as an astronomy professor. Decolonization has not yet occurred in astronomy, or in society, if this small example is any indication. And yet, the sky is being claimed by billionaires for the use that they, alone, prescribe, in the same way that colonizers took the land they claimed hundreds of years ago. One does not have to look far to see commercial spaceflight as a place of capitalist neoliberal colonialist patriarchy and the use of power.

Linda Tuhiwai Smith's "Decolonizing Methodologies" argues that the impetus for this western positioning of the superiority of Western knowledge began during the European Enlightenment which "provided the spirit, the impetus, the confidence, and the political and economic structures that facilitated the search for new knowledges... Whilst imperialism is often thought of as a system which drew everything back into the centre, it was also a system which distributed materials and ideas outward". Knowledge was "extracted" and "appropriated" (Smith 2012, 58). During colonization, Indigenous people were objectified and dehumanized, "classified alongside the flora and fauna" while samplings of various materials were dutifully collected and returned to the mother country for study and display in museums, and knowledge became "commodities of colonial exploitation" (Smith 2012, 59).

That western knowledge was centred and prioritized, and more than that, imposed. While Smith writes of experiences in New Zealand, the brutal legacy of residential schools (that sought to extinguish Indigenous culture in favour of a western Christian mindset) is documented in Canada by the National Truth and Reconciliation Commission (TRC)[9]. In 2021, approximately two hundred graves were found at a residential school in Kamloops, British Columbia, announced by the Tk'emlúps te Secwépemc First Nation. This tragic discovery opened the floodgates to other graves found near other residential schools in other places in Canada.

The brutal, violent and racist legacy of the residential schools that survivors endured intergenerationally, and continue to suffer the effects of today, needs to be completely bought to light, and discussed, to understand, to help survivors and, hopefully in time, incorporate an Indigenous centred solution (that could start by reading and enacting the TRC's suggestions). Perhaps then, the positioning of where knowledge is centred can be renegotiated. Mira says "we haven't really embraced other cultures the way we

should when we explore a place". More than that, we haven't even begun to explore the cultures where we live. Western colonizers stole culture and lives during their invasion; are they willing to listen, and more than that, restore some of the knowledge that was erased? Can trust be restored between those who have been victimized, and those who are part of a group that perpetrated great harm? The TRC Calls to Action report has suggestions to aid businesses in how a collaborative relationship might look.

> 92. We call upon the corporate sector in Canada to adopt the United Nations Declaration on the Rights of Indigenous Peoples as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities involving Indigenous peoples and their lands and resources. (2015, 10)

Canopus states, "I really think it goes back to the respect for the Earth and the world and nature that we don't have, and I think that's one of the things we can learn from First Nations."

While imprisoned for criticizing Benito Mussolini and fascism in Italy in the early part of the twentieth century, Marxist intellectual Antonio Gramsci wrote political theory. He's known for his ideas on cultural hegemony which describes how the state and ruling classes maintain power in capitalist societies (n.b. not all places sending rockets into space are purely capitalist or democratic; China, Russia and Iran have space programs run by the state. China is classified as a socialist dictatorship politically, but is part of a capitalist world order due to their production role. Iran is classified as having a semi developed economy by the United Nations, and is theocratic. Russia is currently a dictatorship). A group establishes its supremacy of another not only by physical force but also through a "consensual submission of the very people who [are] dominated" (Litowitz 2000, 518). That is, through persuasion by establishing the systems people have come to depend on where the dominant group can share their values (schools, pop culture, and so on). The patriarchal hegemony in the commercial space industry, like elsewhere in society, is mainly, but not completely, middle aged white males, some of them billionaires, such as Elon Musk, Jeff Bezos and Richard Branson.

Antares says "unfortunately you know that the rocket industry was kind of started by white males". He goes on to remind me of how slow-moving governments can be, and how private space companies are taking initiatives in technological and social ways faster, with less bureaucracy. He says "a lot of the advancement in making space accessible right now is being funded privately". As an example, he mentions how Jeff Bezos's Blue Origin flew Wally Funk to space[1] (an aviator denied travel to space during the Mercury era because she's a woman, she was part of the so-called Mercury 13, or FLAT's, or First Lady Astronaut Trainees during the early 1960's).

