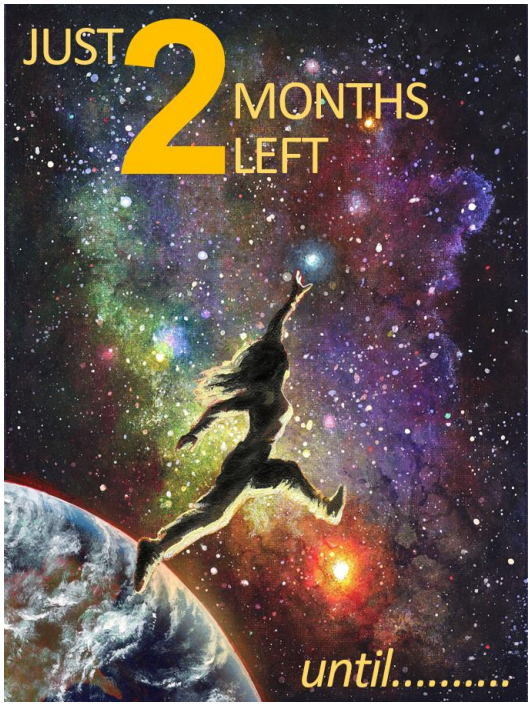
Have Starship, Will Travel

The Newsletter of the Tennessee Valley Interstellar Workshop

Issue 18
Sept 2019



TVIW'S 6TH INTERSTELLAR SYMPOSIUM

November 10-13, 2019 (Wichita, KS)
Website: tviw.us/

The 6th Interstellar Symposium and Advanced Interstellar Propulsion Workshop, presented by the Tennessee Valley Interstellar Workshop (TVIW) in collaboration with the National Aeronautics and Space Administration (NASA), and hosted jointly by Wichita State University and Ad Astra Kansas Foundation, will be held in Wichita, KS on November 10-15, 2019.

The symposium will include a special two and a half day NASA Propulsion Workshop focusing on Beamed Energy Propulsion and Highly Energetic Nuclear Processes for Propulsion (Fusion and Antimatter). This will be a new addition to our regular symposia, a workshop focusing on a specific aspect of interstellar exploration. It will be a part of the overall symposium and will not require special registration. We hope and expect to learn much about the current state of the art and future directions for many varied propulsion methods that may one day take us to the stars!

2019's week-long meeting has three exciting components: Sunday Seminars; the Interstellar Symposium; and the NASA Interstellar Propulsion Workshop.

Check out details about these components, the keynote speakers, and more on the following pages.

To keep up with the most current information about the 2019 Symposium, please consult our website at https://tviw.us/tviw-2019/, where newly confirmed participants will be listed and the agenda be expanded. All registration information on this site, along hotel reservations info.

(…continued on page 2)

NEWSLETTER CONTENTS

FROM GENERATION UNTO GENERATION

BY DOUGLAS LOSS

A philosopher friend of mine, Jim Schwartz, gave a presentation at the Tennessee Valley Interstellar Workshop's 5th Interstellar Symposium in Huntsville, AL, in October, 2017. In it, he asked some probing questions about the morality of forcing future generations into prescribed lives and roles aboard interstellar generation ships: https://youtu.be/5pfZkGSE1WM.

A couple of months ago Jim and some others had a section in *Futures* about space colonization, in which philosophers and social scientists supposedly debated the question, "Should humans seek to exploit and/or colonize space? If so, how should this be done?" To my mind this was in irrevocably flawed question to start the debate with, as it assumed that any human expansion into long-term settlement of space would necessarily be exploitative and would be colonial in nature. Predictably, at least half of the academic respondents didn't even bother with the proposed question but just used the "debate" to ride their hobby horses de jour.

Still, the philosophical and moral questions they ignored are interesting ones. Another philosopher friend of mine, Nick Nielsen, and I decided to start an email dialog roughly about how this might all work out. Nick's initial thoughts were that we might make an attempt to revive some of the original meanings of the term when colonization in classical antiquity meant the splitting of a wealthy city by the creation of a new city which was thought of as a "daughter" city (the original wealthy and populated city being the "mother"). This was the Greek model of colonization around the Mediterranean. When the Romans controlled the Mediterranean Basin, the meaning of colonization changed, as the Romans would settle retired soldiers, often in purpose-built cities. Such cities could, by definition, defend themselves as they were populated by former soldiers. In neither of these ancient instances did any negative connotation attach to the idea of a colony.

The above ideas could be combined with ideas taken from Fustel de Coulanges' famous monograph on ancient cities, in which he makes a sharp distinction between the ancient cities of the early Greek period and the cities of later classical antiquity. This theme could be elaborated to note further mutations in the role of cities since the ancient world. Cities founded in artificial settlements in space or on the moon or other planets would represent another stage in the mutation of the theory and practice of the city.

(…continued on page 3)

ABOUT WICHITA
FOR INTERSTELLAR SYMPOSIUM ATTENDEES

Apropos to the 2019 symposium's theme of "The Next Giant Leap—Ad Astra" is the location of the event in Wichita, Kansas. The state motto is "Ad Astra per Aspera". In keeping with the Ad Astra theme is Wichita's history as "The Air Capital of the World," a title earned by local innovative aircraft pioneers Cessna, Beech and others in the 1920s. Since 1919 almost 70 percent of the world's general aviation aircraft has been made in Wichita. Even today, Wichita is home to one of the top five aerospace manufacturing metros in the country. Major aerospace firms Spirit AeroSystems, Textron Aviation (a merge of Cessna/Hawker/Beechcraft), Airbus and Bombardier operate design and manufacturing facilities in Wichita, and the city remains a major center of the American aircraft industry with 30,000 employees and 350 suppliers and service providers. Wichita is also home to McConnell Air Force Base.

