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Returning to the Moon: Legal Challenges as Humanity Begins to Settle the Solar System – Full Transcript

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RETURNING TO THE MOON: LEGAL CHALLENGES AS HUMANITY BEGINS TO SETTLE THE SOLAR SYSTEM - FULL TRANSCRIPT

INTRODUCTION

On March 6, 2020, leading space lawyers gathered in the Moot Court Room of Cleveland-Marshall College of Law at Cleveland State University to discuss and debate the legal challenges and opportunities arising from the growing number of lunar missions in the planning stages in early 2020, in particular NASA's Artemis Program which will for the first time establish a permanent human habitation on our moon through cooperation between NASA and its international partners (both public and private). The day-long symposium on *Returning to the Moon: Legal Challenges as Humanity Begins to Settle the Solar System* was organized by the Global Space Law Center (GSLC) together with the Global Business Law Review (GBLR). SpaceX and the Open Lunar Foundation sponsored the event (along with an auditorium full of local attorneys seeking Continuing Legal Education credits in Space Law!).

The title of the symposium only tells part of its story. While there are certainly many legal challenges that face the world as we return to the Moon, all of those who contributed to this symposium see something more – we see *opportunities* for ensuring that the future of humankind in space will take place in a peaceful, safe, and law-abiding environment that enables governments, private companies, and even individuals to enjoy the benefits and wonders of space. The participants in the symposium are the people who are writing the space laws of today, influencing the various legislative and normative efforts in the field of space law and policy, and, in the case of some of our representatives from the administrative government, enforcing the laws of outer space. This forum on March 6th at Cleveland-Marshall College of Law (C|M Law) brought these people together to share their thoughts about the future of space law as we embark on unprecedented journeys to the Moon and cislunar space.

The symposium was designed as an anti-conference. There were no canned speeches and no threat of death by PowerPoint. Instead, our eleven speakers participated in five dynamic panels as I, Prof. Mark Sundahl of Cleveland-Marshall College of Law, worked, as the moderator, to keep the conversation flowing.

Although most of the symposium proceeded according to plan, the audience also had its share of surprises. During the panel on how to govern a lunar settlement, a surprise announcement was made by Dr. Giuseppe Reibaldi, President of the Moon Village Association, who joined the panel from Rome, Italy via Zoom. Dr. Reibaldi announced that the *Draft Moon Village Association Principles* had been published and was now open for public comment. These Moon Village Association Principles were drafted to supplement existing law and provide a forum for developing best practices for the long-term sustainability of lunar activity. While the United Nations will address the outstanding issues in time, the Moon Village Association has spearheaded this grass-roots effort to immediately undertake the process of developing best practices among space actors.

We were also privileged to have Professor Steven Freeland join the symposium from Western Sydney University in Australia. Although Professor Freeland has long been recognized as a thought

leader in the field, his participation in the symposium had particular meaning, because he had recently been appointed co-moderator of the upcoming General Exchange of Views at the United Nations Legal Subcommittee regarding resource extraction.

Although the lion's share of the symposium was dedicated to issues of national and international law, the symposium also recognized the local Ohio aerospace industry during the luncheon panel moderated by Scott Parry, a C|M Law alumnus, and featuring John Sankovic, President of the Ohio Aerospace Industry, Jay Jackson of NASA Glenn's Office of the General Counsel, and local aerospace attorneys, Jon Yormick and Justine Kasznica.

Finally, at the end of the symposium, the student members of the GSLC Research Council read out questions that had been anonymously submitted by our attendees during the day. These questions sparked a final free-for-all involving all of our speakers that brought the symposium to a final crescendo of good cheer that spilled over into the cocktail reception.

What follows is a transcript of the symposium. This is a break from the traditional format of the American law journal, but the entire purpose of the symposium was to break free from canned presentations and see what comes of dynamic debate. The only way to preserve the special character of the fruit of this debate is to capture the actual conversation in a transcript.

However, before I leave you to the transcript, I must recognize the people who brought the symposium to life: Kristina Schiavone JD '21 (Member of the GSLC Research Council and Articles Editor of the GBLR) and Joseph Nelson JD '20 (Editor-in-Chief of the GBLR). The success of the symposium was largely due to their tireless work. As always, all the law school logistics were handled effortlessly by Jill Natran, Administrative Coordinator of External Affairs at C|M Law, who went above and beyond when attendance suddenly spiked on the morning of the event.

Onwards and upwards!

Mark J. Sundahl, Director

Global Space Law Center, Professor of Law, And Symposium Moderator

Novelty, Ohio

September 18, 2020

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WELCOME REMARKS

Speaker: Dean Carolyn Broering-Jacobs Associate Dean for Administration, Cleveland-Marshall College of Law

Dean Carolyn Broering-Jacobs [0:04]

Good morning. I am Carolyn Broering-Jacobs. I am the Associate Dean here at Cleveland-Marshall College of Law, and it is my great pleasure to welcome you on this rainy, cold Cleveland morning. Our Dean, Dean Lee Fisher, sends his regrets. He very much wishes that he could be here with us today. Unfortunately, he was unexpectedly called away to a meeting in D.C. I do believe he had dinner with some of the speakers last night, but unfortunately was not able to be here today. It is my pleasure to be here instead.

Our mission, here at Cleveland-Marshall, is quite simply: 'Learn Law, Live Justice.' Throughout our one-hundred-twenty-year history, we have been opening doors and paving the way for generations to come. We were the first law school in Ohio to admit women, we were one of the first law schools in Ohio to admit African Americans, and we are constantly looking toward and planning for the future. One very concrete way that we are looking toward the future is through our very own Global Space Law Center. We are very proud to be one of the only law schools in the United States with a center dedicated exclusively to the study of the law of outer space.

As I reflected on the subject of today's symposium, I could not help but notice how beautifully questions about returning to and settling the moon fit with our mission of 'Learn Law, Live Justice.' That was particularly so when I looked at the lineup of speakers and the organizations that those speakers represent: Organizations that seek to achieve secure, sustainable, and peaceful uses of outer space, benefiting the Earth, and all its people. Organizations taking steps toward space settlement in a way that is equitable, and even a nonprofit focused on protecting human cultural heritage in outer space.

We are so pleased to host the symposium today and to have all of you with us here. Before I close, I want to especially thank our generous sponsors without whom this symposium would not have been possible: Open Lunar Foundation and SpaceX. I also want to give a special thank you to the student members of our Global Space Law Research Council and the student editors of our Global Business Law Review, whose hard work has been instrumental in making today happen. And of course, I want to thank Professor Mark Sundahl. Many years ago,

before I think most of us here at the law school thought that space law was relevant, Professor Sundahl started teaching a course, and the interest grew, and the work here grew, and now we have a center. We are hosting this symposium and it is all due to the energy and enthusiasm of this man. So I thank you Professor Sundahl for all of your hard work and for all of the interesting folks you bring to the law school and for helping our students and all of us 'Learn Law, Live Justice.' So, without further ado, Professor Sundahl.

PANEL 1: SETTING THE STAGE: AN INTRODUCTION TO NASA'S ARTEMIS PROGRAM AND THE BASICS OF SPACE LAW

Panelists: Mark J. Sundahl, Professor of Law and Director of the Global Space Law Center
Christopher D. Johnson, Space Law Advisor, Secure World Foundation

Mark Sundahl [4:12]

Hello. Thank you all for coming. This is a tremendous turnout. I started this process of organizing the symposium a few months back, which is not a lot of lead time, and we did not know quite how it would turn out or what the interest level would be. It turns out that it is pretty high, so you're the ones that make this a success, and I very much appreciate you coming out. You make it a success, and our students who put this together and spent so many hours also deserve a great deal of credit. But we will be speaking to them later in an official ceremony.

At this point, I want to kick off this conference, which is going to be really the 'anti-conference' in the way that I have been marketing it. Maybe that is why some of you are here. Maybe you heard me on NPR saying, 'if you fear death by PowerPoint you should come to this conference.' If you despise canned speeches, you should come to this symposium, because there is going to be none of that here.

I will not allow anyone to give a speech or presentation. I am going to be orchestrating the debates. We are going to have four panels. It will be my job to keep the conversation flowing, keep the dynamics alive, and to really press our speakers and penetrate to the heart of some of the most challenging issues in space law. That is my goal and what I hope we can achieve today, and you are all going to be a part of that as well because I want audience participation. Do not hesitate to interrupt-raising your hand would probably be polite, but I welcome interventions and interjections.

Now, the lineup of speakers is extraordinary, and I am honored to have them here today. I will introduce them as we go through the day. We have really some of the leading lights in the field of space law here with us. For obvious reasons, some speakers had to pull out of the symposium. We did not let that stop us. We have forged ahead, and we are we are going to present the show to you. We also have, and this is another thing that I am experimenting with, but we are going to have speakers participate remotely for three of the panels. Not the

luncheon panel, but all the others. We have an attorney from Washington, a space lawyer from Australia, and a gentleman, Dr. Giuseppe Reibaldi, from Roma. So, I am going to hope that all the technology works, and we can bring these people in to join us on the screen overhead.

All of you might wonder: 'Is there really such a thing as Space Law? What are we going to be talking about for the next six hours? Is there really enough to talk about?' Let me start off by saying: yes, absolutely. Space law may sound very futuristic, but it is not. It is really a long-standing field of law. We had our first efforts in law in the early sixties and the treaties in the sixties and seventies. It has been around quite a while, but things are really starting to get interesting now.

So, I want to, before we get into the meat of the symposium in our debates, to lay the groundwork for you and give you a little background on the basics of space law. I also want to explain to you really why we are here, and that is the NASA program: *Artemis,* to return to the moon. To return this time to stay, and to establish a permanent human presence on the moon.

President Trump has set the goal of 2024 for a first lunar landing in this program. I am going to kick things off by showing you NASA's video explaining how we are going to get to the moon and what we are going to do there. To lay this foundation, I did not want to do it by myself because I know that you will tune out my voice in the next couple of minutes if I keep talking. I am going to bring a friend of mine and a well-known space lawyer, the space law and policy expert of the Secure World Foundation, which is a nonprofit organization dedicated to the sustainable peaceful use of outer space. Chris, will you join me and come on up? I am going to ask Jeff to come up and I will get this video going, and then Chris and I will lead you through the end of the history and the nature of the law of outer space.

***We Are Going* NASA Video [10:26]** Fifty years ago, we pioneered a path to the Moon. The trail we blazed cut through the fictions of science and showed us what was possible. Today, our calling to explore is even greater. To go farther, we must be able to sustain missions of greater distance and duration. We must use the resources we find at our destinations; we must overcome radiation, isolation, gravity, and extreme environments like never before. These are the challenges we face to push the bounds of humanity.

We are going to the Moon to stay by 2024, and this is how. This all starts with the ability to get larger, heavier payloads off-planet, and beyond Earth's gravity. For this, we designed an entirely new rocket: The Space Launch System. SLS will be the most powerful rocket ever developed. And with components and production and more testing, this system is capable of being the catalyst for deep space missions.

We need a capsule that can support humans from launch, through deep space, and return safely back to Earth. For this, we've built Orion. This is NASA's next generation human space capsule. Using data from lunar orbiters that continue to reveal the Moon's hazards and resources, we're currently developing an entirely new approach to landing and operating on the Moon. Using our commercial partners to deliver science instruments and robotics to the surface, we are paving the way for human missions in 2024. Our change is to go quickly and stay, to press our collective efforts forward with a fervor that will see us return to the Moon in a manner that is wholly different than 50 years ago. We want lunar landers that are reusable, that can land anywhere on the lunar surface. The simplest way to do so is to give them a platform, in orbit, around the Moon, from which to transition. An orbiting platform to host deep space experiments and be a waypoint for human capsules. We call this lunar outpost Gateway. The beauty of the Gateway is that it can be moved between orbits. It will balance between the Earth and Moon's gravity in a position that is ideal for launching even deeper space missions.

In 2009, we learned that the Moon contains millions of tons of water ice. This ice could be extracted and purified for water, and be separated into oxygen for breathing or hydrogen for rocket fuel. The Moon is quite uniquely suited to prepare us and propel us to Mars and beyond. This is what we're building. This is what we are training for. This can replicate throughout the solar system. This is the next chapter of human space exploration. Humans are the most fragile element of the entire endeavor, and yet we go for humanity. They go to the Moon and on to Mars to seek knowledge and understanding, and to share it with all. We go knowing our efforts will create opportunities that cannot be foreseen. We go because we are destined to explore and see it with our own eyes. We turn towards the Moon now, not as a conclusion, but as preparation. As a checkpoint toward all that lies beyond. Our greatest adventures remain ahead of us. We are going. https://www.nasa.gov/artemis/videos

Mark Sundahl [14:13]

So, there you have it. We are headed back to the Moon. We have the international space station, as you know, orbiting the Earth. We are going to have another international space station, one orbiting the Moon. It is going to be called the Lunar Gateway. That is under construction and NASA is moving very quickly to get it off the ground. Lunar Gateway will be created and then the lunar settlement will take form. So, that's where we're headed. Now, I want to take a step back. I could go back all the way to 1932 when the first book on outer space law was written: Das Weltraum-Recht: Ein Problem der Raumfahrt. It was written in German by a Czech lawyer, Vladimir Mandl. That is the beginning of space law.

Chris, welcome. Maybe you could say a few words about Secure World Foundation and then we will get back to Vladimir Mandl.

Chris Johnson [15:23]

Certainly. Thank you and good morning.
I want to say first to the folks in the audience, if this is your first space law event or maybe your first space event, space law is a wonderful field, a wonderful community. I've known Mark for 10 years. It's great to finally share a panel and to have a discussion with you in public about space law; what we think it means, and maybe we are going to discover some discrepancies with some overlap and also some points of contention between us. So, thank you for having me and thank you for inviting me. Welcome to the Space Law community. I think you are going to find it a very interesting field to work in. While you are here, meet some of the folks around you. Come up and chat with us and get to know how the space field works. Maybe we can point you to some resources or some opportunities.