The brutal, violent and racist legacy of the residential schools that survivors endured intergenerationally, and continue to suffer the effects of today, needs to be completely bought to light, and discussed, to understand, to help survivors and, hopefully in time, incorporate an Indigenous centred solution (that could start by reading and enacting the TRC's suggestions). Perhaps then, the positioning of where knowledge is centred can be renegotiated. Mira says "we haven't really embraced other cultures the way we should when we explore a place". More than that, we haven't even begun to explore the

cultures where we live. Western colonizers stole culture and lives during their invasion; are they willing to listen, and more than that, restore some of the knowledge that was erased? Can trust be restored between those who have been victimized, and those who are part of a group that perpetrated great harm? The TRC Calls to Action report has suggestions to aid businesses in how a collaborative relationship might look.

> 92. We call upon the corporate sector in Canada to adopt the United Nations Declaration on the Rights of Indigenous Peoples as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities involving Indigenous peoples and their lands and resources. (2015, 10)

Canopus states, "I really think it goes back to the respect for the Earth and the world and nature that we don't have, and I think that's one of the things we can learn from First Nations."

While imprisoned for criticizing Benito Mussolini and fascism in Italy in the early part of the twentieth century, Marxist intellectual Antonio Gramsci wrote political theory. He's known for his ideas on cultural hegemony which describes how the state and ruling classes maintain power in capitalist societies (n.b. not all places sending rockets into space are purely capitalist or democratic; China, Russia and Iran have space programs run by the state. China is classified as a socialist dictatorship politically, but is part of a capitalist world order due to their production role. Iran is classified as having a semi developed economy by the United Nations, and is theocratic. Russia is currently a dictatorship). A group establishes its supremacy of another not only by physical force but also through a "consensual submission of the very people who [are] dominated" (Litowitz 2000, 518). That is, through persuasion by establishing the systems people have come to depend on where the dominant group can share their values (schools, pop culture, and so on). The patriarchal hegemony in the commercial space industry, like elsewhere in society, is mainly, but not completely, middle aged white males, some of them billionaires, such as Elon Musk, Jeff Bezos and Richard Branson.

Antares says "unfortunately you know that the rocket industry was kind of started by white males". He goes on to remind me of how slow-moving governments can be, and how private space companies are taking initiatives in technological and social ways faster, with less bureaucracy. He says "a lot of the advancement in making space accessible right now is being funded privately". As an example, he mentions how Jeff Bezos's Blue Origin flew Wally Funk to space[10] (an aviator denied travel to space during the Mercury era because she's a woman, she was part of the so-called Mercury 13, or FLAT's, or First Lady Astronaut Trainees during the early 1960's).

62% of interlocutors said they think about underrepresented groups in astronomy and space industries (non-English or Russian speakers, women, racialized people). Castor informs me "out of more than six hundred, only four black women" have been to space. That's less than 1% (0.67%). The idea that space is for "rich white dudes" and for people they know was repeated frequently. Polaris mentions that part of his role as a teacher "was to recognize what culture someone was coming from" in order to better engage with that person as their teacher.

One of the first things that Capella said to me were her thoughts on how "selective" this new era of private spaceflight is. That and "white privilege". "You have to be rich to be able to do it, it's not open to everybody", and wondered "did they actually have an interest in space, or do they just want a notch on their belt?" "Space is for the rich", echoes Rigel. Deneb elaborates, "That would definitely be a concern for me about who would be going like would it just be people who are able to pay for the ticket to space like it's currently happening, or would it be like a truly diverse representation of humanity." Specifically related to private spaceflights such as those that Virgin Galactic and Blue Origin are undertaking, Clara Moskowitz echoes this sentiment. "All their flights did was give the impression that space—historically seen as a brave pursuit for the good of all humankind—has just become another playground for the 0.0000001 percent" (Moskowitz 2022).