Symposium co-host Wichita State University is consistently ranked by the National Science Foundation as number one among all U.S. universities in the amount of industry-funded aeronautical engineering research and development. WSU is home to the National Institute for Aviation Research (NIAR), the nation's largest aerospace-based R&D institute.

Of interest is the "Doc" B-29 Superfortress, one of 1644 bombers built in Wichita during WW II. Having been restored to flying status over the last 15 years by hundreds of volunteers, it now has a hangar and museum at the city's new Eisenhower National Airport.

Wichita, a metro of 650,000, typically has an Indian Summer with extended mild weather into November.

Old Town is the downtown's transformed red-brick warehouse district turned entertainment district with shopping, restaurants, sports bars, music and live entertainment. The free Q-Line Old Town Trolley operates throughout Old Town and the Delano District, another historic area. Of note also are the "Museums on the River" which feature botanical gardens, art, live history, science and native American culture.

A signature of Wichita is the "The Keeper of the Plains", a 13.4 meters (44 ft) steel sculpture by Kiowa-Comanche artist Blackbear Bosin which stands at the confluence of the Arkansas and Little Arkansas Rivers. Fire pit "Rings of Fire" are lit to illuminate the statue at night.

With 13,000 artifacts, including rare German V-1 and V-2 rockets, the Cosmosphere in Hutchinson houses the largest combined collection of American and Russian spacecraft in the world. Its SpaceWorks division restores U.S. spacecraft for museums all over the world—including the Smithsonian. Notable are the Apollo 13 command module Odyssey (on display) and the Liberty Bell 7. SpaceWorks did the restoration of mission control consoles at Johnson Space Center.

TVIW'S 6TH INTERSTELLAR SYMPOSIUM

…continued from page 1

Sunday features four seminars and an evening reception. In the morning, Robert Hampson will teach "Life in Space, People of the Stars"; and Ken Wisian, Ken Roy, and John Traphagan will teach "Preparing for First Contact: Protocols and Implications".

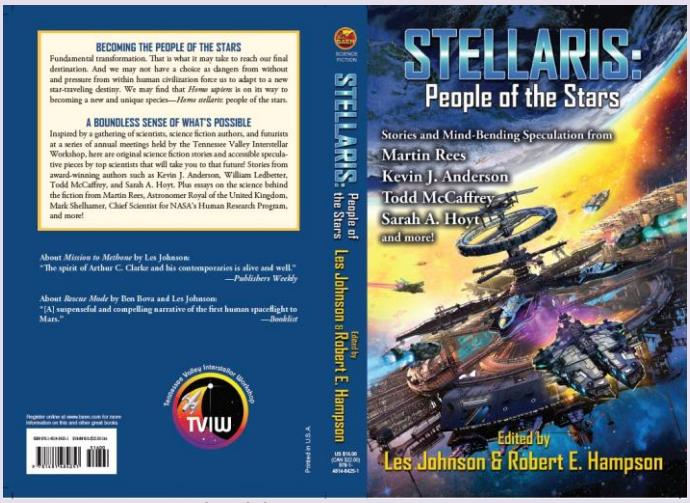
In the afternoon, Tracie Prater and Matthew Moraguez will teach "In-Space Manufacturing: The Gateway to the High Frontier"; and Laura Montgomery will teach "Space Law: An Overview, Past, Present, and Future". While the seminars require special registration, the reception is open to all meeting attendees.

The Interstellar Symposium will take place Monday through Wednesday, and will feature talks of general interest to the interstellar community. Tuesday evening will feature a panel discussion on the ethics of space settlement; panelists include: Kelly Smith, John Traphagan, Sheri Wells-Jensen, and Keith Abney. On Wednesday afternoon, there will be a bus trip to the Cosmosphere museum in Hutchinson, KS – a world-class space museum which features the Odyssey capsule (Apollo 13), an Apollo-era white room, a flown Soyuz capsule, and many, many other space artifacts. The Cosmosphere trip requires special registration.

The Interstellar Propulsion Workshop, sponsored by NASA, will take place Wednesday through Friday, and will feature talks focusing on engineering and physics aspects of interstellar research. Thursday evening will feature a science fiction author panel. Confirmed participants include: Confirmed participants include: David Brin, Toni Weisskopf, Geoffrey Landis, Sarah Hoyt, Dan Hoyt, Rob Hampson, and Les Johnson.

Keynote speakers include Joel Mozer, Chief Scientist, Headquarters Air Force Space Command, Peterson Air Force Base, Colorado. Confirmed speakers include Gerald Cleaver, Jeff Greason, Gerald Jackson, Geoffrey Landis, Chris Limbach, Phlip Lubin, Laura Montgomery, Tracie Prater, James Schwartz, Deana Weibel, Kenneth Roy and Raymond Sedwick. But the full list is considerably longer. You can find it at https://tviw.us/tviw-2019-participants, while abstracts of the presentations of confirmed speakers may be found at https://tviw.us/tviw-2019-abstracts/.