Now, what do I do? I am a Space Law Advisor at the Secure World Foundation. It's an NGO, nongovernmental organization, thus my casual demeanor and dress. As an NGO, what we are focused on is the peaceful and sustainable uses of outer space. So, we work with governments, with foreign ministries, military, academia, scientific community, and especially now with the commercial community to try and get them to have conversations that are shared. We get the people that are concerned with astrobiology chatting with the folks who want to do asteroid mining and lunar resource mining to say these are legitimate, peaceful uses of outer space. You have overlapping interests you need to coordinate amongst yourselves. We get the folks from the commercial field addressing the folks in the military field and say 'is space a

domain or is space a commercial domain or a scientific domain?"

One of the things that is happening now is overlapping uses, contentious uses. You've seen in the news mega-constellations. Mega-constellations sound great, they sound like a great opportunity, but they are affecting another peaceful legitimate use of outer space, which is ground based astronomy. Astronomers have been exploring space for generations, for millennium. So now, mega constellations prejudice and inner affect what astronomy wants to do. How do we mitigate and deconflict those two legitimate uses of space? This is what civil society does, it brings together these stakeholders and tries to get them to have a conversation where we work these things out.

I work in D.C. and I work with a lot of different folks in different communities and honestly, it's mega constellations that I have been working on recently, but before that it was conflict in space. The idea of the space force and the inevitability of conflict in outer space. Is conflict in space inevitable? Is outer space a war-fighting domain? What are the consequences of space force? How does the law of international conflict [international humanitarian law, "IHL"] intersect and overlap with the law of outer space? So, it really is the security issues.

With that, I want to return to the history of space law. You may sit and read the Outer Space Treaty and think it is focused on peaceful uses, but I would say, maybe Professor Mandl back in 1930s, and people writing in the 1930s, were thinking of military uses when they were thinking of space law. When I look to the early drafting of the Outer Space Treaty - and I encourage you if you have an internet connection to get a copy of the Outer Space Treaty because we are going to go through it - When I look at the Outer Space Treaty and where it comes from, the 1963 principles declaration, I see a negotiation on military uses. It is a security treaty, an arms control treaty. And with that, how do we turn to the history of space? How do you think about it?

Mark Sundahl [19:30]

Yes, well, you're absolutely right. The origin of our hard space law, I mentioned Mandl back in 1932; but what really got space law going, you can even go back to someone mentioned it in 1910. What really got space law [to be seen] as a legitimate project was the launch of Sputnik by the Russians and then the Explorer. As soon as Sputnik went up, we realized that we had to start regulating this activity and placing some limits to it. Of

course, one of the initial primary concerns was the military use of outer space and the threat that an enemy could position a nuclear weapon in space right above our country.

Chris Johnson [20:35] The first actor to put something in space was the Soviet Union on October 4, 1957. . . . And what is notable about that is that no one objected to it. The U.S. did not object. Why did the U.S. not object to overflight? Instant custom.

Mark Sundahl [20:52] Yes.

Chris Johnson [20:53] Let us let *them* do that. We are not going to object to their satellite crossing over the Earth, because then we can do it. And if we can do it, that means we can put cameras on it. Let's allow that to happen, let's establish, as a custom, the freedom of access and overflight rights.

Mark Sundahl [21:08] Yes, yes. And with that, we better turn to the language of the Treaty because Chris is starting to delve into the substance here.

Chris Johnson [21:24] Excellent.

Mark Sundahl [21:25] I thought the way we would organize this presentation is to follow the structure of the Outer Space Treaty, which is the foundation of international space law. It is the Magna Carta, as we refer to it. It is the first treaty from 1967, hammered out primarily by the United States and the U.S.S.R. It is only the first of multiple treaties, five multilateral treaties. The Outer Space Treaty was the first, and then we had a convention immediately thereafter, a treaty on the return of astronauts, if a spacecraft went off course, and the return of the technology to the launching state. That was the next issue addressed in the Treaty. Then we had the liability convention, which explains how countries are liable for space activities and any damage caused by them. We had the Registration Convention follow, which requires that states register any space objects they put into orbit or beyond. Finally, we have the Moon Agreement.

Mark Sundahl [22:36] This final Moon Agreement did not fare as well as the other four space treaties, which [were] broadly ratified very successfully. All these treaties I just mentioned elaborate upon principles that are presented first in the Outer Space Treaty. So, be aware that there are other treaties out there. But this is the Magna Carta on which everything hangs, and I thought we'd go through it.

Chris Johnson [23:10] Can I point to a few ideas in the preamble? We know that the preamble of a treaty is not legally operative text. It does not create rights or obligations, but we can look to the preamble to gain an idea about the object and purpose of the treaty, as we know from the Vienna Convention on the Law of Treaties.

Object and purpose: object is the subject matter. What is this treaty about? The purpose is the rationale for why states have decided to change the pre-existing legal status quo into something new. We're going to create this treaty to create new rights and obligations to clarify existing law. The purpose of the Treaty: what I point to [in order to] gain interpretive guidance from the preamble, right here, '*great prospects opening up for mankind in the exploration of space.'* Right there. I point to that, '*whereby the great prospects opening up for mankind as a result of man's entering the Outer Space.'* This is [the] VCLT [Vienna Convention of the Law of Treaties] treaty interpretation. VCLT has ordinary means of treaty interpretation, and here, if you arrive at [an] interpretation of the Outer Space Treaty that contradicts this, I believe you've arrived at an incorrect interpretation. So, keep that in mind as we go through determining what articles mean. Then, the later ones, the recitation of the previous instruments and other objects and purposes: international cooperation, scientific investigations.

Mark Sundahl [24:54] And here we go, Article I. This lays out one of the key concepts as you might expect in Article I of the treaty. And what I really want to point out here [is]. . . '*The exploration and use of outer space including the Moon and celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree in economic or scientific development, and shall be the province of all mankind.'*

Chris Johnson [25:30] Let's read that again. What is the province of all mankind?

Mark Sundahl [25:32] Not space. It's space activity. The exploration and the use of outer space is the province of all mankind.

Chris Johnson [25:42] Not the physical domain itself, but the ability to explore and use.

Mark Sundahl [25:49] Right, right. And this, you know, raises issues because the province of mankind harkens to language that could have legal ramifications. That is, if space is the province of all mankind, then that may invoke environmental protections in other types of law. That is an important point of interpretation to point out.

Chris Johnson [26:22]

Keep that in mind when we get to Article II because here, we are saying the exploration and use is the province of all mankind. We are going to compare that later. That phrase 'province,' - it is uncertain what it really means, but we have ideas elsewhere in international law and international relations about common pull resources, the global commons, and then whether space is *res communis* or whether the exploration and use is the province. And guess what? I have my own, as you can already tell, subjective views on what this phrase means and how to interpret it. There are just many, many interpretations because I don't think we really have objective authoritative guidance on exactly what is the province of all mankind and what is not the province of mankind.

Mark Sundahl [27:12]

This approach embodied this idea of it being the province of mankind and available to everyone. We can go onto the second paragraph here. It says that '*outer space. . . shall be free for exploration and use by all States without discrimination . . . and free access to all areas of celestial bodies*.'

This idea that the space *activity* is the province of all mankind and that the use of space is free and open to everyone, it's this concept of *res omnium*, that the space belongs to everyone. It's not *res nullius*, it's not a thing that belongs to no one. That was deliberately avoided because if something belongs to no one, then it could belong to you if you appropriate it. Finders, keepers. The law of discovery and the age of colonization is what we wanted to avoid. So, instead of space belonging to no one, and therefore subject to appropriation, the drafters make it clear that it belongs to everyone. It is the province of all mankind and use is open and free. You know, Chris is right, the Treaty begins with a very open and permissive approach. Then, we are going to get into the limits on space activity as well.

Chris Johnson [28:39]

Exactly. And we spend this amount of time on Article I because it is establishing the rights. Everything follows from it: our obligations, further obligations, or, in fact, prohibitions. An obligation to undertake a particular action or a prohibition to refrain from undertaking a particular action. It is Article I that establishes that right that is weighed against. Some comments and questions, Professor Mirmina.

Steve Mirmina [29:02]

This is really interesting. Can you guys elaborate on what does it mean that it's the province of all mankind, because that seems to have almost a colonialism connotation to me to say that it is the province. Has this been used in previous treaties? Is there any clarity as to why that term is chosen? You

mentioned environmental concerns but those didn't happen until years after. This concluded in 1967. This actually came from 1961 right from the declaration. So, what did the drafters have in mind when they chose those words?

Mark Sundahl [29:45]

What is great about this question, first of all, is – I will introduce him formally – it was asked by the lead international lawyer at NASA who handles issues of the international space station. There are two other experienced space lawyers here and we can't even agree on what some of the language in the first article means. So, even though this has been around since the sixties, there is plenty of room for questions and debate and we will see that as we go through. There are hot button issues that revolve around the interpretation of words and phrases here.

Mark Sundahl [30:29]

Now, I am not dodging your question. That was a pretty good dodge, maybe, but I really don't know. I think it is an unusual formulation to say that activity is the province of all mankind rather than physical space. I am not aware of anywhere else and there [are] a lot of experienced international lawyers in here.

Chris Johnson [30:55]

What does province mean? I guess, for me, it means 'if you'd like to undertake that activity.' So, it is not mandatory that you explore outer space, but if a state chooses to do so out of national interest, then certainly that ability to exercise that right or freedom to explore space is something that is given to them and established. Because the Outer Space Treaty, think about it, could say that it's prohibited to explore outer space unless you get permission from the United Nations or you get permission from the Security Council. No. They are saying it's a right that you hold explicitly codified in Article I, if you should choose to undertake it. And beyond that, I'm not certain what it means. I want to…yes, question.

Audience Question [31:47]

Thank you. This is not meant to be political in any sense, but seeing the language in that first paragraph - is there among space law, the space law community, is there concern that the America first policy - somehow strange, this first paragraph, *the province of all mankind* and the announcement of the Space Force, et cetera…is that causing consternation or concern among other countries?

Chris Johnson [32:24]

That's a great question. I think you are correct. If it is a statement by someone in the U.S. government that says we need to dominate outer space, that seems to run counter to the right of all states that are parties to the Outer Space Treaty to

explore it without. . . you know, look at the next two paragraphs: 'Without free equal access.' 'Without asking permission from other governments.' As one state which says that we will dominate an area outside of our state territory. We have the high seas with international air spaces. All these areas outside of state territories where states can only exercise their jurisdiction in one state saying that we need to dominate that area. I would lean for it being a little bit ambitious.

Mark Sundahl [33:13]

Yeah, and I would respond to that. . .if we had to negotiate in an outer space treaty today, we would not get this. The United States would not sign it and ratify it, and that's one of the reasons. We'll talk about this throughout the day today: do we need new law? Do we need new space laws? And then, what form do they take? Treaty? Domestic? Soft law?

There are, on a regular basis, calls to revise the Outer Space Treaty, amend the Outer Space Treaty. Bring it up to date. Professor (Joanne) Gabrynowicz, a well-known space lawyer said, 'do not call for the amendment of the Outer Space Treaty, because that opens up the possibility for all kinds of changes to it and who knows what we are going to get.' We are very fortunate to have this excellent set of rules on the books now and we do not want to threaten that.

Audience Question [34:30]

My question, I mean it's axiomatic, access is a wonderful word, but you have to pay for it at some point. The colonialism question is still out there if you are ending up driving all the world scientific activity towards your access, your way to get out there. You're the one creating the infrastructure and they have to pay their way to get on your rockets and in your space. I think we still have to really work out the idea of what this shared access really, really means. I mean, you've got other countries coming on with their own rocket systems and things like that, but there has to be some sort of generic infrastructure out there that. . .we're either paying into or able to participate with.

Mark Sundahl [35:19]

No, it is an interesting idea, and it is an ongoing debate and we will have more time to talk about this. This idea of operating in the interest of all countries and sharing benefits. Cooperating principles, these are all principles that we aspire to. Cooperation internationally - we have great success in that and the international space station. But what do those terms really mean? Like sharing benefits, does that mean that if we are mining asteroids, we need to share the platinum with all the countries in the world irrespective of economic development? No. I don't think anyone is saying that. Telecommunication

companies do not share their profits equally among the countries of the world. But what is the sharing? What is the cooperation? To what extent must we give, must we share?

Mark Sundahl [36:19] We are going to take one more [question] and then we've got eleven more Articles to do in the next ten minutes.

Chris Johnson [36:22] But this is really the big one because it's the right one . . .

Mark Sundahl [36:24] Yes.

Chris Johnson [36:26] **. . .** but go ahead.

Audience Question [36:27] I wanted to ask whether the Russians have a difference or different interpretations of the treaty based on their Russian translations?

Chris Johnson [36:36] We will see in the later articles that all versions of the treaties in the different languages are official, but it was negotiated in English. To my knowledge, I've never heard Russian statements at the United Nations taking different interpretations of treaty provisions that run counter to what we've heard elsewhere.

Mark Sundahl [37:00] But, that is a good point and certainly, we have different interpretations. There is no question about that, but is its different interpretations because of a different meaning of a Russian word? It's also possible. We'll talk about some of [the]. . . different questions. . .and different interpretations with respect to Article II. Let's understand that Article I emphasizes the freedom to use and explore outer space and encourages cooperation and operating in everyone's interest.

Now, we get to Article II, the famous and controversial prohibition on appropriation. This is not the age of discovery. This is not the age of colonization. We will not allow that in outer space. It says that '*outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.'* We are not allowing countries to appropriate celestial bodies. We will not allow the Moon to become the fifty-first state or a province of Russia. We did plant a flag there, but it was a symbol that we came in peace. (There are debates about the meaning of this and about how this prohibition impinges on the right, this *freedom* to use outer space. In particular, to use natural resources, to extract natural resources from the moon and other celestial bodies. Asteroid mining - is that permitted under Article II? Isn't that a type of appropriation of a celestial

body? If you picked up a moon rock, can you take it home? That's a question that I think the consensus now, I can safely say, I'll boldly say, [is] that it is permitted, and the U.S. Congress has made that explicit in a statute from 2015, making it clear that anyone who extracts natural resources from a celestial body can own that and sell it. And make money on it. That is one of the hot issues. Yes - Jessy Kate [Shingler] [pointing to audience].