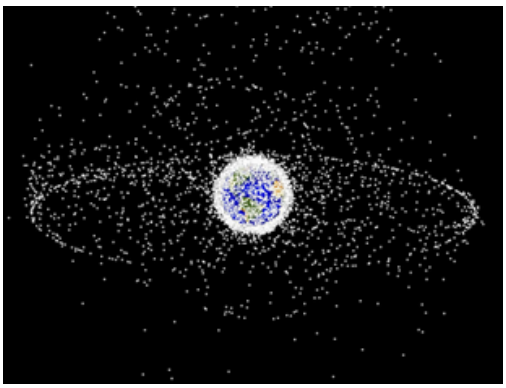
100% of interlocutors interviewed agreed that regulations are needed for the use of outer space, and everyone was also concerned about changes in the appearance of the night sky (due to light pollution). Technological innovation generally precedes social development and regulations. In time, societies adapt to their changing worlds, although this process is generally rife with inequity. This hegemonic process has occurred time and time again since the Industrial Revolution, with no thought given to the consequences for the subaltern (who is everyone on Earth outside of the upper echelons of those in the spaceflight industry in this case, both governmental and private industry), or those outside the technological innovation process. The same is true regarding the journey of humanity into space, where regulations are slow to impede the process of thousands of sky-changing satellites into LEO (Low Earth Orbit). Like garbage and space debris that falls into the ocean, we likewise treat the sky with distain. This not only has environmental consequences, but scientific ones too. My interlocutor group was aware of changes in the appearance of the night sky over time, but didn't think that the general population shared that concern, because as Deneb states, "our daily life is hugely impacted so I can't necessarily bite the hand that feeds. Having internet and everything like those satellites are super helpful and GPS I don't know how anyone got anywhere without Google Maps.". Telecommunication satellites allow for transportation, communication, entertainment to name but a few ways in which they're firmly ensconced in daily modern life.

What people may be less aware of are the risks that an unlimited number of satellites pose as part of satellite constellations (satcons), as well as the ensuing light pollution and space debris that accompany them; they're a recent phenomenon so we must be open to unpredictability regarding consequences. Space debris is a broad category that includes objects large and small. They're not just floating; they're generally traveling at around 27,000 km/hr (the speed at which they were deposited there, to stay in orbit) and can be hazardous if they encounter other objects (especially tin-can-like pressurized places like the ISS that contain humans that require a nitrogen oxygen atmosphere to survive). Some of this debris will eventually burn up in Earth's atmosphere on its own, some of this debris will potentially stay in orbit a long time unless removed. The map of the debris is catalogued, and in flux. Alice Gorman describes this debris. "Satellites that work, satellites that don't work, the rocket stages

that delivered them, bolts, canisters, fairings, exploded fragments, flecks of paint, shrapnel, tools, fuel, and possibly, a remnant of organic waste from human spaceflight missions (yes I mean space poo)" (Gorman 2019, 120).

Anthropogenic light pollution from the ground from things like streetlights has negative human health consequences that has long been known (for us and for other species, see Ouyang et al 2017)). However, now we are seeing light pollution from the sky, and with an increase in the number of satellites, this will only worsen. Sky glow from satellites is not regional, like light pollution from the ground. Skyglow from satellites is global; everywhere and inescapable, even in the most remote location. Light reflects off satellites (and their solar panels) and creates a background glow on the night sky. 77% of interlocutors mentioned light pollution as a concern. (Pollux, Castor, Antares, Capella, Canopus, Albireo, Mira, Rigel, Polaris and Procyon). Pollux's thoughts about why this effect have gone mostly unnoticed is due to how gradual it is. That is "it's maybe a bit of the frog in the boiling water".

SpaceX's constellation of Starlink satellites is but one company (albeit the main company in this field) competing for bandwidth. Their "megaconstellation" "of circa 12,000 Starlink Internet satellites would dominate the lower part of the Earth orbit, below 600 km... (which are) acting as sources of reflected sunlight affecting ground-based (and in some cases even space-based) observations" (McDowell 2020,9). That number may rise to about 65,000 satellites, including other companies like OneWeb and Kuiper. Amazon is getting involved in this, the Chinese have their own plans to launch their own satcons, and in Canada local start-up company Kepler is getting in on the act. [11] They're changing how the sky looks from the ground. Sometimes this means a few more floating points of light that few will notice, other times they can interfere with astronomical work. As Lawler et al says, "These satcons will have negative consequences for observational astronomy research, and are poised to drastically interfere with naked-eye stargazing worldwide should mitigation efforts be unsuccessful." The chances of dying by asteroid are very small, but that's probably small consolation to the lifeforms that died during the impact event that hit Earth sixty-five million years ago that wiped out most of the dinosaurs.