Keep track on our website, https://tviw.us/tviw-2019/, for new information.



STELLARIS: People of the Stars
Ed. by Les Johnson and Robert E. Hampson
Sept. 2019. 320p. Baen, paper, $16 (9781481484251)

Booklist Review by. Terry Goosey (1 Sept 2019)

The question is, what happens when a bunch of sf authors and scientists sit around pondering the fate of humanity in space? The answer is Stellaris. This collection combines short stories and scientific essays by some of the hardest hitters in contemporary science fiction and science fact, resulting in a thought-provoking look at a selection of real-world challenges and speculative-fiction solutions. The themes and topics are wide ranging, but standouts include Mike Massa's exploration of security and interstellar flight, which offers insight into the challenges a group of humans will face when essentially cut off from any outside help for unprecedented periods of time, and William Ledbetter's "Bridging," which deals with two long-separated groups of a colony who warily work together to build a space elevator. At what point after we go to the stars will humanity give way to expediency and survival, or is our humanity what gives us the leg up on survival even as the concept of earthbound Homo sapiens fades into the past? Readers will enjoy this collection that is as educational as it is entertainment.

TVIW 2019 SCHOLARSHIP WINNERS

Following a competitive process with many high-quality applicants, the Tennessee Valley Interstellar Workshop has chosen three students as the recipients of our 2019 scholarships. With the support of Baen Books (who are sponsoring the Tim Bolgeo Memorial Scholarship), Rob and Ruann Hampson, and J and Beth Roye, we are awarding these deserving students one graduate scholarship ($2500) and two undergraduate scholarships ($2500 each). These scholarships were created to encourage the next generation to study science, technology, engineering, and math (STEM) fields that support the research needed to get humanity to the stars.

Our winners are:

Lauren Oldham, our Graduate winner, and winner of the Tim Bolgeo Memorial Scholarship, earned a Bachelor of Arts in Geography from the University of Kentucky summa cum laude in 2014. She worked for a small company in mapping, going on to earn a Graduate Certificate in Digital Mapping in 2016. She will be pursuing a Masters in Digital Mapping at the University of Kentucky in the fall of 2019. She has been working with Women in Engineering to encourage local high school girls in STEM fields.

Our first undergraduate winner, **Alex Tharpe**, lives in Dyersburg, TN, with his family and two dogs, and has been very involved with his local community. He will be attending Tennessee Tech University this fall, majoring in Engineering, possibly going into Mechanical or Chemical Engineering. He is considering a possible career with the military (Air Force) or an aerospace organization.

Tatiana Cheves, our third winner, is an undergraduate from St. Petersburg, Florida, and will be attending Emory University in Atlanta, Georgia, in the fall. She has taken classes from St. Petersburg College in Seminole, FL for the past few years, and plans to major in Biology and Environmental Studies. She is a member of Women in Science, Technology, Engineering, and Math; as a member, she mentors underclasswomen in STEM careers and programs.

FROM GENERATION UNTO GENERATION
BY DOUGLAS LOSS

…continued from page 1

Nick considered these to be much better models of what will happen with human expansion beyond Earth than that oft-invoked cautionary tale of 19th century European colonialism during the Great Game. He also noted that a roundtable called "No Planet B" is scheduled for CASCA-AAA (A joint Canadian Anthropology Society and American Anthropological Association conference) in Vancouver this November with this as its premise:

> As a planetary species we live together among the rising seas and blazing fires of climate catastrophe. Meanwhile techno-capitalism is birthing a new space race out of an emergent Silicon Valley Military Industrial Space Settlement Complex.
>
> Rather than face up to the reality of many-species suffering, climate refugees, wars, colonialism, and artificial scarcity of capitalism, globalizing Silicon Valley elites work on plans to leave the Earth and "colonize" other worlds or flee to their heavily secured bunkers on our planet.

As Nick said, this pretty much ticks all the boxes of the emerging anti-space settlement sentiment in elite discourse. Of course, these folks see themselves as rebels against any and all elites. He said he could rant about this, but that that wouldn't be as productive as answering a couple of questions:

1. Is it possible to talk to people like this?

2. Will any of this matter, or will boots-on-the-ground establish the facts that we will later rationalize?

I replied that I thought that the concept of off-world permanent settlements is being colored very strongly by the terminology being used. Calling such settlements "colonies" is triggering an autonomic response among the unthinking ideologues. Of course, their denigration of their conception of colonization is based on the exploiting of indigenous humans in the areas colonized, which wouldn't be the case in the settlements we're

talking about. To maintain their outrage, they have to find something else to putatively be exploited. That's why we're seeing them complain about the possibility of exterminating extraterrestrial lifeforms, even though no such lifeforms have been identified, and about the possibility of making scientific investigation of non-living materials and locals impossible (or even just less possible).

So my answer to his question #1 was "No." As to question #2, I've always felt that the elite whining about all this is fairly meaningless as they won't be the ones going or the ones deciding to go. If off-world settlements become feasible and economically and socially desirable, they'll happen and all the academic caterwauling won't be any more effective at stopping them than spitting into the wind.

I thought it might be useful to try to guide the terminology away from "colonization" and toward "community construction." There's a somewhat long history of intentional communities, constructed communities, etc., that might give us a more rational perspective on off-world settlements, as they'll be just that, and won't be nearly as analogous to terrestrial colonization as they are to intentional community creation.