Jessy-Kate Shingler [39:15] Can you say a bit more about the relationship between appropriation and sovereignty in this phrase 'international law contacts'? In particular, the phrasing seems to imply that sovereignty, a claim of sovereignty, involves appropriation. Does that mean that appropriation implies sovereignty? And what does that imply? What is it trying to say? Is it trying to say something about the permissibility of sovereignty and space versus appropriation itself?

Chris Johnson [39:51] I like that distinction- that merely one actor, who is not a state using resources to derive water, fuel, or air, use it to build habitats on the moon. One particular actor, not a state. Not making a claim of sovereignty using those resources, and that being different from the impermissible appropriation.

The way that I explain Article II, is that it is a sliding scale, and at the far end of the spectrum, that which is clearly prohibited is national appropriation. But, closer along that sliding scale in the area of legality is the use of resources. Including the use of resources for all the purposes that we want to do in space, for deep space, long term presence in space, i.e., pointing to Article I freedom preamble inspired by the great prospects. If we are to do those long-term things in space, like Artemis, it means that Article II permits those things. National law, which solidifies that, shows one state's interpretation of what that article means. As is pointed out by the U.S. delegation COPUOS, the Committee on the Peaceful Uses of Outer Space, where these treaties were drafted. As it was pointed out by the American delegation. States pass national legislations clearly enshrined in the right to use space resources and he defends the American law saying, 'I cannot imagine any state passing legislation which prohibits their people and their companies from using resources in space.' It is states' inherent right to interpret a treaty and decide what it means for itself. If we want to [have] long term presence in space, it means that we can use long term resources in space, so long as they don't arise to the level of impermissible national appropriation.

Mark Sundahl [41:49] And we are going to . . . we have to, Chris, we need to resist the temptation to follow our imagination and our ideas as we go through this because we could be way over-shooting the limits of our time. So, we are going to talk about asteroid mining resource extraction in great detail. I know it is tempting to fly down that path already, but we are going to resist. We are going to take you through onto Article III now which I will read: '*States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, [including the Charter of the United Nations], in the interest in maintaining international peace and security and promoting international co-operation and understanding.'* Again, you get this principle of, this idea of, cooperation among countries and the peaceful uses of outer space. You see this threaded throughout the treaties and this makes it clear, which I think could have gone without saying, that we're going to obey international law in outer space. Just because we've left the surface of the Earth, doesn't mean that we've left international law. It's going to continue to apply. Ah, Professor Mirmina . . .

Steve Mirmina [43:10] Thank you. Alright, is it me? I'm just looking at Article I, second paragraph, it says that *outer space . . . exploration and use by all States. . . in accordance with international law*. Then in Article III it also says *States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law.* In my drafting practice normally you do not say the exact same thing twice in the same treaty only two articles apart, so do either of you know why that sentence was almost repeated verbatim, just separated by a couple of lines? Am I missing something in my reading?

Chris Johnson [43:59] I think the specific mention of the U.N. charter, that would be the difference. And at least establishing a link between a special regime and international law and the wider body of international law. And then, yeah, maybe it is in the interest [of] maintaining international peace and security and promoting international cooperation. But yeah, that could be true, that is what we call an infelicity in drafting.

Mark Sundahl [44:33] These treaties were written rather hastily, as everyone was concerned about law and order in space. So, I think you could probably criticize the drafting and improve upon it.

Steve Mirmina [44:53] So, let me give you guys a softball then. When it says in accordance with international law, did that mean the international law that was in effect in 1967, when this treaty

was essentially drafted and ratified, or does it mean international law still to come 30-40 years in the future?

Chris Johnson [45:12] I believe it's still to come. It includes that time element of it.

Steve Mirmina [45:17] How can you draft an agreement saying you are going to agree to something that hasn't or doesn't exist? It hasn't been agreed to yet.

Chris Johnson [45:28] [laughing quietly] You know.

Mark Sundahl [45:28] Well, you can just by signing it. But I understand your point.

Steve Mirmina [45:38] In terms of the intentions of the parties, do you know what they agreed to?

Chris Johnson [45:38] They had the concept of customary international law developing at that point, and they said, 'we make this now in accordance with international law and we all understand as states how international law will work; that custom will grow, and that treaty practice will grow and that there will be subsequent agreements.' They knew drafting the Outer Space Treaty that the astronaut agreement they were almost done with, and the liability convention would be next. They knew that space law was an open system. It would continue to grow.

Steve Mirmina [46:07]

That's fine for the 1968 astronaut convention and the '72 Liability Convention, but international environmental law didn't exist until bound by international environmental law or human rights law or other areas of law? Let's say cyber law, right? Of course, it didn't exist 50 years ago, but by Article III we're saying we are going to conduct activities in outer space in accordance with international law, today, 50 years later. So again, the question is: how can you agree to be bound by something that doesn't exist?

Mark Sundahl [46:43] I don't think that there's a problem with the contract law preventing you from agreeing to something that isn't fully formed yet. Like we have, you can create and this of the top of my mind, but you can create a security interest on after-acquired collateral that doesn't exist yet. So, I don't think that it's an impossibility. I think it shows a great respect and commitment to international law that we will, we agreed, to continue to comply with international law, whatever that might be, in the future. And that shows almost a blind faith in the international system.

Chris Johnson [47:27] They wouldn't have a choice though, because they know the custom can grow and while they're doing this, yeah, environmental law didn't exist, but the people that negotiated this were also negotiating the non-polar proliferation treaty. This was negotiated in Geneva, where they are also working on security measures. They know that there's going to be things that come later because that's how states enter into treaties [and] have a continuing relationship with other states.

Mark Sundahl [48:05] We have a lot of interesting stuff to get through. So, Article III we need to comply with international law. Article IV, why don't you take the lead (nodding to Chris Johnson)?

Chris Johnson [48:22] When I look at the rationales behind the Outer Space Treaty once they finished Article IV, they said 'we're basically done.' We have the 1963 Test Ban Treaty, we have this arms control measure restricting the placement of nuclear weapons and other weapons of mass destruction in space, and the article or paragraph two, *the Moon should be used exclusively for peaceful purposes*. Once they negotiated that, they said 'we have some stuff about, you know, responsibility, liability, treating astronauts nice.'

This is an arms control measure, and so when Arthur Goldberg finished this at the U.N. and comes back to New York, he says 'this is an arms control treaty.' Following from the '63 test ban treaty, we're going to have subsequent treaties. It does what the U.S. and U.S.S.R agree to: the nonplacement of WMDs in space. That doesn't solve all problems with weaponization or militarization of space. There are in fact some lacuna, some gaps, in Article IV, but we have enough. We both agreed to it, we worked it out bilaterally, U.S. and U.S.S.R. Then, we took it to the larger committee and said 'we agree to this, the major superpowers and space faring states. Now let's wrap it up.'

Mark Sundahl [49:37] Yeah. And you'll see the centerpiece of this article is that nations are not permitted to station nuclear weapons in orbit. And then this idea [that] the Moon and other celestial bodies can be used exclusively for peaceful purposes. We'll have a chance to get into that as well. Does that mean the Space Force is illegal now?

Chris Johnson [50:06] I want to ask to the audience: do you see, what are the gaps in Article IV? If you have this major prohibition on WMDs, what [does it] still permit? The military would read Article IV and say 'okay this still permits us to do what?' It prohibits WMDs but doesn't prohibit conventional weapons. What about the

nuclear exchange, [an] ICBM transmitting from one state to another state that doesn't make a complete orbit (a fractional orbit), that goes from one point to another point and never enters into or establishes a full stable orbit of the Earth? That's permitted as well. And they said it still allows - it doesn't outlaw nuclear strikes. It prohibits their stationing. They intentionally drafted it to carve out that and they said 'we have enough, let's finish this Treaty.'

Mark Sundahl [51:10] It doesn't prevent nuclear war. Now, Article V. Let's keep rolling here.

Chris Johnson [51:19] Treatment of astronauts and return of space objects. State parties shall regard astronauts as this phrase '*envoys of mankind.'* Uncertain what that really means, but it means something beyond mere citizens outside our state territory. '. . . *In outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle. In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties.'*

They actually were really concerned about this. They, and we, have not seen much state practice about states rendering assistance to other states, to astronauts of other states. But, you know, when they were drafting this, there were not many astronauts. There were not many people who had been to space or had been to celestial bodies. They actually really thought that this was a major concern, but it has lessened in importance and practice over the years.

Mark Sundahl [52:31] Although, there is state practice of returning air and space vehicles. If part of a spacecraft lands in another country, we have had that situation a number of times, they do follow this provision and return it to the launching state. This is further elaborated upon in the rescue and return agreement, which is the second treaty. Okay, so we have to help rescue astronauts and return space assets. Article VI.

Chris Johnson [53:05] The regulators' favorite article.

Mark Sundahl [53:07] Fascinating article, yes.

Chris Johnson [53:14] I think it's important to read some of this.

Mark Sundahl [53:15] Yes, Article VI. What Article VI is getting to is national activities. It talks about national activities. Outer space is not restricted to governmental activities. It is, of course, an international treaty, and so it places obligations only on the states. But, the obligation of Article VI is that the state shall ensure their nationals, their companies, comply with the requirements of the Outer Space Treaty. They're not up there stationing nuclear weapons in orbit, for example.

The language here [has] become quite important and is really the springboard for domestic legislations. We are talking a lot about international space law, but, of course, there's domestic space law as well. And that comes out of this treaty. '*The activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty.*'

If you are a private actor, you need to be authorized by the state with jurisdiction. That is, you have to apply for a license and be given a license and then you need to be supervised. Continuous supervision. You have to be supervised during the space mission. This is the international requirement that forces the states to adopt regulations to monitor their private space activity. But the open question is: how much regulation is required exactly? And that is something that is being debated now in the U.S. Congress.

Chris Johnson [55:10] I want to return to the first sentence. Why is this so important that states authorize and supervise? Because they're responsible for their national activities in space, including the activities of non-governmental entities. This is. . . guess what? It is absolutely different from the rest of international law. This attribution, this direct attribution without a test being done. Whatever your non-governmental actor does, well, the state is responsible. So what SpaceX does, what Open Lunar does on the Moon, the U.S. government is internationally responsible to other governments for and for ensuring that whatever the commercial actor does complies with international law. That direct attribution, contrasted directly with the rest of international law, is absolutely unique and it was a compromise between the U.S. and U.S.S.R. The U.S.S.R. said we don't want to permit any non-governmental actors. No private activity in space. Space is only for states to explore, and the treaty, the drafting, was going in that direction. Then, the American side said, 'We'll insert something. Whatever, how about this,

everything that a private actor does, the state is responsible for. Can you agree to that?' And the Soviets said, 'Yes, we'll agree to that. No matter what, someone is responsible and that someone is a state. We can agree to that.'

Mark Sundahl [56:32]

Not only is *that* state responsible – we'll see that states are also liable, not only responsible, but *liable* for any damage caused by governmental space activity. [And therefore] also [liable for] damage caused by non-governmental space activity. Again, we get the imputation of liability as well as responsibility. We can talk about the difference, but I think we don't have time at the moment.

You'll see that the rule is that there [is] strict liability for any damage caused on the surface of the Earth or to an aircraft, something in flight. Strict liability – there is no question about whether you were acting responsibly or not. The state is on the hook. If there's damage caused by one space object to another space object in outer space, then in order to find liability you need to find fault and that is a question that is still being debated. What exactly does fault mean? What are the best practices for avoiding collisions in orbit, for example? And when does your behavior arise to the level of negligence? I think we can move on to VIII: jurisdiction and control.

Chris Johnson [58:03]

Remember Article II, no appropriation? So, what can states do in outer space? Well, they are free to explore it and they have the ability, the right, to exercise jurisdiction in an extraterritorial sense. Extraterritorial exercise of jurisdiction over their objects so long as they place them on their registry. You can't own as your territory in space, but you have jurisdiction over your people and over the space object itself, so long as you place it on your national registry. That is the link established by Article VIII.

Mark Sundahl [58:39]

This is one of the areas of Space Law that is beginning to show strain under the developments of technology in the space industry, in that jurisdiction is granted, jurisdiction and control, to the state of registry. [That] contemplates that the state that launches it and registers it will always operate it and own it, but that's not so much the case anymore. You can have private satellites that are transferred to other operators from other countries. Yet, the Outer Space Treaty is unbending there. Whoever registered it has jurisdiction and that does not change. Now, does that mean that no other state can have jurisdiction? No, I think it's not necessarily exclusive jurisdiction and you can solve that. But it is, and I just wanted

to point it out as one of those aspects of Space Law that maybe does need updating.

Chris Johnson [59:43] And keep in mind that as you read the treaty, so far, right here in this article, we've seen the concept of 'registering state.' We've previously seen the concept of 'launching state.' Before that, Article VI, we saw the concept of 'responsible state.' Are they all the same state? Space Law is not perfectly certain on what that means, but these concepts are developing.

Mark Sundahl [1:00:05] Article IX, I think this is your forte.

Chris Johnson [1:00:12] In the drafting of the Outer Space Treaty, once they got to Article IX, and this I learned directly from Professor Gabrynowicz, you'll notice Article IX is four sentences that are quite long and complex. This is because they had all the major issues worked out in all the previous articles that I mentioned. Everything else they said 'just put it in Article IX. We'll leave it there, it's convoluted, it's messy, but it's fine.'

It essentially talked about, in the phrase we need to pay attention to, the first principle of cooperation and mutual assistance in the first sentence, and '*shall conduct the activities . . . with due regard to the corresponding interests of other States Parties.*' This is uncertain what due regard means, and it's different from due diligence rule to govern your own behavior. It is due regard to look at the behaviors of others, in the interest of others, and take those interests into account and how you conduct your activities. Does due regard mean that mega constellations should be prohibited because they interfere with other actors? Does due regard mean that space debris and the creation of vast fields of space debris is impermissible?