(Public Domain image of an ever-changing representation of orbital debris from humans; courtesy NASA)

Our planet's history includes asteroid impacts time and time again; it might be nice to know if there's an asteroid coming our way that we could potentially do something about. Outer space, like land, oceans and air, is now an arena to be stockpiled and used, before others do, in the imperialist colonial style. Those with the most resources will grab the most, in this continuation of the process of colonization that has captivated powerful nations for hundreds of years. When countries (or in this case, private companies with less oversight) explore new areas with a goal of financial success and resource exploitation, will negative processes of colonization be repeated, or will humans learn from that and aim for equality? Do people know or care about space colonization, or is just the arena for a privileged few?

Outer space is not a lawless place, however the Outer Space Treaty, bought into effect by the United Nations, governing the use of space, was ratified in 1967[12]. A lot has happened since then. In late 2021, 54 years after the Outer Space Treaty came into effect, the United Nations formed a working group to further discuss the use of space and "to promote international cooperation and study legal problems arising from the exploration of outer space. It lacks any ability to enforce the principles and guidelines set forth in the 1967 Outer Space Treaty or even to compel actors into negotiations" (Hanlon and Autry 2021). The pace of spaceflight development is obviously outpacing regulations to keep up with it. We now have increasing risks of debris from space, the weaponization of space and threat of the Kessler Effect occurring in due course, whereby space debris crashes into other space debris, causing more space debris, causing problems for anyone planning to launch anything into orbit.

The sky is a shared global entity and cultural space, and yet only a small hegemony of space leaders decides what to do with it, in the same way that political leaders made decisions regarding exploration and exploitation beginning centuries ago.

Scientists depend on being able to analyze images from space to look for threats to Earth like asteroids, but the streaks of light from many of these satcons prevent it, or severely corrupt data. Lawler et al continues, "Without drastic reduction of the reflectivities, or significantly fewer total satellites in orbit, satcons will greatly change the night sky worldwide" (Lawler et al 2022, 1).

Some of the effects from these satcons are unpredictable and not yet known, but we're already discovering they are impacting us. Humans have looked to the night sky for millennia, seeking truth and wisdom in their everyday lives, searching for scientific knowledge, wondering when to plant crops, weather prognostication or exploring our own consciousness. It has generated thought, imagination and art; people still appreciate Van Gogh's "The Starry Night" after all, or delve into archaeoastronomy to look at millennia old cave drawings of astronomical phenomena and realize we're been looking up for a very long time the world over. For example, in the Southern United States (Chaco Canyon petroglyphs showcasing the ancient Chacoan civilization's interpretation of a supernova[13]) or cave art in Australia that was created thirty thousand years ago, like the Sun engraving at Ngaut Ngaut, South Australia (Norris and Hamacher 2010, 99). However, we're now reaching a point, due to anthropogenic causes, that means the appearance of the sky is changing and less accessible than it has

ever been in human history. What effects will this have on future artists, scholars or amateur astronomers?

In space, it's frequently said that there's a place for everyone in the space industry, although that's not generally observed in the workforce which should include more social scientists and artists. If space needs everyone, a more diverse workforce is needed with people who listen to each other and respect other cultures and beliefs is required while, or before, we continue our human space journey.

Conjunctions

There was a common theme of familial connection that was an unexpected part of the interview process. The interview questions did not include questions of family, and yet they spontaneously arose with almost all the interlocutors when asked to describe their space origin stories, or how they got interested in space. Sirius describes going on a trip to the Yukon with his wife and mother-in-law to see the aurora borealis (northern lights), and during that trip "she was out of the back deck in the middle of the night early morning hours, pointing up constellations and telling me stories about those constellations. That's what hooked me."