I lived for a few years in Columbia, Maryland, which is an intentional community. I'm sure there are some folks there who like the place, but I found it sterile and barely a community at all. To my way of thinking, the designers of said community really hadn't studied and didn't understand how functional, organic communities start, grow, and succeed. I hadn't actually studied the variety of intentional communities to see what has worked and what hasn't, but I suspect there would be a good deal of valuable information to be gleaned from such a study.

There are other intentional community movements underway that could be considered analogous to off-world settlements, such as seasteading. There's also Asgardia, although I'm inclined to view that as either a hobby by the originators or a scam.

Nick wrote back that he found it interesting that there are so few successful intentional communities (once called communes, and no doubt there have been other names as well), fewer still that endure for a significant period of time and cover a large geographical area. While in countries with a reasonable degree of freedom there is no legal regime that prevents the creation of intentional communities, nevertheless few are created, and fewer still are successful. One might argue that very small nation-states (say, Monaco or Vatican City) are something like intentional communities, and that our nation-state system of political organization today forces them into the mold of nation-states. He wasn't sure if this is accurate, but there is no reason that a successful intentional community could not iterate its social and economic model and grow to a great size within a given nation-state. However, this hasn't happened. Why hasn't it happened, and would the fact that intentional communities haven't been successful have consequences for building communities off world?

The artificiality of intentional communities may be an important component of this. While a top-down plan is being awkwardly imposed, people are responding to the actual conditions of life and creating a community from the bottom up that reflects the ordinary business of life, and intentional communities get stuck when the bottom-up reality comes into conflict with the top-down model. We can easily see this happening off world, when a government or commercial enterprise seeks to establish a presence according to the model approved by the higher ups, which works well on paper but which clashes with conditions on the ground. Governments and companies can impose their will (something intentional communities usually try to avoid), but this, too, leads to conflict, and often also leads to independence movements.

Following the foregoing, one could say that a colony, in the narrow sense, is a community in which the top-down model prevails, while a settlement is a community in which the bottom-up model prevails. Civilization has its ultimate origins in bottom-up social organization, but the later stages of a civilization (once a social, political, and economic model has reached maturity) tends toward the top-down. Nick said this is how he would define it, but whether anyone else would want to adopt these usages is another matter (and not likely).

Part of the problem with terminology surrounding "colony" and "colonization" is a peculiarly American obsession with language. We all know that governments and large companies in the contemporary world hire consultants to try to arrive at linguistic formulations that serve their interests while alienating as few as possible, though it was Nick's observation that this surface-level debate has little traction outside the western world. People usually know they are being sold a bill of goods.

He agreed that, when the technology is available and the enterprise can be financed, off world enterprises and associated human communities will happen, regardless of the language used to describe them, and regardless of how they are conceptualized, and when society changes enough over historical time there becomes a real question of identifying institutions of the past with institutions of the present. He mentioned again the differences between Greek and Roman colonies and the European colonies established in the course of the Great Game. One could say that the linguistic continuity masks a multiplicity of differences that matter. Any future communities that might also be called colonies would also have this linguistic continuity covering over substantive differences on the ground.

It is human, all-too-human to want the linguistic continuity because this gives us some orientation in the midst of a changing world, and it is similarly human to engage in more-or-less similar enterprises over time, even under changed conditions, so there is justification for the extension of traditional language to new activities. By definition, off world human communities will be historically unprecedented, but we will talk about them using established language and think about them in terms of our existing conceptual framework, though our language and our concepts will slowly shift to accommodate our behavior. Top-down linguistic and conceptual revisions are about as artificial as top-down social organization. Esperanto has its enthusiasts as well as its critics; it is the intentional community of languages. Nick would bet on the success of spontaneous and fragmentary innovations of language and conceptual framework that change our way of thinking on an evolutionary scale, scarcely noticeable within a human lifetime, but adding up to substantive changes over historical time.

I did a bit more investigation into what I'd called "intentional communities." At the time I hadn't realized that that was a term of art for artificial communities created with specific social purposes as their defining *raisons d'etre*. What I was thinking of was more what's often called "planned communities," like Columbia, MD or Reston, VA. Or come to that, the great majority of retirement communities or gated communities that are springing up these days, or even the company towns of yore. As I live just a stone's throw (almost literally) from Alcoa,

TN and a short drive from Oak Ridge, TN, company towns are pretty familiar to me.

It seemed to me that a major difference between intentional communities and planned communities is that intentional community membership is generally based on an acceptance of the social *raison d'etre* while planned community membership is based on a contractual agreement between the member and the controlling organization. Whether the planned community be a company town, a gated community, or a retirement community, an individual or family will only be allowed to reside there by agreeing to fulfill contractual commitments.

This seems to me to be a likely organizational tool for off-world settlements too, as the local environments in which the settlements exist will not be forgiving of casual modifications of, or abandonment of, agreed-upon facilities.

I recognize that this sort of organization might be chafing to many. But if there are multiple settlements with somewhat varying contracts for membership, self-sorting may occur.

Again, I'm drawn to the literature on "seasteading," even though seasteading is only at the very edge of nascency.

The balance between top-down organization, which at some level will be an absolute requirement if the settlement is to be able to sustain human life and a continuing biosphere, and bottom-up organization, which will be an absolute requirement if any true sense of community is to develop, will be interesting to observe. I wouldn't pretend to be able to design a feasible and functional interface between these two organizational modes, but I think such an interface will become one of the necessary and defining characteristics of any successful off-world settlement. Or any seasteading, for that matter.