Due regard also is the hook that we hang planetary protection of not placing Earth life on other planets, because it could prejudice the interest of astrobiology in the future. This idea of harmful contamination in the next sentence gives further meaning to what due regard means, but it is quite nebulous. I'm not certain what due regard means and the hinges of Article IX, but you see that sentences three and four create obligations of consultations with other states.

Mark Sundahl [1:02:05] I've been spending a lot of time thinking about this article and we'll see how important it is. This really sets the standard, the minimum standard, for behavior in outer space. That you are to operate with due regard to the corresponding interests of all other countries.

What does that mean? What does 'corresponding' mean? Why doesn't it just say interest? Due regard is the minimum standard and then, as Chris pointed out, there is a duty. If there's a possibility of harmful interference with the operations of another country, there's a duty to initiate consultations, but that's all. It does not prohibit harmful interference. It just requires consultations, and if you consult and then you decide to go ahead with your harmful activity, well, you're still in compliance with the treaty. Maybe you haven't operated in due regard, but [the rule is] 'due regard and then a duty to consult,' not an outright prohibition on harmful interference, which I always thought was a bit odd. I always like to just read it into that, but rigorous international lawyers have corrected me that I should not read things into the treaty like that. It's [still] worth pointing out. I think we're going to wrap up this portion of the of the symposium. We've had a lot of the high points. It's not the end of space law, but we've had a lot of the major provisions.

Chris Johnson [1:03:42] Those are the major articles, yeah.

Mark Sundahl [1:03:43] Thank you, Christopher, for joining me in this, and I hope you all feel edified and now ready to take on the difficult questions in space law. Thank you, Chris.

Chris Johnson [1:04:18] Thank you.

PANEL 2: WHO IS GOING TO THE MOON? PUBLIC/PRIVATE PARTNERSHIPS AND PROCUREMENT

Panelists: Steven A. Mirmina, International Law Practice Group, NASA
Christopher D. Johnson, Space Law Advisor, Secure World Foundation
Dr. Diane Howard, Chief Counsel Space Commerce, U.S. Department of State

The private sector has been in space for decades: their builds and designs took man to the Moon in the 1960's, their space shuttle design served NASA starting in 1980, and their satellites have been in low Earth orbit providing communications, television, and Earth observation. In many situations, private industry has been contracted by NASA and other governmental agencies. The following panel discusses the current paradigm stretching into the past and what it looks like moving into the future. Will NASA transition from controller and contractee to one-of-many customers for the emerging space commerce? What does that relationship look like beyond low Earth orbit?

Discussions also cover the responsibilities of nation states for the actions of private actors in space under Article VI of the Outer Space Treaty. This discussion transitions into the current licensing regime for private launches and activities in space, including any holes in authority to deal with on orbit activity. The holes in regulatory authority and the disjointed nature of oversight and regulation is highlighted as a major question mark going forward for less traditional space activities, such as asteroid mining or private space stations and moon exploration.

Mark Sundahl [0:00] I do not want to be too optimistic, but I think the gods of high technology are smiling on us today.

Dr. Diane Howard [0:08] Hello.

Mark Sundahl [0:10] I would like to kick off our first panel then. There will be no more lecturing from Professor Sundahl. I am now going to just kind of stay out of the way and let our guests speak. I've introduced Christopher Johnson already from the Secure

World Foundation. He will continue here on the stage. He is joined at his left by Steven Mirmina, who you've heard asking some impossible questions earlier. But Steve is a long-term employee of NASA, where at NASA headquarters, he is in the International Legal Department. He is the one who fields the legal questions that arise with respect to the operation of the International Space Station. He is also now heavily involved, and maybe the lead, in negotiating and arranging for the Artemis mission, the construction of the Lunar Gateway, an international space station that will be orbiting the Moon, and then the next steps of actually settling the Moon. Steve is involved in creating the legal infrastructure that will make this possible. Welcome, Steve. And then finally, on the screen above us, is Dr. Diane Howard, also a highly esteemed space lawyer and friend of ours. As you can imagine, the community at this point is rather tightly knit, but growing. Dr. Howard was recently appointed as the Senior Legal Counsel in the Department of Commerce, Office of Space Commerce, one of the multiple federal agencies that is involved in the regulation of outer space activities, and now we're moving to domestic law. Welcome, Diane, and thank you for joining us.

Dr. Diane Howard [2:26] Thank you, good to be here. Thanks for having me.

Mark Sundahl [2:29] Excellent. I want to start by going back to Steve and having him say a little bit more. I am not sure how accurate my description of your work is, but maybe you want to clean it up a little bit.

Steve Mirmina [2:43] Thank you, Mark, I think you did great. Thank you everybody for coming this morning, and I know this will probably be repeated throughout the day but thank you to Professor Sundahl and thank you to Kristina Schiavone, and to Jeff, and all the people that are on your staff. It's been a magnificent conference and thank you for all your hard work and thank you for your hospitality. It's been really great to be here.

I am Steve Mirmina, I've been working at NASA since 1999, it's a little bit more than twenty years. I'm in the international law division and, just for fun, on the side I also study and teach Space Law in the Washington D.C. area. In fact, Chris Johnson and I co-teach a class on Space Law at Georgetown Law School. So, a lot of these questions that I asked are quite fun ones for us to think about to discuss.

At NASA, just like you said, I'm working on the International Space Station, the Artemis program, and the agreements with the international partners to construct the Gateway, which I

know that we're going to talk about in a little bit. I'm also working on issues of space law that come up in the United Nations; issues ranging from orbital debris, to use of nuclear power in space, to other issues that the U.N. is working on in relation to space exploration.

Mark Sundahl [4:10] Thank you, and Diane, would you say a little bit about what you're doing?

Dr. Diane Howard [4:13] Yeah, so I actually came to D.C. to take this position at the Office of Space Commerce almost a year ago and I came from academia. I too was a person who was teaching Space Law. I saw that the tasking that were given to my office through space policy directives there could really use my particular skills, and so I came to D.C.

I think the best way for me to tell you about what I do is to tell you about what my office's functions and roles and authorities are. Primarily, we at the Office of Space Commerce are the principal unit within the Department of Commerce to coordinate space policy and also legislation within the department. We also have another very important role, and that is to advocate for industry within the executive branch. Some of the things that Steve just mentioned that he is actively involved with in his portfolio for NASA, I, or my colleagues, are also involved with as part of the interagency.

The role of the interagency is really very, very important. In that interagency we advocate for industry, but we also look at things through other equities. Another equity that we have is we actually do the licensing of commercial remote sensing, which is under a big overhaul, as it is all licensing within the United States.

Another thing that we do is coordinate. There's a great deal of space activity within the Department of Commerce. You may not realize that; most people think Department of Commerce, it must just be a lot of bankers or finance, but what we really are is a department that deals with data and analytics, and so we have the National Institute of Standards and Technology. We've been very instrumental in getting the entire interagency involved in standards development in the entire space ecosystem. I'm kind of collating and curating a lot of the different standards and practices that exist internationally and also domestically. And doing a level set and making sure that we understand exactly what they address, what they don't address, and what needs to be addressed. Doing this in a way

where we have everybody in the room working together to do that. That gives you a little bit of an overview as to what I do.

Mark Sundahl [6:38]

Thank you, Diane, that's a great portfolio and fascinating work. I think we are fortunate to have you in that office. Commerce is really the focus of this panel, and I want to focus in on who is going to the Moon. We know NASA is going to the Moon, but who else? Steven Rubio asked the question of you [looking at Steven Mirmina]: Who all is participating in this Artemis program?

Steve Mirmina [7:08]

Thanks for the question. The Artemis program is, well, let me speak specifically about Gateway because that's real, it's actually on my desk now. Gateway grows out of the International Space Station program. The International Space Station is a very large laboratory, and it's in outer space, and it's been occupied by humans for just about twenty years now. We have sometimes three, sometimes six, sometimes as many as thirteen astronauts from all over the world working on this orbiting laboratory.

The laboratory is looking for various cures for diseases that people have here on Earth, from epilepsy to osteoporosis to cancer studies, and it's also helping humankind learn how to live off of the Earth. If you weren't aware, when astronauts go to outer space, they will have issues with the health of their eyes. They'll have macular degeneration. They'll have bone loss. By NASA and other space agencies studying how to protect the life of the astronauts and how to protect their health, we are helping people down here on Earth. If we can help astronauts from having macular degeneration [while] they're in space for a year, well, that same research will be used [here on Earth for people] . . . who might be having issues with their eyes, or people as they get older might have loss of bone density. The science that we're learning to protect the lives of astronauts for future deep space exploration will also be beneficial to people down here on Earth.

Now, the International Space Station, because I know you have CLE [Continuing Legal Education], let's talk about the legal issues. It was created by a treaty. Specifically, here in the U.S., we would consider [it] an executive agreement, rather than a treaty, and it's called [an] intergovernmental agreement – an agreement between governments. We call it the IGA for short. There's an IGA for the [International] Space Station or the ISS. IGA, we call it. And it's got fifteen different parties. So it's got the U.S., Japan, Russia, Canada, and it has eleven member nations of the European Space Agency.

The European Space Agency is essentially Europe's version of NASA. It's got five partners: NASA, ESA, CSA is the Canadian Space Agency, Roscosmos, and JAXA, the Japan Aerospace Exploration Agency. So, it's got five partners, even that has fifteen parties. As a natural evolution of the International Space Station, NASA wanted to take the partnership and move it forward. I say NASA, but it was actually a U.S. government decision. We wanted to move this partnership with these partners forward to building this new Space Station, or this new Gateway, to outer space that's going to be in lunar orbit. Just like the video showed, it's going to be in lunar orbit.

Then, from the space station around the Moon there will be a short-term sorties down to the lunar surface, and the goal is to have sustainable lunar explorations. Rather than going for a few days and coming back, we would go for a much longer stay, maybe as long as thirty days, before the astronauts come back. The thought is that this Gateway, which is going to be around the Moon, we need to learn how to live there and we need to learn how to use resources there so that we could have a program to go to Mars.

Just to give you an idea, going to the Space Station, that's about two hundred fifty miles away. Going to the Moon, that's about two hundred and fifty thousand miles away, and going to Mars is, let's say, about two hundred and fifty million miles away. So, we need to learn how to live. You know, the Space Station, you could be there in a few hours. The Moon, you could be there in a few days. But going to Mars could take maybe six to nine months. You need to bring everything with you. You can't stop at CVS if you need to get a prescription. You need to have everything, including all your medical knowledge with you.

Again, just to get to your question about that the Gateway in particular, the goal would be that we have the same partners. In fact, I mean, this is literally on my desk, we have a series of bilateral agreements with these partners. Essentially, if you think about a spider in the center of a web, we would have an agreement between NASA and ESA, and then another bilateral group between NASA and JAXA, NASA and CSA, and potentially NASA and Roscosmos. That is how the legal structure would work for the Gateway program.

Mark Sundahl [12:38] It is certainly an international project, this Lunar Gateway, and the Artemis program. But is it only governmental?

Steve Mirmina [12:50]

Thanks for reminding [us that] the central question was of 'who is going to the moon?' Yes, NASA is going with our space agency partners. But it's funny, you know, I saw on the agenda that you wanted me to talk about public-private partnerships, and my question back to you is: what does that term even mean? Because people are talking about the commercialization of outer space as if it is something new, and I'd like to get Diane's views on this shortly.

We've been having public-private partnerships since the sixties in outer space. NASA has always been working with contractors. We have a budget of a little more than twenty billion dollars annually, and eighty-five percent of that goes out the door right away. It just goes to our contractors. In fact, the NASA space shuttle, it wasn't built by NASA, it was built essentially by Boeing and other contractors. When we had the company that launched the space shuttle, we had the United Space Alliance, which was a joint venture with Lockheed Martin, and we had United Launch Alliance. All the major aerospace contractors are the ones who actually will bend metal, will actually build something for NASA.

Even though we say its NASA space exploration, it involves contractors, and it has as long as we've been in business for fifty years. So, we will bring all the major aerospace companies with us. In fact, SpaceX, - the reason one of the speakers is not here today is because she's at a SpaceX launch down in Florida. It's going to be their twentieth resupply mission to the International Space Station. Again, people talk about public-private partnerships and they talk about commercialization of outer space but it's something that we've been doing throughout history.

Mark Sundahl [14:50]

Yeah, I think that's very interesting. Yeah, question? [pointing to the crowd]

Audience Question [14:57]

So, just to touch on that comment because I can't let it go. I think the idea [of] 'public-private partnerships.' Right now, what people are talking about is not where the government works with industry, owns all the IP, owns all the hardware, and industry just builds it for them and turns everything over. The interest now in public-private partnerships is where government starts buying services and realizes [it needs] to engage industry in a different way. I think what we'd like to hear is a little bit more about what it takes to do it.

Certainly, the government, even before NASA if you look at the Defense Department, goes out with the procurement, asks

for the specs, and owns every single little piece including the hardware, so I don't think we have been doing it the way we're talking about doing it now. What we're talking about doing now is the way SpaceX is doing it and Blue Origin, where they want to put public money in, retain their IP, and provide a service back to the government. How are we enhancing that, how are we encouraging that, and how is that going to be a part of gateway?

Dr. Diane Howard [16:05] So, I actually agree with you sir. I think Steve makes a good point. There have been commercial activities in space for a long, long time. We really do have a very good example of an early public-private partnership back in Comsat and Intelsat back in the early sixties that went from a kind of a public-private partnership model, one of the first in space, and ultimately privatized.

I think when we talk about public private partnership now, we're really talking about a continuum, and in order to really satisfy the elements of a public-private partnership, there needs to be some allocation of costs and risks between the parties, public and private. There also needs to be some ability to negotiate. It's not so much the government as the person who's directing everything, but the government is one of a number of customers. And in that case - I mentioned before that we advocate for industry, not just within the executive branch, but we just advocate for industry - we are trying to [help the] industry understand the different ways that they can be involved in different kinds of activities.

A lot of what I work on right now is space situational awareness and spacecraft management. We're looking at ways to get away from the old paradigm where it is a government-provided service from the eighteenth space wing out in Vandenberg, and you get what you get. Instead, [we] leverage some of the newer commercial capabilities that have come online. We're right now trying to figure out how much? What should the basic service look like that's provided by the government? Then, how do we leverage those other capabilities and make them available to all levels of users?