Capella talks about her husband as being her gateway into astronomy. "You know he was such an enthusiastic guy about it. And, you know, I kind of got drawn in from him." It later became a family activity, involving their three children, and how they call participated in family outings to their astronomy club's observatory.

Capella's daughter Deneb says "my dad sort of like leads everything but I've always found it really interesting too, especially like with a telescope and when you're young to see everything, and just to realize that there really is something else out there."

Betelguese recalled family support early in childhood during the Apollo 11 lunar landing. " I always remember the, the moon landing. We were camping as a family. And I insisted that my parents bring along this small black and white TV. So... I was watching that thing in our tent. And it was pouring rain outside and my dad run this electrical cable from the battery of the car into the tent to power this thing ... And you know how a grainy the images were..."

Canopus's space family connections were also Moon inspired. "When I was a teenager, I guess maybe not even quite that Mom and Dad got me a telescope for Christmas, and it was what you might expect a small refractor on a wobbly mount with crap eye pieces ...and it was of course, following the moon landings of people out there and so perhaps that was why they got me the telescope." Albireo says "my Mom being school teacher... she was trying to help you know at home, get me sort of more enthused and get my marks up and stuff like that. So she was making a kind of a concerted effort, getting me to read more finding things that I was interested in, stuff like that. And she found that I sort of took an interest in science fiction... I'm just a just a product of the space race, you know, my parents were watching the TV broadcast with Walter Cronkite, and they pump me down in front of a TV and I guess maybe I don't clearly remember it."

Pollux has early memories of his father and a comet. "It was either Comet Kohoutek or comet West, that was coming by. And my dad had a little tabletop. You know, type telescope. And we went out to vacant lot near the house...to look at and see if we could see the comet."

Polaris's story was a conjunction of a trip to the Grand Canyon as a small child, being curious, and playing with enabling siblings. "How did I become a scientist. Okay. And as far as I can tell, it's innate personality trait for me, whether that's nature and nurture I really couldn't tell you. But since I was three, I've been asking annoying questions like even before I knew how to articulate them, that by the way is my distinction of what makes a scientist versus everybody else. Everybody asks questions, scientists ask annoying questions." After the Grand Canyon trip, he took what he learned there and attempted to replicate the processes that created the Grand Canyon in his yard. At age three. "When I got home, I dug myself a little channel in the front yard that went right up to the spigot on one side and a big hole in the ground on the other side, turned on the water and waited... It didn't work. So, I grabbed a bucket and started bailing out of the hole, so it would keep going for longer because they said it took a long time, still didn't make buttes, but I didn't get covered in mud and in fact I was having such a good time doing it my siblings joined in and we had a bucket brigade of dumping muddy water all over the front yard."

A connection to space may begin as part of kinship at home, and then develops. Kinship is a large part of the space community in a field which is usually rather insular, within an activity that can be done solo. Introverts abound. They look through telescopes alone, but it is much more fun to say "Hey, come look at this; how many of Saturn's moons do you see?" to confirm an observation, or to have someone to keep us company, or to chat to, or ask "is that a coyote?" when hearing rustling in the bushes nearby, followed shortly thereafter by the coyote's startling communicative howl. These kinship ties may begin with the family we're genetically related to, or the family we've acquired through association and friendship; a chosen family. As part of the wider global family of homo sapiens who all share the same sky.

Image by the author, 2013 May 23, Toronto RASC's Carr Astronomical Observatory (CAO), anticipation waiting for darkness; what unpredictable moments would we face? We're in it together

Orbital Motion

Humans have an urge to explore; multiple interlocutors mentioned this. We're curious creatures. We want to see what is behind a door, beyond the next hill, over the next ocean. For example, Procyon says "I think people will explore, wherever they can get to go, you know, and if they can figure out how to go and dive into a lava flow, they will". Rigel goes on to say that to meet our full potential we need to both explore robotically and in person. She equates it to doing a virtual tour of a museum. "You can sit in your living room at your computer desk and see the Mona Lisa... but until you have boots on the ground and can look at it, you can't truly appreciate it".