Nick replied that one can think of intentional communities as civilizations in miniature, with the pretext for the community being analogous to the central project (the social *raison d'etre*) of a civilization. The pretext for a community can be a pretty low bar, such as a single interest. For example, a nudist colony has as its central project nudity in the public spaces of the colony. That's a single-interest central project. Other intentional communities might have a more complex central project, like people who participate in renaissance fairs and seek to reproduce past ways of living.

If we look at it like this, the low success rate of intentional communities can be considered equivalent to the claim that civilizations don't scale. When you make a civilization and its central project too small, it just doesn't work well. However, the problem with this is that it would place a big question mark on the origins of civilization. If civilization doesn't scale well, then how did they get started? And we can't consider the origins of civilization to be a rare or unusual thing, because multiple civilizations independently emerged in widely separated geographical regions. So there's an idea, and a problem with the same idea. The imperative of survival is probably key. If a nudist colony fails, usually no one dies.

Nick said he considered company towns as particular instances of intentional communities with a low bar to pass: employment in the company whose town it is. The social *raison d'etre* is the success of the company. A contractual arrangement may be thought of as a formalization of a social *raison d'etre*, much as the law is a formalization of some baseline social agreement on what is acceptable and what is unacceptable within a given community.

He agreed about the self-sorting of membership in various off world settlements, and if off world company towns exhibit sufficient diversity and variety, that might be sufficient. Any one company town has the motivation to pull together when it is in rivalry with another company town. When a company town fails, the former residents usually distribute themselves among nearby company towns at a lower level of status, or leave the area entirely. That in itself is a motivation for everyone to be successful in their first choice of company town. The balance of this calculation changes, however, depending upon the supply of labor. If labor is tight, conditions will be good, and individuals will be incentivized to leave for another company town. This mean less loyalty and less likelihood of pulling together. If labor is abundant, conditions will be worse and individuals will be incentivized to stay where they are at.

This observation suggested an interesting tension: moving people off world will be expensive, so labor will be tight. Companies will be incentivized to move enough people off world that they can be more choosy about their labor and not be completely at the mercy of a workforce (which could, for example, unionize, and bring work to a halt in an economically disastrous way).

To return to the example of law, with Roman law and constitutional law we have a top-down model of jurisprudence; with common law we have a bottom-up model of jurisprudence. To this day, England has no constitution, so its legal system is primarily bottom-up, but the tradition of monarchy, and the borrowings from Roman law inject some top-down concerns. The US began with a constitution (if one doesn't count the Articles of Confederation) so its legal structure is primarily top-down, but the tradition of popular sovereignty injects some bottom-up concerns. This is what we see in most societies: a primary model that is supplemented by subsequent revisions. Nick expects we will see the same in the future, with off world settlements starting out as top-down entities that are later supplemented by bottom-up concerns.

Once there is a critical mass of a human population off planet (and we don't know what this critical mass will be), then there will be the possibility of alternative forms of social organization coming into their own. Given the incentive by companies to move more people off world in order to assure an ample labor supply, the very action taken to retain top-down control could lead to passing the critical mass after which top-down control will become impossible.

This discussion was a lot of fun, but I realized that we hadn't actually addressed either Jim Schwartz's morality questions in the above-referenced presentation at the TVIW symposium, or the question about whether or not to "colonize" space that was raised in *Futures*.

The question of the morality of committing future generations to lives aboard generation ships or other extraterrestrial settlement from which they have little or no possibility of leaving is one worth examining on its own. As to whether humanity "should" "colonize" space, that's just academics virtue signaling to each other. If and when it will make sense economically and technologically, it will happen, and all the whining in the world won't make a bit of difference.

Nick commented that anything that we do in the present to set up a world for the future commits future generations to living in that world without their consent. This is true if we put them on generation ships, and it is true if we confine them to Earth. An argument could be made (though he would not maintain that this is a definitive argument) that we have a moral obligation to

follow out all the possibilities of the first "pulse" of industrial civilization, as we may not get a second chance. If we don't open the door to the universe to our descendants, they may not be confined to Earth, which may be seen as a greater error than being confined to a generation ship.

Nick's greatest concern for existential risk is what he has come to call "sustainable dystopia" (https://geopolicraticus.tumblr.com/post/182270083427/sustainable-dystopia-a-form-of-permanent) in which we ensure that things can go on indefinitely, but there is no possibility of broadening horizons or any hope for the future other than more of the same.

As to the future generation question, I'm drawn to pioneer movements of all types in the past. When poor people took passage from Europe to the New World in the sixteenth, seventeenth, and eighteenth centuries, they knew it was virtually impossible for them to ever return, or for their progeny to go back should they want to. The lure of freedom and economic betterment convinced them to make the voyage, in the belief that whatever the consequences for them and their offspring, their lives would still be better than if they'd stayed in Europe.

Nick said that if memory serves, Edward Glaeser in his book *The Triumph of the City* characterized moving to a city as making an investment in discomfort in order for the children of those experiencing the discomfort to have better lives. This was true for pioneers in the 19th century, it is true for people moving from city to country in the 21st century, and it will be true for people moving into space in the coming century.