If you take that idea and you just extrapolate it to the coming activities through Artemis, but not only through Artemis, you can see the involvement of the private sector in new and exciting ways, and I believe that you will see more of that unfold as we go forward. Certainly, NASA has relied upon the expertise and the efficiencies of the private sector through its contracting. But I think the relationship between NASA and

the commercial world is also undergoing a change, and I will fight for you.

An example: there is a working group in NASA called the Commercialization of Legal Working Group. I and one of my colleagues were invited to participate in that working group just to help with this kind of 'shake up' of how things were done for the last fifty years and how they can be done for the next fifty or five hundred. As a result of that interaction on that working group, we are going to co-host a summit in May to help the commercial sector understand ways that NASA can make working [*inaudible*] available to them because they may not understand that. So, I think that's changing, sir. I think you're right. It's not just the government as the person who signs the contract and says we want you to do this, but the government as a customer and the government as an enabler. And NASA, NASA as an enabler.

Mark Sundahl [19:18]

I think, Diane, maybe that's the best way to encapsulate this evolution of the relationship between NASA and companies, is 'customer.' That NASA wants to be the customer to purchase services, to purchase the taxi service from SpaceX to deliver cargo and crew, to purchase other services that are offered by private industry rather than contracting with private industry to work on a NASA-owned and controlled projects.

NASA clearly works with private industry, relies on private industry. Let's say you have a launch service company that you fly rockets, and you want to deliver cargo or crew to the International Space Station or to the Moon. What do you have to do? Can you just launch a rocket without getting any license? Can you just light it up out of your backyard? Or let's do some basic domestic space law here. Maybe I will start with Chris. I mean, what kind of licenses are needed, and who issues these licenses for space activities? And I'm coming to you next, Diane, I'd like to hear about Commerce's jurisdiction and how that jurisdiction may possibly expand or change in the future.

Chris Johnson [20:48]

This is exactly what we were teaching just a few days ago. The U.S. national space legislation has developed over decades and because of that, we don't have what they call a 'one stop shop' as they have in other countries. If you are going to be taking pictures of the Earth, you are performing remote sensing, you have to go to one particular agency to get a license to do that. You have to go to "NOAA," National Oceanic and Atmosphere Administration. That's one license and one office you have to go to, but all space activities rely on frequencies. The use of the electromagnetic spectrum ground link to your

space station, space station back down to your ground station, and then space station space to station space, space to space. All those user frequencies also have to be coordinated.

If you are a commercial actor, you have to ask the Federal Communications Commission, "FCC," for a license. If you are a governmental actor, you ask someone else and TIA [Telecommunications and Integrated Applications Directorate] for government frequencies, and that is a license process that you have to go through.

The FCC had to take that on board and decide what frequencies they were going to permit the commercial actor to use. But frequencies are an international concern. In fact, the use of frequencies has to be coordinated internationally. The International Telecommunications Union, 'ITU,' they're the folks that come up with the Master International Frequency Register, the MIFR. It says, 'oh okay, remote sensing, no matter where you are on the Earth, we'll be in these particular bands. Satellite communications will be in these particular bands.' The FCC follows that guidance from the international regime and then decides how to parcel it out amongst the commercial actors.

If the U.S. is going to be a launching state from its various launch sites, and maybe soon, space ports, you don't go to the FCC, you don't go to NOAA, you go to the FAA [Federal Aviation Administration] for a launch license. This is yet another avenue that you have to go through. Amongst all those different things, there's the FCC, you can have guidance on how it's going to regulate orbital debris, and it may be different from – does NOAA take that into account? Does the FAA ask what your debris coordination plan is? This is getting into the policy, the kind of wonky side of it, but who is best to do that? Which governmental agency is best to do that? I would like to ask these, the government lawyers. Perhaps Diane would like to respond on how the Department of Commerce and her office in particular has this posture of both regulating, but, in a sense, trying to foster commercial space.

Mark Sundahl [23:41] Yeah, and I'll hand it over to you Diane, but I want to, maybe, just wrap this up in a little package. What we're talking about here is one of the big areas of debate among space lawyers and Congress, as well as what kind of reform is needed for domestic space legislation. One of the big problems is that it has been piecemeal in its creation and so, we don't have a streamline one stop shop. We have the FAA, we have the Department of Commerce, we have the FCC, and it becomes

cumbersome. And so, we are engaged now, and Congress has been debating and looking at revising domestic space legislation to improve that situation. The questions are like Chris said: who is the best agency to oversee commercial space activity? Is it Commerce? I mean, we're talking about commercial activity, so maybe commerce is the right one to handle this regulation rather than the FAA, which deals with transportation. Transportation is just a small part of space activity and the activities to come. That's kind of the flavor of the debate that's going on, and Diane, I'd love to get your insights.

Dr. Diane Howard [25:03] Well, I have a few things that I'm at liberty to say. First of all, what can we do about the fact that there isn't one place to go, one thing that we can do within the executive branch to all speak to one another. Chris mentioned that the SEC had come out with a notice of proposed rulemaking last year, or actually, in late 2018, to address some of the orbital debris challenges with some of the newer things that were coming online in some of the smaller telecommunication satellites. It was a bit of a reach because it was talking about not only the telecommunication satellites, but just, you know, space objects. At that point, my department put in a public comment saying that this was something that should be addressed by all the different licensing entities within the federal government, so that we weren't creating even more cumbersome regulation, but instead that we were aligning ourselves.

We convened an interagency working group to that end, and everybody was invited, and everybody came. This was concurrent to NASA leading an update to the U.S. Government Orbital Debris Mitigation Standard Practices that have been in effect since 2001. A lot had happened between 2001, and at that point, when that began it was 2018. So, we postponed further work on aligning this aspect of the regulation process until that update was completed.

We had another meeting on February 4th, because this update, the standard practices, addressed a number of these new issues, but not all. It was actually put out to the public in December. So, the time has come that we would get together and talk again. And that's what we did. Through that reconvening, we decided that . . . what we need to do now is take those U.S. government data practices and find the best way that we can incorporate those standard practices from the government into the licensing and the regulations of these various different parts of the federal government. So that we're all kind of speaking the same language and we're not over burdening

industry, but at the same time, we're preserving the space environment.

We have decided that we're going to do some outreach with industry. We're going to message out. We're going to have NASA - NASA is going to present this. Dr. J.C. Lou, who is sort of the ring master of the interagency working group that worked on it for 44 meetings, for a whole long year, and really did an amazing job. After we message out, we're going to stop and listen to what industry has to say, because industry has given us indicators that they have an appetite for, perhaps, more, and so we want to hear that. That's the approach that we're taking to the regulation right now.

Chris mentioned the one-stop-shop, and one of our statutory authorities for our directories is to remove impediments. There are many kinds of impediments. There can be legal impediments or institutional impediments, but [the authority is] to remove impediments to industry going forward. Certainly, one of these impediments would be not knowing where to go and how to do things. So, we are doing everything that we can to add a service ombudsman for now.

There are some activities, you know, regulatory process is going through an overhaul. Space Policy Directive-2 [SPD-2], which I don't know if anybody spoke about earlier today, but it came about before the one I mentioned, which was the space traffic management one. It actually requires all of these different licensing entities to take a look and to streamline their licensing to make sure that these things are easy to follow and that the United States remains a leader. That we are not over-burdening new entrants, but also preserving our international obligations as per treaty.

In SPD-2, there is an awareness in the Department of Commerce, because of its role as advocate for industry, it has a dual-hatted role. Regulating, but that's CRSRA [Commercial Remote Sensing Regulatory Affairs], that's a different part. Also, this is advocating for and promoting a private sector that we actually are a natural choice to help; particularly new entrants, to figure out what they need to do in order to remain compliant with our domestic regulation and also international obligations. . . . So, we're serving as an ombudsman, unofficially.

We have people come to us all the time, not sure of exactly where they should go to do what, and we need [to] point them in the right direction, and we do that. Whether or not that will

go forward, whether or not there will be legislator support for [a] one-stop-shop, or if there will be a different CARVE counts for authorities, that remains to be seen. I can tell you that this is something that's under discussion right now.

There was a National Space Council Meeting back in August and coming out of that meeting were several recommendations. One recommendation to our office: we were directed to come up with a report describing some of the drivers to and impediments to the space industry in the US. The second of these taskers, as we call them, asked us to put together a report addressing the issue of authorities. What things are actually licensed, what things are not, and to come up with a road map to address the things that are not. [Then,] to coordinate that roadmap with our colleagues over at the Department of Transportation.

I will leave you one final thought in figuring out who is the best. I don't know that there is one best place. I think there's a lot of expertise. Deep expertise in different parts of the government. I think we really are losing sight of the end goal if we think that we need to pick *one*. I think we need to pick them all. I will say, that in helping us understand the long-term benefits to assigning certain roles and responsibilities within the executive branch, I think it's better to take a long view and figure out what is the high-level mandate for that department.

If the primary purpose of a mission is a transportation mission, it's moving people or things from point A to point B, then wherever that may be, I would posit to you the one way to look at that would be that [it] would certainly fall within the purview of the Department of Transportation. If, on the other hand, their primary purpose of an activity is telecommunications or connectivity, whether that's, you know, between Space and Earth or Space to Space, whatever, then I would posit to you that that would likely be a communications function called the FCC. If, on the other hand, the primary purpose of a mission is commercial in nature, maybe it's a gas station in space or an additive manufacturing concern that's happening off-planet. Then I would posit to you that perhaps that would be something that would be better suited to our department. That's just my final thought.

Chris Johnson [32:46] They use that phrase 'one-stop-shop,' but I would predict it's not a one-stop-shop. It's a front door that you first approach one regulatory agency and they assist you . . .

Dr. Diane Howard [32:56] Exactly.

Chris Johnson [32:47]

. . . to get license elsewhere. I do want to ask our two government lawyers - I want to return to the International Space Law for just a few moments and maybe ask kind of a cynical question, a hardball question. I spoke about Article VI and the direct imputation of non-governmental actors and their actions as the direct responsibility of a government. Given that, whatever a commercial actor does in space, the government is responsible for, and therefore governments are in some sense exposed to a potential risk of violating international law by what their commercial actors have done.

The U.S. would look, or a country would look, at its commercial actors and say: 'whatever they do in space, if they violate international law, we're responsible. If they cause damage, physical damage, we are exposed to potential liability.' This is, you know, akin to a parent having to go to jail for what their kids do. Given that potential exposure, why permit commercial actors at all? Why permit space activities by your commercial actors at all? It leaves the state open to potential violations of international law. This is a point, pointed out by Professors Larson and Lyle in their textbook. They say that, given you could be exposed to violations of international law, what's the rationale for even permitting commercial actions in space?

Steve Mirmina [34:35]

It sounds like you're making an argument that we shouldn't have any private industry in space, and it should be all governmental. I don't know if everybody would agree with that point. No, I don't actually contend that. I think that the U.S., and I can speak best to the U.S., I know it's true in other systems as well, but I know the course[of] the U.S. statutes and regulations best. We've solved that through our FAA regulatory structure. For example, yes, the U.S. Government would be absolutely liable for damage done by our actors in space and responsible under international law under Article VI, so we need to make sure that whoever goes to space, goes up responsibly.

That's why we have the FAA licensing regime where we look at: are they financially responsible? Are they technologically responsible? What are they going to put up? There is a payload review that the FAA looks at. Are there any national security risks? Is there a risk of damage to people on the ground or to other actors in space? And, we also have an insurance regime, where we have anybody who wants to license something, they have to have insurance. Hundreds of millions of dollars, usually. There's a special term called the *maximum probable loss*,

where they look at [what happens] if there is an accident. Generally, if there's an accident, remember there's always a self-destruct button or range safety officer, they could destroy the rocket if something were to go awry, if there were a bad day. Generally, it would be safe, right? Because it usually launches over water, and you're really just insuring the failure of the destruct mechanism. Because if it goes too far off the projected range, then it's going to be destroyed by the range safety officer.

But, even that, they look at the rocket, you know, insurers will come into U.S. industry. They'll go through the factory. They'll look at the failure rate of the rocket. They'll look at the success rate. They'll look at how many times it's launched successfully. They'll insure the third parties to the launch. The first and second parties to the launch, they usually wave claims, they have to by law, waive claims against each other, so you're not going to be liable for damage done to somebody else in the actual launch activity. And, for third parties to the launch, there's a very comprehensive insurance regime. So, although you're right under international law, the U.S., or any launching authority, would be responsible to other nations. The way that they protect themselves against liability is through a comprehensive insurance regime.

Mark Sundahl [37:12] Very well, very well put. Yes, this is a complicated system to allocate risk and deal with this imputation of liability. A question from the audience, Sir.

Audience Question [37:31] Thank you. One question is, what court would handle relevant claims in the Outer Space Treaty? Typically, as I understand it, treaties like this, there's often a court specified, and as I read through the Treaty, I don't see that there. If the answer is: there is not one, then that actually allows states to, you know, sidestep any responsibilities that they might have.

Second, I wonder, as part of Article VI, in addition to making states liable for corporate activity in space, there's another reading of that. I doubt it was one that was had at the time, because it might be the second sentence of it, where organizations would have to register their activity with the state. [The other reading] is that it chains, it couples, corporate activity to the state in a way that would prohibit by international law corporations from exploring space ahead of states. So, it really ensures the primacy of state forms and state sovereignty and state domination in space. I just sort of offer that as a thought as well.

Chris Johnson [38:58] First, the venue question. . . There is in the International Institute of Space Law, the Manfred Lachs Space Law Moot Court Competition, where states sign a *compromis* saying that they will bring their claims before the International Court of Justice [ICJ] in The Hague. [It] is the principle judicial organ of the United Nations, where disputes arising under treaties would be decided in an open manner. So ICJ is one forum for disputes between states.

Audience Member [39:42] It's not compulsory.