While we analyze past actions, the future is much more unpredictable since current collaborative partnerships are unraveling for geopolitical reasons. I won't offer a crystal ball to gaze into. Ritzer and Dean concur that "the social sciences... prognostications about the future are notoriously weak" (2015, 440). However, I've witnessed time and time again that, once in space, the country of origin appears less important than the person. Astronauts frequently collaborate, share meals, help each other out. Politics becomes less important when you're working together, isolated in a harsh environment.

Public domain image courtesy NASA. From left: astronauts Christina Koch, Luca Parmitano, and Nick Hague with cosmonauts Alexey Ovchinin and Alexander Skvortsov, representing three space agencies (NASA, ESA, Roscosmos), They're having a space pizza party 2019. What is more human than to share food while collaborating on a project?

Humans have been continually residing on the International Space Station for over twenty-one years. Expedition 1, with a crew of three humans, docked at the fledgling orbiting human-built home on November 2, 2000, and over two decades[14] and many long duration spaceflights later with multiple rotating crews from many countries, we stand at Expedition 66.

From an anthropological perspective, fieldwork of an archaeological nature was recently undertaken in space to study "space culture" (Walsh and Gorman 2021, 1331). Wherever humans go they leave artifacts. Astronauts are being used to collect data for this project, as they have done data collection in many areas of research before; that is something they're used to. They'll be "carry (ing) out an archaeological survey of the interior of the ISS" (Walsh and Gorman 2021, 1338). Does the presence of gravity determine how a society works, and how humans interact? Stay tuned.

During the process of interviewing interlocutors, this research evolved from purely interrogating the act of colonization into the relatively new arena of space (based on historical instances) and morphed towards questioning why this activity (humans going to outer space) should be happening at all, which was not an expected response given the pro-space nature of these groups. Unpredictability was added as an event common not only for the interlocutors, but was something that connected all levels hierarchically; it even included the researcher. From government or leaders in industry, to the people involved in decision making processes, to the engineers and workers and the possibility of technical challenges, right through to the citizen scientists and amateur astronomers, there were instances of unpredictability.

RUD's (Rapid Unscheduled Disassembly)

At the time of writing, Russia has shocked the world by invading Ukraine, perpetrating acts of war against its neighbour country. Russia has been a partner in many space activities, which depends so much on collaboration between nations. Until SpaceX started ferrying astronauts from the United States to the International Space Station (ISS), and since the retirement of the Space Shuttle, the Russian Soyuz was the only reliable way to get humans to space. More than that, Russia is a partner in the collaborative consortium of countries who operate the ISS together, which used to be a source of great pride among space enthusiasts. That is, countries that used to be at war with each other (the United States, Japan, Russia, Canada, the European Union) moving beyond past enmity, working together towards a greater good. At least, that is what we had hoped. There is so much grief being felt in the space community, not only worldwide at the trauma occurring to the Ukrainian people, but at the unraveling of this community of cooperation. CosmoQuest's Dr. Pamela Gay did a deep dive into this recently[15], trying to put together all the moving parts.

It's emotional on a number of levels, not the least of which is the idea that space is my happy place, the place I've turned to during times of emotional upheaval, to try to make sense of life, to be my emotional port in a storm. Well, now the storm has moved into space, and is an intrusion; my happy space is not so happy any more.

Spaceflight rockets are close cousins to weapons of mass destruction (North Korea is currently being observed testing intercontinental ballistic missiles on the Korean peninsula[16]). The United States probably wouldn't have landed a person on the Moon in 1969 if it hadn't been for a former World War II Nazi aerospace engineer Wernher von Braun testing the V2 rocket; a weapon of mass destruction that wrought havoc during WWII and caused countless deaths. Von Braun's later legacy is supposed to erase

V2 rocket. Image by author, August 30, 2016 Smithsonian, Air and Space Museum Washington, D.C.

his earlier one, one supposes. The United States took a war criminal and turned him into a Disney television star.[17] One only has to visit the Smithsonian's Air and Space Museum in Washington, D.C. to see a V2 rocket displayed near an Apollo lander.