This moral question isn't one of absolutes, but of probabilities. If the lives of future generations must be taken into consideration when making such decisions, the only reasonable way to phrase the question is, "Will doing this make my progeny better off than if I don't do it?" If the question is phrased, "Do I have the moral right to compel future generations to live with the consequences of my actions?" and the answer is "No," then there is no moral justification for any action, ever. If the answer is "Yes," then any action is justified.

Professor Randy E. Barnett of Georgetown University wrote an 80-page section on "Constitutional Legitimacy" in his 2004 book, "Restoring the Lost Constitution: The Presumption of Liberty." In it, he examines the concept of "consent of the governed," and whether and why the Constitution is binding on us who were born to citizenship in the US. Naturalized citizens have in fact consented to be governed by the Constitution, but natural-born US citizens have in general not affirmatively consented to be governed by the Constitution. I mention this all just to let you know about it; there's no way I can summarize 80 pages of closely reasoned legal philosophy here. Just be aware that such questions are not being ignored, and that they are somewhat analogous to the question of the moral responsibilities to future worldship generations.

I hope this intrigued you, and would love to hear your responses to it at dialogs@tviw.us.

More info can be found at: https://galaxyforum.org/1st-women-on-the-moon-2019-essay-contest/

UPCOMING INTERSTELLAR AND SPACE EVENTS

September 13-15, 2019 (San Diego, CA). Starship Congress IV: Bend Metal, Icarus Interstellar.

September 14-16, 2019 (New York City, NY). The Interstellar Initiative: 2019-2020, Japan Agency for Medical Research and Development and the New York Academy of Sciences.

September 24-26, 2019 (Wales, UK). UK Space Conference 2019. Website: ukspace2019.co.uk/

September 25, 2019 (International Space Station). Expedition 61 crewmembers launch to the ISS, including a NASA astronaut, a Russian cosmonaut, and a crewmember from the United Arab Emirates.

October 15, 2019. Abstracts for the 2020 Society for Social and Conceptual Issues in Astrobiology (SSoCIA) biannual meeting due. Website: https://egrove.olemiss.edu/ssocia/.

October 21-25, 2019 (Washington, DC). 70th International Astronautical Congress 2019.

November 10-13, 2019 (Wichita, KS). TVIW's 6th Interstellar Symposium. Website: tviw.us/

Fall, 2019. Boeing's CST-100 Starliner Orbital Flight Test (uncrewed) launch to the ISS.

Winter, 2019. Boeing's CST-100 Starliner Crewed Flight Test (crewed) launch to the ISS.

Winter, 2019. SpaceX's Crew Dragon Demo 2 (crewed) launch to the ISS.

March 26-29, 2020 (Oxford, MS). SSoCIA biannual meeting. Website: https://egrove.olemiss.edu/ssocia/.

USE AMAZONSMILE TO BENEFIT TVIW

When you do your back to school shopping with AmazonSmile, Amazon donates to TVIW at no additional charge to you. Amazon donates 0.5% of each purchase to the non-profit organizations of your choice and TVIW is one of those organizations. This is a painless way to support us.

To participate, go to smile.amazon.com. Sign into your account and a "pop up" page will appear. On the right side of the page, at the bottom is a "search" window. Type in: Tennessee Valley Interstellar Workshop and click the search button. Click on the top one and you are done. Your donations will be automatic for any purchase within the Amazon Smile program (which is most merchandise). You can also use the following link.

https://smile.amazon.com/ch/46-4572727

INTERESTED IN HELPING OUT TVIW?

Are you interested in diving into the community of individuals passionate about interstellar spaceflight? Would you be interested in being a part of an organization focused on sharing that knowledge and building a community of explorers?

If so, let us know!

Recently, TVIW announced an opportunity to help restart the 'From Here to the Stars' vlog (you can see previous episodes here: https://tviw.us/from-here-to-the-stars/). This is just one example of the many opportunities, all of which vary based on the amount of time you are willing to give.

If you are interested in learning more about the volunteer opportunities with TVIW, contact us online at tviw.us/contact-form/.

LAUREN OLDHAM
SCHOLARSHIP WINNING ESSAY

"A body at rest will remain at rest, and a body in motion will remain in motion unless it is acted upon by an external force." Newton's first law of motion. It's something that most people learned sometime in a high school science class, but quickly filed away into the mental folder of Junk I'll Never Need in the Real World. It's a law that simply states that external force is required to enact change. Isaac Newton, of course, was talking about how massive bodies interact, but this law can certainly apply to humanity's innate desire to resist change. Sometimes we have to be forced to take action.

While humans once ventured into space for science, exploration, and sheer superiority, interstellar exploration has been put on the back-burner in recent decades (the occasional space-faring Tesla Roadster notwithstanding). The Space Race is undoubtedly over. Space travel is too expensive, too time-consuming, and too dangerous to pursue.

But the time for human interstellar travel is rapidly approaching, and global climate change is going to be the catalyst that requires action. Just as Newton postulated, when humans are comfortable, they tend to stay at rest until they are forced to make a change. As sea levels rise, extreme weather events become more common, developing populations explode, and resources become increasingly scarce, the fear that Earth will soon become uninhabitable by humans is being realized. Our options are limited: we must either completely change our economies, lifestyles, and reverse our reliance on fossil fuels, or we must search for other planetary systems to inhabit.

When we do finally take to the stars, we will need every skill to rebuild society in a way that proliferates our ingenuity while avoiding the pitfalls of our current systems. Of course we will need physicists, engineers, and other STEM professionals to physically propel us into space, but we will also need navigators, geographers, and social scientists to get us and keep us there.