Chris Johnson [39:43] Exactly, Exactly. There has yet to be any cases before the ICJ about space law. ICJ is in the Peace Palace in The Hague. In this very same building, the Peace Palace, is the Permanent Court of Arbitration [PCA]. The Permanent Court of Arbitration established optional rules on space related disputes about ten years ago. No cases so far have been brought to the PCA under those optional rules. The difference between the PCA and the ICJ: arbitration is a closed door. So a state, if there is a space related dispute, [has] two avenues. They can say, 'if we want to take this to a tribunal, we can go through the ICJ and have it public. We can go private through the PCA, and outside of that, potentially diplomatic measures would be the first form to resolve a dispute.'

Mark Sundahl [40:38] Enforcement of International Space Law suffers in the same frailties of general International Law and the question is whether ICJ has any teeth. We've certainly seen the United States walk away from the ICJ when the decision wasn't going our way. So it suffers from those same challenges that all of International Law does.

Maybe there hasn't been an ICJ case, but there are domestic cases involving space activity. Some commercial ones, and maybe the most entertaining one was the case decided by the Ninth Circuit Court of Appeals. A gentleman wanted to charge NASA parking fees for landing a probe on his asteroid, and the Ninth Circuit Court of Appeals took it up and dismissed the case. It cited the Outer Space Treaty, that he had no property claim to this asteroid. So, there are some cases out there, but not a lot.

Chris Johnson [41:47] Your second question was about private space exploration as somehow secondary to government-lead space exploration. Did I understand that correctly?

Audience Member [41:47] Basically, the implications of that second statement in Article VI, not that it wasn't sophisticated at the time, but possibly that

it would prohibit a company from going out and basically acting in ways that states would not want to.

Chris Johnson [42:15]

I think it probably was intentional where they said we're creating rights for states to explore space, and [that] private actors have to ask for permission, authorization, and continuing supervision. Actually, this is how it has worked for the first six decades of space exploration. Only now is the possibility of the next couple years of privately funded, privately-lead space exploration. I think some of our other panelists later in the day can speak a bit more about that.

Audience Member [42:47]

One way I think about that is that states don't want companies going out and exploring space for the reasons of liability. We don't want you to mess things up because, as specified in this Treaty, we'd also be liable for it. Another way of thinking about it, and it's not exclusive, is that we don't want you going out there and basically creating your own little sovereignties.

Chris Johnson [43:17]

I mean, let's think about it. Commercial activities, they all seem well and good. I deal with space sustainability and the security sides of space. First, an easier example. The last few years, we've seen private commercial companies, I will name them: Swarm Technologies, Beresheet Lunar Lander, and the lunar archive foundation of this individual Nova Spivack [CEO and Co-Founder of Arch Mission Foundation], have. . .violated international law or not complied with national space law. They've been, essentially, bad actors.

Swarm Technologies launched without an FCC license. The FCC looked at their application and said, 'make your transponders and your reflectors bigger,' and Swarm said, 'let's launch anyway.' They went to India and launched on a PSLV [Polar Satellite Launch Vehicle] without their letter from the FCC granting them a license and got a huge fine because of it. This is kind of the first time we've seen an actual bad actor do something. Getting to space without government permission.

Then, the Beresheet Lunar Lander, the individual who snuck tardigrades, microscopic life forms to the Moon. [This] may [have] implications under Article IX due regard or COSPAR [Committee on Space Research] Planetary Protection concerns. This is the easy, but a little bit uncomfortable, example of commercial actors doing something that a state would not authorize and wasn't even aware of. They did essentially. . . an end run around the back of government oversight authorization [and] continuing supervision. But, this is still the easy case.

The more difficult case…we know security concerns right now. We know that there's suspicious activity in the geosynchronous orbit, where satellites are creeping around the GEO [geostationary Earth orbit] belt and observing and performing rendezvous proximity operations with the other birds of a GEO. And we've seen states make statements. The French Ministry of the Economy said there's a Russian satellite creeping around these particular satellites- 'we don't like it; we wish it would stop.' But what can they rely on? Article IX?

So, I'll say this. This is the more comfortable statement. Could a private actor do such a nefarious or aggressive or unfriendly action in space that it becomes an incident where it triggers military issues? Could it be an armed attack? Use of force, and therefore trigger the government which is responsible for it into a state of international armed conflict? I think that there are nefarious activities in space, and those could be assisted and aided by commercial actors or nonstate actors. Could a state contract with a private company and say, 'well we're not violating International Law, this private company is, and we're not responsible for them.'? I don't have a good answer to that, but that could happen.

Mark Sundahl [46:26] Yes, we have another question from the audience.

Audience Member [46:30] Building on your two comments just to say that I guess there's an additional interpretation or way of thinking about these private activities, which is more in the affirmative side, that private and independent actors can do things that governments can't. You began to allude to [it] at the very end there, and sometimes that's negative, but sometimes it's positive. Sometimes they can go out and take the heat or take on a demonstration of something that is ambiguous in the legal context, but. . .helps to bring together actors to set precedents in ways that haven't been done before. I think there's [a] kind of symbiotic relationship there for better and worse, all of which can be looked to.

Mark Sundahl [47:18] I think we will get back to the point where you talk about resource extraction. If I understand you correctly, this idea that private entities are fundamentally different from state entities and their obligations are different. For example, could a private entity appropriate a celestial body? We know that a state can't, but can a private entity? We can circle back to that.

I'm glad one of my questions here was to ask: how do we enforce domestic legislation? The Swarm example was a good

example of that. It will be a cease-and-desist requirement if you violate the terms of license and then there's the opportunity for astronomical fines. I think they have maybe a million-dollar fine or something like that, but for a startup, it's significant.

I'd like to circle back to some treaty language and get your idea about how to interpret this treaty language. I'm thinking about Article VI, this requirement of government to authorize and then provide continuing supervision of private activity, and that is what generates our domestic regulations. That language is generally interpreted to mean that states have to adopt laws to enable the issuance of licenses and then they need a mechanism in place to monitor any licensed activity.

Is that the only way to read this treaty language? How much regulation is required? To what extent could it be just a bare bone, kind of catch all, if you want to go into space? Send a letter to this agency and they'll either say yes or no. Would that suffice, or do we need this kind of very detailed regulation that we have here in the United States? And why this is becoming such a hot issue, I think, is a more critical issue now than before, is because we see the emergence of nontraditional space activities.

We've known, and we've done it for a long time, how to regulate and license remote sensing, telecommunications, and other traditional space activities. For example, you know, navigation… although that's a separate issue. We know how to regulate and license these traditional activities, but now we're talking about asteroid mining. We're talking about private space stations. We're talking about private human space flight. We're talking about refueling and repairing satellites on orbit, which just occurred in real life for the first-time last week. We had two private satellites for the first-time dock, and it is magnificent technology. We have all this new stuff going on. Do we need new laws now to regulate it or are existing laws sufficient? Or are we required under Article VI to beef up our legislation to fulfill our obligations? What are your thoughts on that?

Chris Johnson [50:42]

This is precisely the question, right? Well, so I'll ask another cynical question: where does it say in the Outer Space Treaty that you're allowed to remove space debris? Where does it say that you're allowed to manufacture in space? There's no clear explicit authorization or regulation of these activities that we want to do in space.

Steve Mirmina [51:09]

So again because this is a CLE, we need to pause for a minute and then I'll pass it to Diane to talk a little bit about Administrative Law. As you know, and as we know, agencies of the U.S. government can only do those activities that the U.S. Congress authorized them to do. You have to look at, for example, NASA's statute, and NASA can do only those things that are in the 1958 Space Act as amended, where it says that 'NASA shall,' and it enumerates specifically what those things are. We cannot do other things. If we don't have the explicit statutory authority to be able to do something, we can't do it.

That problem exists also with the FAA, and I'm not picking on them. But the Federal Aviation Administration has the authority to license launches into outer space, as well as re-entry of spacecraft, as well as space ports. They can license those things that go up, they can license the activities that go down, but they do not have the authority to license what we would call on-orbit activities, that is, anything that happens after launch and anything that happens before returning. They just don't have the authority. They would love to regulate it. In fact, there have been times that they've really had to stretch their authority, and during various payload review processes, in order to say whether certain things were okay, such as, you know expandable habitats or…

Mark Sundahl [52:50]

Lunar express.

Steve Mirmina [52:51]

. . . lunar express activities, right. They had to really stretch the limits of their authority. I think Professor Sundahl really put your finger on what would be called a gap or a lacuna in U.S. Domestic Space Law. That there is no U.S. government agency that has the authority to license what happens purely in outer space. Let's see what Diane thinks about that.

Dr. Diane Howard [53:20]

I will say that it's evolving, and it's evolving precisely because there are nontraditional activities that fall outside the framework. I mentioned before that there was a tasker that came out of the August National Space Council meeting that addressed exactly that. And we've worked on a report here within my department. It hasn't made it out of the building just yet but, and it will at some point. We are aware, I believe all of us that are thinking human beings are. . . actually, [of] the authorities that exist in enabling legislation, much like Steve just mentioned, and the things that fall outside the scope or the purview of that statutory authority.

It is not a settled question. It requires some legislative support and I think that the payload review fell short when we get to

the continuing supervision part of Article VI. The payload review, it is the safety of the payload, and all of the different aspects that are dealt with by the different reviews of that payload, have to do with the launch of that payload and the ongoing supervision of that payload after it's in orbit that is not within the purview of the statute or the Code of Federal Regulations that pertain.

I think these are serious issues. Somebody was asking before, what do we do with the exposures with regard to [what] the private sector can expose the state to? The best thing that we've got is the Article VI licensing, and so we need to take this very seriously and make sure that we're compliant. But. . . I do believe that there are more benefits than costs to having the private sector involved. I think there are many efficiencies that ensue when we get the private sector involved, and I think we want that. We want NASA to be able to do amazing science and exploration, and we want to let the private sector take over things that don't require quite as much scientific and exploration dollars, research, and development. The private sector is the natural for that, but that requires us as U.S. government state actors to be very, very clear and very, very serious about how to make sure that our Article VI responsibilities are fulfilled in a way that is responsible, but also allows industry to flourish. It's not an easy one, but it's certainly a worthwhile question to ask and to answer. I think it's something that we will all ask and answer it together. I don't think it's any one entity or person [that will] come up with that by themselves.

Mark Sundahl [56:10] This issue of whether we need to revise our domestic space law is one of the rare instances where we have companies begging for regulation.

Dr. Diane Howard [56:27] Yes.

Mark Sundahl [56:28] They want more regulation and I know it's…

Dr. Diane Howard [56:31] But they want it to be effective.

Mark Sundahl [56:31] . . . and I know it's the attitude of some politicians. Yep, go ahead, Diane.

Dr. Diane Howard [56:33] They want it to be effective regulation. They don't want it to be heavy handed. They don't want it to be cumbersome, and they don't want it to be conflicting. They want it to be clear and predictable.

Mark Sundahl [56:45] Right, right. But there's an attitude of some politicians that all regulation is bad, and I think we need to understand that that's not true. And in fact, companies are asking for regulatory clarity. I think . . . .

Dr. Diane Howard [56:57] That's right.

Mark Sundahl [56:58] . . . everyone's aware that we have this Article VI issue. companies would prefer that we do something about it now, so that it's settled. There is a concern that there might be investment in the commencement of the space venture of some type, and then we get a surprise, a surprise law is enacted that wasn't foreseen by the investors. We don't want that kind of uncertainty. Is there a question? [pointing to audience] Yes?

Audience Member [56:27] Thank you. My question. . . perhaps best matches up with this panel as opposed to the others. The question is really kind of the elephant in the room and that is affordability. I mean, I spent ten years in Congress working on budget issues, and we are now, it's debatable, as to whether we are initiating an era of fiscal accountability or whether that snaps back at some point. You skirted over a lot of issues with funding, with public-private partnership by offloading that sort of responsibility, but there's got to be some overarching guidance of how these goals are [going to] be met, how are they [going to] be afforded, and how they are going to be paid for. Is that something that you want to talk about here?

Dr. Diane Howard [58:20] I will posit it to you that we have a very cohesive set of policy directives coming from the administration in the last couple of years. I mean, from Space Policy Directive 1, which changed the focus to just the Moon, to redirecting it to just Mars, rather, to the Moon to get to Mars. To Space Policy Directive-2, which streamlined regulations and deals with the issue of aligning the different regulations. To [SPD-3], which is the space traffic management policy, and to [SPD-4], which is the standing of the space force. These stand on the shoulders of an extremely good national space policy that came about in 2010 and an international space transportation policy in 2014. So, we have some excellent policies here in the U.S. We now need to implement them and/or continue to implement them, and I believe we are. Again…

Mark Sundahl [59:12] And, of course, of course, the risk.

Dr. Diane Howard [59:14] . . . Budget would be good.

Mark Sundahl [59:14] Of course, the risk, Diane, is that we have in November or next January, President Sanders. And will President Sanders have a different view of the Artemis program then President Trump? This is one of the problems with democracy and our legal system. The Chinese don't have to worry so much about the lack of continuity. . . .

Dr. Diane Howard [59:46] Yes.

Mark Sundahl [59:46] . . . in the ruling class.

Chris Johnson [59:48] I'd like to ask a question to my other panelists about when is a good time to draft law? And maybe you'll agree with my understanding of this law. In 2004, the U.S. passed the Commercial Space Launch Amendments Act, which was thinking that commercial space tourism is about to begin, and we need to come up with the rules for space tourism, and to establish the categories of Space Flight Participant (SFP). It said that we need waivers of claims between actors, and we need tiered insurance regimes. Up to maximum probable loss, or 500 million dollars, and then 500 million dollars to 1.5 billion would be reimbursed or indemnified by the government.

They came up with this rationale and some standards because they said commercial tourism is about to begin, we need to have the regime in place to foster it and meet the needs of the national interest and uninvolved public, but also foster commercial tourism. And that tourism did not happen. The law is still on the books. And then a decade goes by, and we started thinking about commercial space flight and Space X launching astronauts to the space station, and Boeing launching astronauts to the space station. So, the proposed activity changed. It went from being millionaires expecting to go on sub-orbital trajectories for a few minutes at maybe 105 kilometers high.