Observing

A long-time space nerd, astronomy and space science has been my emotional port in the storm of life; I turned to it during times of tumult. Looking up into a dark sky and thinking about the age of the universe and the immensity of space puts my too-short life and little problems into perspective while reaping the benefits of being in the great outdoors. My shoulders drop, by jaw unclenches and I take a deep breath; I'm so lucky I live in a time when photons of light traveling from galaxies millions of lightyears away end their journey at my retina after traveling through my telescope and eyepiece; a multitude of telescope equipment is relatively inexpensive and accessible this century, unlike most of human history to date[18]. There's a connection of light between myself and the universe. In recent years, however, internal conflicts and defacements of the sky have emerged causing guilt and concern.

A conflict exists between learning about the wonders of the cosmos, recognizing the preciousness of life on Earth, seeing the amazing things that humans can do in the spa-

pace industry (that put humans on the Moon, sent rovers to Mars and landers to Titan, former enemies collaborating as partners on the ISS and so on) but all the while the possibility exists that humans will not learn lessons from the past. Humans don't always treat other humans well when push comes to shove, especially when economic pressures intrude, or when humans decide to start to live in a new place where they didn't previously. This internal conflict, between my love of space and how others are coopting it for profit and ruin, does not just concern me. What was unpredictable was how many interlocutors shared these concerns. It wasn't just me, the "woke" person.

Setting

We're all astronauts exploring our place in the universe. We're collaborative lifeforms on a rock in space moving through the cosmos in the only place in the universe where life exists, that we know of. Environmental, familial and equity themes were noted by the interlocutors. The late Carl Sagan once wrote "We are not yet ready for the stars. But perhaps in another century or two, when the solar system is all explored, we will also have put our planet in order…What we do with our world in this time will propagate down through the centuries and powerfully determine the destiny of our descendants and their fate, if any, among the stars" (Sagan 1980, 212). Not everyone is going to be aware of, or like, or have knowledge of, everything, even if it affects them and their environment.

Within my interlocutor group, 85% agreed that going to space was part of future human evolution. There's uncertainty in when, and how, this might happen. Even if groups who are interested in the use of outer space for scientific, not exploitative, purposes cannot agree on how to proceed in our journey outwards towards space, then perhaps billionaires need to slow down and not continue their path of speaking for our species without more consultation with different cultures and astronomical groups. They should consider collaboration and seek out different voices. There can be no globalization without a globe; our whole world and all the humans that inhabit it. Humans cannot say they're going to decolonize and not do the work and learn from it moving forward. This education has not been completed, and not all voices are heard. One thing that humans and outer space have in common, is that we're susceptible to unpredictable events but we move inexorably onward, or upward.

Notes

1. https://cosmoquest.org/x/about-cosmoquest/
2.The answer is yes https://www.universetoday.com/132791/confirmed-really-star-stuff/
3.NASA official launch video of STS-122 https://www.youtube.com/watch?v=jqGUco8zzPs
4.https://www.fws.gov/refuge/merritt-island/about-us
5.https://www.nasa.gov/mission_pages/station/research/news/iss-20-years-20-breakthroughs
6.https://twitter.com/nat_geo_theory/status/1497223309922025483
7.https://www.nativeskywatchers.com/
8.https://www.rasc.ca/helen-hogg
9.https://nctr.ca/records/reports/
10.https://www.nytimes.com/2021/07/19/science/wally-funk-jeff-bezos.html
11.https://kepler.space/
12.https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html
13.https://earthsky.org/human-world/chaco-canyon-nm-rock-art-supernova-pictograph/
14.https://www.nasa.gov/sites/default/files/atoms/files/iss20_celebrating_20_years.pdf
15.https://www.youtube.com/watch?v=gtiKRASHOu0
16.https://www.bbc.com/news/world-asia-60858999
17.https://www.youtube.com/watch?v=8zcU85O82XE
18.The organization Astronomers Without Borders also helps provide equipment regardless of location as we "all share the same sky" https://www.astronomerswithoutborders.org/home

References

Boutsalis, Kelly. 2021. "Weaving Indigenous and Western Knowledge." *University Affairs* 62, no. 3: 10-. https://www.universityaffairs.ca/features/feature-article/weaving-indigenous-and-western-knowledge/ Accessed March 22, 2022.