Geographic Information Systems, or GIS, is a scientific subset of geography that displays, manipulates, and analyzes spatial data. Digital Mapping is the act of creating maps for the digital world with a heavy emphasis on software development, user interface design, and map interactivity. As a software developer entering the Digital Mapping Masters program at the University of Kentucky, I plan to use to many applications of Geographic Information Systems to navigate and map the cosmos, compare and select potentially habitable planets, build clean, sustainable cities, and effectively manage resources and diseases.

The first step in interstellar travel is navigating out of Earth's atmosphere and into the surrounding solar system. While our solar system is well-researched, documented, and mapped, GIS can be used to chart the remainder of the Milky Way galaxy and beyond. Just as Google Earth gives a three dimensional view of our planet, digital mapping provides a way to bring life to a digital view of the universe. With exact coordinates of celestial body locations, we will be able to accurately calculate time and distances between stars, planets, and other cosmos. I will also be able to collect data and take extensive notes on each body we encounter.

With enough data, I will be able to create full navigation systems for the universe. Just as we pull up an application on our phones to tell us the fastest route from Lexington, Kentucky to Ithaca, New York, space travelers will be able to plot a route between Earth and the Kuiper Belt and beyond. More than just providing navigational guidance, the application will also have detailed information on each discovered object to help filter by planet type, asteroid size, atmospheric components, or even interstellar gas stations or Starbucks (for coffee or Battlestar Galactica memorabilia). Using data visualization packages such as three.js and Mapbox, I can design a solid front-end user interface for this application, allowing users to seamlessly navigate both the app and the universe.

Our goal, however, is not simply to traverse the cosmos aimlessly. Because of the continued degradation of Earth, we aim to find an Earth-like planet to inhabit. As it turns out, the universe is virtually endless and habitable planets are a dime a dozen! But not all of our potential new homes are created equally - we need to observe, collect data, and compare the planets to determine which will be the best fit for humanity. GIS is the perfect tool to accomplish these comparisons.

Once we find planets that have suitable atmospheric conditions for humans, it is most important that they have ample land and water resources to support life. With detailed satellite imagery of each new planet, I can create digital maps of their surfaces. Utilizing geoprocessing tools, I can also perform proximity analyses to determine if and where land masses are close enough to fresh water, and how much water is available to support populations of people. This sort of analysis will allow us to determine general locations on landmasses that can best support human life without straining resources.

Digital mapping will not only be useful in plotting water resources, but also countless other natural resources. Whether these other planets are rife with gold, copper, aluminum, or some other currently unknown elements, their locations and quantities will be valuable information in determining which planet is the best fit for humanity. Similarly, we will require lumber or other wood-like materials to build shelters and other equipment. Through raster files, I can plot exact numbers of resources in predetermined and consistent grids (1km by 1km or even more refined), overlay them with polygons of human settlements, and then perform zonal statistics to count how many resources are immediate or closely available to humans. We will need to rebuild society literally from the ground up, so comparing the locations and quantities of these resources through GIS will be integral in selecting the best planet for humanity.

In addition to plotting the static locations of natural resources, we will also need to research and monitor potential natural hazards in each environment. Rain, snow, wind, and temperature can be mapped in interactive web applications for daily use. Using satellite imagery, rasters can be plotted on top of imagery or other map features (points, polygons, etc.) to show the movement and quantities of small weather systems. We need a planet with enough rain to be able to replenish water systems evenly and grow crops, but not so much rain that we become perpetual seafaring creatures.

Larger storm systems such as hurricanes can be modeled and plotted in a similar fashion, predicting future damages if they were to hit populated areas. Tracking and mapping these systems over the course of many years will show which paths are the most common. I can then generate heatmaps that can be used to determine areas that are most susceptible to these systems, so we will be able to actively avoid building cities around them. Furthermore, geospatial analysis can be used to compare elevation to storm surge, determining areas that are most prone to flooding. Natural hazards can be unpredictable, but a little mapping and analysis goes a long way in mitigating worst-case-scenarios such as flooding in New Orleans and Houston in recent decades.

After we select our new home planet using GIS analysis, I can use another geographic subset to help design our cities: urban planning. Designing cities to be efficient and sustainable is incredibly important in avoiding the same pitfalls that forced us to leave Earth in the first place. There, cities have become sprawling, overcrowded, congested, massive waste-generators. With urban planning, I will be able to design cities with infrastructure to encourage public transportation, optimize routes to resources, and reduce urban sprawl by implementing mixed-use planning with ample walking and bike paths.

A common argument that we hear against public transportation in many current cities is that the infrastructure was not built to support it and it would be far too disruptive and expensive to implement. Utilizing urban planning theory and digital mapping, I can design cities with these features before they're even built. Underground subway systems like those in Hong Kong, London, and New York City will be mapped and constructed long before the cities on top of them. I can use GIS to discover population hotspots that would require more closely-spaced and frequent subway stops, while also branching out into rural areas that are often ignored in our current subway systems.

Cities themselves will be mapped strategically to be evenly distributed with rural agricultural lands between them. Rapid bullet trains like those in Japan will link cities together, thus reducing the reliance on air travel over land masses. With farmlands located near cities, the transportation of goods will be short and reliable, reducing the demand for cargo travel, and subsequently reducing carbon emissions.