Now the rules that they had written for that 10 years later, they go: [these are] the rules that we're gonna have to apply to NASA astronauts on SpaceX rockets going on orbital trajectories for long periods of time and serving in a governmental capacity on the International Space Station. And they're gonna be Space Flight Participants? So, I don't know if I've got the story correct of the timeline and how the law is written in 2004 – 2005. 15 years later may apply in a way that was not expected. Is this a problem, and is this an example of drafting law essentially kind of too soon and having it misapplied?

Dr. Diane Howard [1:02:04] Right.

Mark Sundahl [1:02:06] Did you have a response to that, Steven, in particular?

Steve Mirmina [1:02:10] I wrote an article about that.

Dr. Diane Howard [1:02:11] [Laughing happily.]

Mark Sundahl [1:02:11] Ahhhh.

Steve Mirmina [1:02:12] In fact, three of us were together down in Florida when we talked about that.

Dr. Diane Howard [1:02:17] Yes.

Steve Mirmina [1:02:20] You absolutely put your finger on the problem, in terms of drafting law in advance of technologies. What you identified specifically about the government astronauts, NASA astronauts, being transported to the Space Station on commercially provided vehicles. Under the law, as you described it, all astronauts are divided into two categories: you're either crew, or you're what's called a 'Space Flight Participant.'

In NASA, we know what crew means right? At NASA, it's astronauts. But under the law, the crew means you're an employee of the licensee. So here, SpaceX has the license. The only crew under U.S. law would be employees of SpaceX. Well, NASA employees are not employees of SpaceX. So, we couldn't be crew, but then the only other category for them would be Space Flight Participants, and that was like you said [pointing to Chris] that was envisioned to be millionaires going up to sub-orbital altitudes and coming down a few minutes later- essentially, be passengers or tourists.

Certainly, NASA astronauts aren't tourists, and there were restrictions. The tourists weren't allowed to operate the vehicle. They weren't allowed to carry, let's say, certain tools or weapons into space. They couldn't carry a knife or even a screwdriver or something which NASA astronauts might need for their own survivability. So, there were problems with the law.

In 2015, NASA went to Congress and said, listen these are our fundamental issues with this law, that the law was actually impeding sending NASA astronauts to space on commercial vehicles. So, they actually created a third category astronaut,

called 'government astronaut.' And this government astronaut would be NASA crew or international partner astronauts, like astronauts from Italy or France or Canada or Japan, that now send food to the space station. But it was an example. We had to go, and we had to fix the law because the law was actually slowing down the commercialization of outer space.

Mark Sundahl [1:04:26] Unintended consequences. It raises the broader, more theoretical question of legislation; prospective legislation, or should legislation be reactive? To what extent should we regulate this new activity when it's just taking shape, and there was great pushback from industry? There are virtually no design or safety requirements in our human sub-orbital spacecraft, human space flight requirements. There is a requirement that the atmosphere on board the spacecraft be sufficient to sustain human life. But it doesn't go much beyond that. They didn't want heavy regulation, and there is still a moratorium on any further regulation.

Again, the companies and investors want some regulatory clarity, so we do want to write laws prospectively as well. And a great example of that is the statute that was enacted by Congress explicitly stating that resource extraction [of] celestial bodies was legal and you can own what you extract. Now, asteroid mining and resource extraction are still somewhat in the future, although coming quickly. Should we have regulated it at all? In that case, it's important to have this prospective legislation because no one is going to invest billions of dollars unless they know they can keep the platinum that they mine. In this case, it was very important, but in the sub-orbital case, maybe we did too much, too soon.

Chris Johnson [1:06:11] I can give another story of the regulations expanding and evolving, oh, Diane has a comment.

Dr. Diane Howard [1:06:17] I have to go. I am so sorry. Thank you so much for having me, but I have to go to a meeting.

Mark Sundahl [1:06:22] Oh, alright. Let's hear it for Dr. Howard. [Audience clapping]

Dr. Diane Howard [1:06:25] Take care and goodbye.

Mark Sundahl [1:06:26] Thank you, Diane. We appreciate it very much.

Dr. Diane Howard [1:06:32] Bye. Thank you.

Chris Johnson [1:06:33] [I was just about to ask] about the Orbital Debris Mitigation Standard Practices versus the FCC's Notice of Proposed

Rulemaking approach to orbital debris, because that's the story I want to tell. In the early 2000s, the FCC realized. . . creating debris is a problem and they expanded the questions that they asked applicants. They said 'oh you want frequencies, well show us that you can de-orbit your spacecraft within 25 years. Show us your end-of-life plan that you can either de-orbit or move to a graveyard orbit. Prove to us that the odds of your spacecraft exploding on orbit or causing debris through conjunctions [are low]. They expanded the questions that they asked. Now, we have the issue of mega constellations, you've seen mega constellations having an effect on ground-based astronomy, and this is what I mentioned earlier.

Mark Sundahl [1:06:36] And let me just interrupt here, just quickly, so people get a better sense of these mega constellations. We have about 2000 operational satellites in orbit right now. Elon Musk is planning on putting [out] an additional 42,000 Starlink satellites, and this is only one of the three planned mega constellations that I'm aware of.

Chris Johnson [1:08:01] Yeah.

Mark Sundahl [1:08:01] The amount of space traffic is going to go through the roof, and so…

Chris Johnson [1:08:07] So, SpaceX asked for permission from the FCC and showed, 'here are our plans for our mega constellations.' Ten - I don't know what the exact number is. It's like 10,000 space crafts in one orbital shell, at a certain altitude another 16,000 and another set of thousands. Essentially, such a proliferation of spacecraft, that even within the first few launches, appreciable effects were noticed by the astronomy community, where they are imaging just in galaxies, and in that image is a stream of satellites crossing it. A web of satellites crossing it.

The FCC granted those licenses to SpaceX and said 'here, you've shown us your debris mitigation plans.' They did not ask for any effects on the astronomical community. And why did they not ask that? As you pointed out, they, as a regulatory authority, they do what their rules tell them to do. It was in their rules to ask what are your debris mitigation plans? It was not in their rules to ask what are your effects on the astronomy.

Some people, and this is recent articles in Scientific American and the new scientists essentially having that conversation, say the FCC violated its licensing process and it should have taken into account NEPA [National Environmental Policy Act] for environmental concerns for how these mega constellations

affect the environment. But the FCC did exactly what it was supposed to do in granting that license. The idea is, maybe the application process and the questions can be expanded, and they would need new statutory authorization and new language. 'Then what?' the FCC asked. As it is, mega constellations are free to go ahead, regardless of their effects on ground-based astronomy and possibly even other users of the space domain.

Mark Sundahl [1:10:16]

Excellent. I think, with that, we are going to wrap up this panel: Who is going to the moon? We're all going to the moon. Governments, all the different countries' governments and non-governmental actors. Now you get a taste for how that works, and some of the legal issues that surround the regulation of these activities.

I do want to mention that the lunch is sponsored by Open Lunar Foundation. From the Open Lunar Foundation, we have Jessy Kate Schingler here, who asked a couple of questions, and so we ask her to say a few words when we return with our food but thank you to Open Lunar.

LUNCHTIME PANEL: HOW OHIO COMPANIES CAN GET INVOLVED IN THE ARTEMIS PROGRAM – LESSONS FROM NASA AND INDUSTRY LAWYERS

Panelists: Dr. John M. Sankovic, President, Ohio Aerospace Institute
James W. "Jay" Jackson, NASA Glenn Research Center, Office of the General Counsel
Jon P. Yormick, Phillips Lytle, LLP
Justine Kasznica, Babst Calland, LLP

From the largest of rockets, to the smallest of aircrafts, Ohio is regarded as the birthplace of aviation. The history of aviation has seen the advancement of science and technology evolve today into the multibillion-dollar industry of space. Ohio plays a key part in this extremely robust industry. The following panel discusses how Ohio companies are involved in the Artemis program, the establishment of a sustainable presence on the lunar surface, and what their mission and visions are for the future. Will Ohio companies create a stronghold in the commercialization of space? How does legislation and the government shape that relationship?

Ohioans, despite regulatory concerns, have grown to implement space policies into tangible procedures to overcome many of the challenges the space industry is deeply engaged in. The panel also focuses on aerospace collaborations between the community, the State, and throughout the nation. The discussions outlined how the Artemis program is a nationwide effort, not just a NASA vision.

Mark Sundahl [0:00]

[Welcome to the second half of] today's symposium.… I have assembled some panelists here, really the leaders in the Ohio Aerospace community, and I wanted this luncheon panel to have a local flavor. You may or may not know that Ohio has an extremely robust aerospace industry. If I'm not mistaken, Ohio is the number one supplier to Boeing of all the fifty states. There are large companies, medium size, 'mom and pop' operations, but a lot is going on here, and, of course, we have the NASA Center.

I'm going to introduce the moderator today, who is Scott Perry. Scott was a former student of mine and an alumnus of

the law school. He is unique among my former students in that after studying space law with me, he hadn't had enough, and he went to Nebraska, the University of Nebraska in Lincoln, where he earned his Master's degree in the Law of Outer Space, studying with Frans von der Dunk, the great Dutch priest of the higher knowledge of space law. We're proud of Scott, and asked him to come and participate in the symposium today, and he will introduce the speakers. But before we get there, I would like to introduce Jessy Kate Schingler, who I mentioned before is from the Open Lunar Foundation, and they were generous sponsors and sponsored the lunch you're now enjoying. I just wanted Jessy to have an opportunity to say a couple of words. . . Jessy.

Jessy Kate Schingler [1:43]

Thanks, Mark. Thanks for having this exciting event. The Open Lunar Foundation is a nonprofit based in the Bay Area. We're building spacecraft to go to the Moon in order to have a nonprofit actor that's sort of got a seat at the table for near-term developments that are happening in the lunar ecosystem. I'll say a bit more about what we're working on in the panel this afternoon, but in the context of sponsoring lunch here today, I think [it] was really a recognition from our side that the reason we're doing this is to ask a lot of the same questions that the folks here today are asking, and to be a bridge between the thought leadership that's happening in the space community about open questions. About, you know, the legal regimes, regulations, coordination, cooperation, and then to take that and apply it in actual spacecraft development and operations. Being here today is really our way of learning as much as we can from what people are thinking and what the cutting edge of ideas are in this industry. So, thanks for all your great questions and participation, and I look forward to being on the panel and talking a bit more about our projects later on.

Scott Perry [3:07]

Thank you very much, and this morning I thought it was just terrific. I enjoyed the engagement, audience participation and questions, and the discussions back and forth. Thank you for the kind introduction, Professor Sundahl. I believe it might have been your very first space law course that you did teach here, perhaps elsewhere I'm not sure, but thank you for that.

The panel I'd like to introduce, I'll just start immediately on my left and work toward the podium over there. Immediately to my left is Jon Yormick. He is an experienced international business and trade attorney, practicing for more than twenty-

five years. His customs and international trade practice he represents the U.S. and non-U.S. companies before the Department of Commerce, the Bureau of Industry and Security, U.S. Customs and Border Protection, Department of Homeland Security, Immigration and Customs, the U.S. Department of State, and you get the message, right? That's, I mean, that's pretty much everything you can need to get to. He's represented clients in aerospace and defense, electronics, energy optics for tonics and transportation, logistics sector. We welcome Jon here, thank you for your time and we appreciate having you here.

Next to Jon is Justine Kasznica. Justine is a shareholder at Babst Calland. She works in the firm's Mobility, Transport and Safety, Transportation Safety, Corporate and Commercial and Energy and Natural Resources groups. That's a lot to take on too. She's a commercial transactions attorney and represents technology companies, investor groups, universities, and research institutions seeking to commercialize new technologies.

Then, we have Dr. John Sankovic. John comes from OAI [Ohio Aerospace Institute], following a distinguished thirty-one-year career at NASA. That's the Ohio Institute where he most recently served as the Senior Chief Technologist and Director of the Office of Technology Incubation and Innovation. There, he received numerous awards, including the NASA Outstanding Leadership Medal, six agency Honor Group achievement awards, and an RND One Hundred Technology Innovation Award.

And then, finally, closest to the podium is James "Jay" Jackson, NASA Glenn Office of the General Counsel. He is the deputy general counsel for NASA at the Glenn Research Center. He's responsible for Glenn's Office of the General Counsel Management and Strategy, as well as providing legal advice and counsel to senior executives and top-level managers at Glenn. In this role, Jay is a member of the Glenn and NASA headquarters office of the General Counsel Leadership teams as well.

That's a brief introduction. Just to restate, the focus of this topic is how Ohio companies can get involved in the Artemis program and lessons learned from NASA and the industry leaders. So, most of that is right here in front of you.

Scott Perry [7:07] Okay. So, John Sankovic, if we can start with you, I'd like to invite you just to share anything else you would like to about yourself and maybe the mission and vision of OAI (Ohio Aerospace Institute).

Dr. John Sankovic [7:37] Sure. Thank you very much for the ability to be here. I think I'm the only non-attorney here, but my sister's one, so I got that. The Ohio Aerospace Institute has been around for thirty years. It was originally founded by the Ohio Board of Regents, where the state university presidents had PhD engineering programs, of which there are ten in the State of Ohio. Look north to NASA Glenn and they look south to the Air Force Research Laboratory. Also the industrial members: the Parker Hannifins, the Eatons, Ohio's rich heritage and aeronautics. They really wanted to stitch that together, so we've been really advocating for aerospace and collaboration between the academic community and the State, and actually throughout the nation. The industrial base here in the state and the two federal laboratories that we have here are really trying to move the needle for Ohio.

Now Ohio, from the beginning - if you go down to Dayton, you cannot come down to that city without seeing the Wright flyer throughout the city. What has Ohio done since then? [With regard to] the growth of the aviation industry, it was mentioned that Ohio is the number one supplier state to Boeing. We're also the number one supplier state to Airbus. We're the number three to Northrop Grumman, and that's unbeknownst to many people, even in Ohio. That's really because we supply. We are not building the air frames here necessarily, but all those other pieces. The landing gear, the fuel systems, the tires, the hydraulics, the avionics, and of course the engines, that's all being done in the state along with advancement materials.