Choi, Kristen R et al. 2020. A Second Pandemic: Mental Health Spillover From the Novel Coronavirus (COVID-19). *Journal of the American Psychiatric Nurses Association* 26.4: 340–343. Web.

Dean, Paul and George Ritzer. 2015. *Globalization: A Basic Text*, 2nd Edition. Wiley-Blackwell.

Gorman, Alice. 2019. *Dr. Space Junk vs The Universe; Archaeology and the Future*. The MIT Press.

Hanlon, Michelle L.D., Greg Autry. "Space law hasn't been changed since 1967 – but the UN aims to update laws and keep space peaceful." *The Conversation*, November 23, 2021. https://theconversation.com/space-law-hasnt-been-changed-since-1967-but-the-un-aims-to-update-laws-and-keep-space-peaceful-171351.

Howell, Britteny M, and Jennifer R Peterson. 2020. "With Age Comes Wisdom: A Qualitative Review of Elder Perspectives on Healthy Aging in the Circumpolar North." *Journal of Cross-Cultural Gerontology* 35, no. 2: 113–131.

Lawler, Samantha M, Aaron C Boley, and Hanno Rein. 2021. "Visibility Predictions for Near-Future Satellite Megaconstellations: Latitudes Near 50° Will Experience the Worst Light Pollution." *The Astronomical Journal* 163, no. 1 (2021): 21.

Lee, Annette S., William Wilson, Jeff Tibbetts, Cark Gawboy, Anne Meyer, Wilfred Buck, Jim Knutson-Kolodzne, and David Pantalony. 2019. "Celestial Calendar-Paintings and Culture-Based Digital Storytelling: Cross-Cultural, Interdisciplinary, STEM/STEAM Resources for Authentic Astronomy Education Engagement." *EPJ Web of Conferences* 200: 1002.

Litowitz, Douglas. 2000. "Gramsci, Hegemony, and the Law." *Brigham Young University Law Review* 2000, no. 2: 515.

McDowell, Jonathan C. 2020. "The Low Earth Orbit Satellite Population and Impacts of the SpaceX Starlink Constellation." *Astrophysical Journal*. Letters 892, no. 2: L36.

Moskowitz, Clara. 2022. "Billionaire Space Tourists Became Insufferable." *Scientific American* 326, no. 3: 55.

Neilson, Hilding. 2019. "Astronomy Must Respect Rights of Indigenous Peoples." *Nature (London)* 572, no. 7769: 312–312.

Neilson, Hilding, Rousseau-Nepton, Laurie, Lawler, Samantha, & Spekkens, Kristin "Indigenizing the next decade of astronomy in Canada." *Zenodo*. https://doi.org/10.5281/zenodo.3755981(2019)

Norris, Ray P, Hamacher, Duane W. 2011. "Astronomical Symbolism in Australian Aboriginal Rock Art." *Rock Art Research* 28, no. 1: 99–106.

Ouyang, Jenny Q, Maaike de Jong, Roy H. A van Grunsven, Kevin D Matson, Mark F Haussmann, Peter Meerlo, Marcel E Visser, and Kamiel Spoelstra. 2017. "Restless Roosts: Light Pollution Affects Behavior, Sleep, and Physiology in a Free-Living Songbird." *Global Change Biology* 23, no. 11: 4987–4994.

Sagan, Carl. 1980. *Cosmos*. Random House, New York.

Smith, Linda Tuhiwai. 2012. *Research Through Imperial Eyes. Decolonizing Methodologies: Research and Indigenous Peoples.* Zed Books: New York, NY.

Truth and Reconciliation Commission of Canada, Truth and Reconciliation Commission of Canada: Calls to Action. Accessed March 22, 2022, https://ehprnh2mwo3.exactdn.com/wp-content/uploads/2021/01/Calls_to_Action_English2.pdf Public Domain.

Walsh, Justin St P, and Alice C Gorman. 2021. "A Method for Space Archaeology Research: The International Space Station Archaeological Project." *Antiquity* 95, no. 383: 1331–1343.