In addition to underground railroad systems, I can also design roadways to greatly reduce car congestion. Hearkening bus transit systems like the one in Curatiba, Brazil, I can create easily accessible, frequent, comfortable, and attractive bus lines and stops in areas where underground systems are less feasible (which I will already know from previous land mass analyses). Buses will have access to bus-only roads that enter the hearts of cities where cars are not allowed. When buses are cheap, reliable, and relaxing, people will be encouraged to utilize them in place of personal vehicles or ridesharing.

The final linchpin of sustainable cities is mixed-use zoning. Many current cities and their surrounding suburbs are constrained by strict and restrictive zoning laws. Housing, retail sites, restaurants, office parks, and schools are only allowed to be built in certain areas in according to zoning divisions. This results in large, sprawling cities filled with commercial enterprises that are largely segregated from housing areas. People are forced to commute ever-longer distances into the surrounding suburbs to purchase affordable homes, exacerbating traffic congestion.

Mixed-use urban planning is key to reducing urban sprawl, and the best way to design is it to study geographic theory and map it. It is easy to fall into the trap of doing things the same way that we have always done them, but in order to create thriving cities that will not ruin our new environment, we have to be vigilant in *actively* planning to reduce our carbon footprint. In our new cities, densely populated apartments will be placed beside offices and playgrounds and zoos and restaurants and grocery stores. With reliable and cheap public transportation, there can be heavier emphasis on walkable and bikeable spaces in city centers. Sidewalks, bike lanes, and tree cover will be plentiful, all achievable through planning and mapping. No matter what resource you need, it close by and not require a personal vehicle to get to.

Now that we have traveled the universe, analyzed and selected a new home planet, settled into that planet *and* have clean, maintainable cities, we are ready to set it and forget it, right? Wrong! You know what they say - more planets, more problems. With new environments, resources, plants, and animals, of course there will be a host of new problems to contend with.

Luckily, geography and digital mapping will continue to provide support in assessing and mitigating these new problems.

A key to proper management of resources is to actively manage them from the very beginning of their use. Many natural resources on Earth have been mismanaged because we became reliant on them before we realized how scarce or destructive they were for the environment. On this new planet, we already have accurate measurements of all of our new resources, so I will be able to update our raster maps as we use them to detect changes in quantities. Utilizing digital mapping, I can transform these static maps into an interactive web application with a time slider to show resource quantities over time to ensure that we are not over-harvesting them. Similarly, I will be able to map carbon emissions and other pollutants on a regular basis to determine areas of concern before they spiral out of control.

In addition to monitoring various emissions on our new planet, we can also monitor and track new pathogens. An unfortunate consequence of settling a new planet is that new diseases will be a huge problem. Just as explorers spread European diseases to the "New World" during the Age of Exploration, so too will humans contract and spread new diseases in this (literal) new world. John Snow (the Father of Epidemiology, not the King in the North) was the first to use mapping and spatial analysis to determine the source of a cholera outbreak in London in the 1800s, ultimately halting it before it could spread unmanageably. Using more modern methods of this same analysis, I can track diseases as soon as they arise so that we can narrow down their origin and hopefully stop them from spreading.

From first leaving Earth's atmosphere to solving problems on our new planet, GIS and geography are integral to the success of interstellar travel. They are incredibly vast fields that encompass many different areas of study, from the hard sciences to social studies. The applications of many STEM professionals in interstellar travel are obvious; astrophysicists who know the mechanics of the universe, engineers who design and build new equipment, aerospace technicians who maintain spacecraft. But geography and GIS are the unsung heroes of interstellar exploration. Geographic Information Systems are comprised of statistics, analysis, computer science, web development, and countless other STEM fields. Geography more generally studies the interconnectedness of people and their environments. While the technology of GIS will help us navigate and analyze the universe around us, the theories of geography will help us build sustainable infrastructure, economies, and lifestyles to avoid the mistakes we have already made on Earth. Both are needed equally for successful interstellar travel.

As a student of the Masters of Science in Digital Mapping program at the University of Kentucky, I can employ my burgeoning expertise of Geographic Information Systems to get us there. With a Bachelor of Arts in Geography and approximately one-third of my graduate coursework in Digital Mapping completed, I know a lot of the theory and applications of GIS, but exploring more thorough technical capabilities under the mentorship of leading Digital Mapping experts will further engage me to help in interstellar missions.

-

Exploration has long been a favorite pastime for humanity. Much less of a hobby and more of an intrinsic driving force, humans have always pushed boundaries to see what else is out there, wherever 'there' may be. From the 15th to the 17th centuries, sailors took to the sea during the Age of Exploration, ultimately spreading European influence across the globe. Many of the great explorers - Columbus, Magellan, Vespucci - were accomplished sailors and navigators, but most importantly, they were pioneer geographers.

While much of the Earth has already been explored in some capacity, humans still seek discovery. And where better to set our sights than up? Whether we explore the cosmos for science, for fun, or to escape an increasingly volatile Earth, just as we set out across the Atlantic to discover what lay beyond the endless horizon, we will one day take to the skies to examine the universe. Hearkening back to the age of great discovery several centuries ago, we will need the best geographers to lead the missions of interstellar travel. Geography and Geographic Information Systems can be used to guide our descent into the unknown, analyze celestial bodies for human suitability, build thriving, sustainable cities, control resources, diseases, natural disasters, and so much more.

Until Next Time…
Look Up at the Stars
and
Dare to Dream Big.