What's exciting now is this move to commercialization of space. How does Ohio plug into that? Right now, it's a very open time. There is a lot of opportunity. I think it's going to be exciting to see what the panel has to say, because we have startups represented here. Astrobotic, another competitor that's also trying to go back to the moon on an all-Ohio team. That all really depends on the government framework. Is the

government deciding to move in space as it's done in aeronautics?

The NASA center has been here for eighty years. We, as a nation, don't have the government own our planes. We don't have the government tell Boeing how to build that plane to their spec and then take their IP. We don't have government pilots in there. Everyone that works as a flight attendant doesn't work for the United States government. So how do we take that model, what we have in aviation now, and move it into space? Is NASA going to take on a model where they're not government astronauts, where they tell Ford to go build the car? Do they move to a rental car model, where they rent the car and then go ahead and put their own people in? Or do they go to an Uber model, where not only do they not own the vehicle, they don't even drive it- they just pay for that destination? So, that's the exciting time, and I think that's where we are right here, as a nation, and Ohio is certainly interested in playing in that. So, thanks.

Scott Perry [10:56] Justine, if there's anything else further you'd like to share about yourself that wasn't mentioned just in the brief bio and within this theme that we're focused on here. Maybe touch on some of the key types of work that you do in your representation.

Justine Kasznica [11:13] Thank you so much. Since we're talking about state jurisdictional appropriation, I'm actually from Pittsburgh, but brought onto an Ohio panel, which we'll be lenient on that. We're thrilled to be here. I really appreciate the introduction. I'm a partner at a law firm, a large law firm in Pittsburgh. We're best known as an energy environmental law firm, although I run our technology and mobility safety group. We focus our practice on autonomous mobility primarily, so anything to do with autonomous vehicles, drones and in the aerospace side and commercial space.

I have had the privilege [of] wearing a second hat serving as outside general counsel to Astrobotic Technology in Pittsburgh. You may have heard them in this space industry, commercial space world, as one of the first recipients of the Commercial Lunar Payload Service Program awards task orders. We are thirteen years in the making. We've seen the company grow from being formed to receiving its principal NASA contract in May of last year, which really broke open the door to enable the transportation of lunar delivery services.

It's great that it's in the rust belt, two hours away from here. I really believe that it's a segue way to building a space ecosystem in this region. Astrobotics' core business is to essentially serve as a last mile delivery function from trans-lunar injection to do a soft land descent on the lunar surface, with then the deployment of various payloads, both static and mobile. Once the spacecraft that Astrobotics builds, called Peregrine Lens, is deployed and Peregrine itself becomes a telecommunications and energy - is an essential utility - on the moon, providing support and resources to the payloads that are then deployed.

The mantra for Astrobotic has always been how do we make space accessible to the world? We are very much a U.S. owned, U.S. built [and] designed company. We pride ourselves on that. But, the goal, and I think this harkens to what we saw in Articles II and VI especially [from] the Outer Space Treaty, we see it as a mandate for a commercial space enterprise to be that enabling access for us on the transportation side. Not just to the U.S., but to the rest of the world in a controlled way. I think we've seen. . . the company try to get investment locally from the West Coast. I've seen the CEO and others pitch VCs [venture capitalists], and others, and get laughed off stages for about ten years. We've worked very hard to build a business model to try to show that space has a sustainable history and future to it that is more than just relying on government funds.

I think NASA has recognized the importance of that initiative and endeavor, and has rewarded the 'technology first' attitude that the company has exhibited. We've watched in the last year the company grow from about fourteen people to seventy-five, with plans to expand beyond that. It's incredibly exciting to be able to generate that kind of talent acquisition in a rust-belt region like Pittsburgh. I'm originally from Boston. It's just really rewarding to see that happening in our back door, and I think connecting to this region and industry, knowing what Ohio is doing with its strong history [in] aeronautics and aerospace.

It's really interesting to me, and I'd love to hear what the panel participants have to say. But, if you don't know it, look up: Astrobotic. We're here to stay and it's been a tremendous ride. If you want to know where we stand on a number of the issues that were raised earlier today, I wear two hats: One is as a lawyer and academic thinker about these issues. And, two is as a pragmatic, zealous advocate for a young space company that

is really trying to succeed with this new commercialization of space. I'm happy to talk to both sides of those. Thanks so much.

Scott Perry [15:46] Very much, and Jon, similarly if you have anything additional you'd like to add or discuss, maybe some of the key aspects of your practice dealing a lot with regulations, ITAR [International Traffic in Arms Regulations], and so on?

Jon Yormick [16:04] Thank you very much. Mark, this is great. Thank you for inviting me to be on this panel with such distinguished colleagues here. I consider myself to be very fortunate. As I recall, you and I met some probably dozen or so years ago when you were at some event here in town, and one of John's predecessors with ITAR was up on the panel saying "that damn ITAR." You know, it's really just a stumbling block for all of these Ohio companies that are supplying Boeing, and Airbus, and Northrup Grumman, and other defense contractors.

So Mark, as I recall, we met, and then we were pretty quickly after that out to OAI to talk about how we can assist companies, understand export controls in the regulatory environment of their technology, of their hardware, components, sub-assemblies, and how to make sure that they are in the game, and can remain a vibrant part of this supply chain that needs to be relied upon. By young, growing companies, by the established behemoths out there like Eaton and Parker Hannifin. I represent and advise a lot of the lower-tiered companies that want to get their products, their technologies, onto aircraft and space launch vehicles.

Scott Perry [18:12] And finally, Jay, down at the far end. Any words you would like to add about yourself, and maybe your current work and responsibilities and so forth there at NASA?

Jay Jackson [18:25] Sure. I echo a lot of the comments. Sitting up here is a lot of fun with distinguished panelists. One thing I'd like to say, just right off the bat, is we are going. We're not up here discussing should we or why. We're now in, kind of, the execution phase. It's the how. Justine mentioned, CLPS, the Commercial Lunar Payload Services. As a contract mechanism that, more or less, NASA bought exactly what John was just talking about. We bought the ability to become a customer. We bought a way to get our product to the moon.

Artemis, this wonderful program, is really a lunar exploration program that isn't specific to any type [of] mission. It's not like Constellation of the past, which is funded individually. There is no appropriation dollar specific to Artemis. It's an overarching lunar exploration program which encompasses many components. [It] includes the ability for Ohio companies to get involved with our tech transfer, and find ways to maybe partner with Astrobotic in performance of a CLPS contract, which is a Far Part 15 procurement, or alternatively maybe engage NASA using the Far Part 35 mechanism like what was used for the power propulsion element as part of Gateway. There's opportunities that live and breathe within NASA's missions.

The Artemis program is really not just a NASA vision, it's a nationwide effort. Both commercial and government are working together to find lunar exploration for the benefit of all, which has always been NASA's mission. NASA's longest mission is research and development. That's been going on since the NACA days. This is another phase or iteration of that. So, it's an exciting time not only to be at NASA, but it's an exciting time for industry. It's a great time, frankly, to be a lawyer, because it's a lot of new ideas, a lot of different ways of thinking, and some challenging exercises. Not only are we applying the local precedent of what has been done, but we are challenging ourselves to see what can be done through rule changes, thinking about things a little bit differently, by working in a different context, a different paradigm, or by working with commercial partners to do things that maybe traditionally we didn't want to do or weren't able to do. I'll just conclude with: Artemis is here to stay. It's a big, broad, and ambitious program. I think the opportunity for Ohioans to be involved, Ohio companies, is unrivaled in the history of NASA.

Scott Perry [21:01] John, you touched on it in your preliminary remarks as well, but what is this Ohio landscape, and perhaps in the case of Pennsylvania as well? What is it currently looking like? What are we seeing? What are the trends? Who are the players? Who's emerging? Just kind of [go] over some generalizations of what you're seeing out there.

John Sankovic [21:55] Oh, I guess I'll go back. There was a comment earlier about SpaceCom, and that was one of the first public-private partnerships. This region really is at the forefront of that.

NASA, one of its main goals in the '60s all the way up through the '80s, was to support the commercial space communications industry, right? It wasn't just communications for itself, but it was actually to push that industry forward. The NASA center here is part of that supported opening Spectrum. Spectrum, I look at a lot of the historical work that we did with managing Spectrum in the nation. It's very analogous to what we would be doing to the real estate on the moon and beyond. I think we can learn a lot from that regime.

Here in Cleveland, we actually do still manage the Spectrum for NASA. The International Spectrum Manager and the Domestic Spectrum Managers all reside here working through the ITU, and, of course, NASA headquarters, through all those regulatory bodies. Part of that work, and part of the technological work, we open up one spectrum band, the KU band, which was used for video back in the '70s. Then in the '90s we opened up KA, which is what enabled your current DirecTV and a lot of the satellite communications we have right now.

Unfortunately, what we haven't seen is, with that technology development, we didn't see the industry develop in the state based on that technology. Similarly, the states developed all the hydrogen oxygen rocket technology. That was all managed here out of the Cleveland area for years, and we didn't see the development again in the industry develop here. It developed in other places. I think what's changing now is a desire to see the technology developed around the power of propulsion and communications technology.

There are companies that are involved locally that want that to grow here within the Great Lake states, so, you know, I consider Pittsburgh a colleague. It's really this industrial heart of the nation that comprises a hundred and ten million people, fifty-one million jobs, six trillion in economic output. That's what the Great Lake states plus the two Canadian provinces put out. That's its own market. That's a major industrial force, not to mention the universities in the area.

So, what do we have now? What's really been happening is there's been a lot of work with the International Space Station. We talked about the power system for the International Space Stations developed here, and all those payloads that you saw, the science being done. Two of the four U.S. laboratories were built right here. The company that built that, ZIN

Technologies, is still here. They employ over three hundred people. Very much in the basis of moving out and still doing those types of payloads, doing the electric propulsion system with Aero Jet for the power propulsion element, right? Part of the activity, and we're a competitor to you on the stage, but for the CLPS activities, there's plenty of room to go around in that.

Ohio and Pennsylvania are at the forefront of that. It's not just the two coasts. It's the heartland of the United States. Why is it different now? Well, I think what's different now is we're not going to build one. We're not going to build two. It's the industrialization of space, right? And that's what this region knows how to do. How to build things at scale. How to move out. And we start seeing commercial money getting involved in the larger markets, and I think that's starting to excite the manufacturing base in the region.

Scott Perry [25:41] Anyone else want to just add generally with what they're seeing? Maybe in their contracts or who they're talking to?

Justine Kasznica [25:49] I came from Boston and ended up in the Pittsburgh region, and I'm here to stay. One of the things that we find in this region, I think, is shared between western Pennsylvania, Ohio, the Rust Belt, and even the Great Lakes region, is a very different approach to building business. I think when we first got into the space race, you hear a lot of names that are coming out from the West Coast that have ready access [to] the Capital, and the way that we don't necessarily have as a region from the investment side. I think it's made us be a lot more lean and very agile in terms of how we create an industrial business. What we're talking about is principally hardware, software, or embedded software systems.

Those are complex and not something that readily fits into a financing box that a software as a service model, which is what the VC's would typically understand fall into. It takes longer to develop, far more expensive. God knows you bring in agencies into the mix and, you know, it blows people's minds. But this region understands that. It has a history in it. It has a low cost of living that allows us to create those embedded hardware systems and technologies. We understand the public-private partnership model; I think better than most other areas in the state. I think we need to leverage that as a community.

I think we're doing that already. I think the administration has been incredibly supportive of those efforts to really galvanize

the talent and the resources that we have here. We need to continue to expand and build on those. The way we think about commercial access to space is, as a lawyer, I spend a lot of time thinking about 'how do we reduce challenges to growth and challenges to commercialization?' Throughout the day, this morning with Mark's great selection of panelists, we're hearing a number of resounding themes that I want us to sort of harp on.

One is regulatory certainty, but more importantly, we have a regulatory structure in place that is there to be applied today without necessarily creating change. Change creates uncertainty. From the perspective of a young space company, what we want to do is know which agency to talk to get our permits and approvals, and our payload acceptance tests done. We know that we need to talk to the FCC and NOAA, and all the other agencies, and leverage our FAA colleagues to help galvanize that process. The government is our greatest customer, and they're the best way, and they have the capability to work with us in a very, kind of, friendly way that I think allows a company like ours to address the hoops that might be there today.

Does that mean that what we have is a perfect regime for ten, twenty, thirty, fifty years from now? We can revisit that in the future. But, I would say we are a company that has been around for thirteen years and has never landed on the moon. We have technology at the ISS. We've seen two nations try and fail in the last year to get on the moon in a similar capacity. Before we jump into sort of a highly academic exercise about what could be, where we are right now, we need to enable the demonstration missions to enable the deployment of their technologies, bring back that information, share that information with our partners at the government level, and then grow off that. It's always a chicken and egg problem.

I mentioned to you that I work with autonomous robotics and autonomous vehicle companies and we have the same issue, and the FAA, and drones. We always have the same issue of 'we need regulation,' but technology is evolving at such a rapid pace that we are not yet sure what we're going to celebrate as the next sort of future of the technology that wins. In that phase of development, I think what we need to do is a very light touch. Does that mean I think we have no regulation? No. I think someone said, you know, no regulation is great, right?

I feel like most of us here would probably agree that smart regulation and working with the system, and the Outer Space Treaty principles and framework as it's created today, and how the nation has implemented that into actual tangible processes and procedures by which we get licensing to get something from Earth to the Moon is a good enough system to get us going right now. And, I would say that to introduce a level or uncertainty at this point could be counterproductive to the advances that we've made. That's just a perspective of a young company trying to reduce barriers in innovation.

Export controls is another issue that we deal with quite a bit. Another issue that we're constantly seeing with this access to space internationally is the threat from corporate espionage for espionage of intellectual property. I think there's a number of critical challenges that the space industry already is deeply engaged in, and I think this administration is very much attuned to that we're trying to resolve it at a company level. But, these are larger issues that I think will be challenges that we'll need to resolve.

And then finally, I would just say that, despite the challenges, I think we are at the paradigm dramatic shift of an industry that we will see in our lifetime. The fact that you can go down to Pittsburgh and work for a company, and within a year or two we're looking to launch at the end of 2021, well August, 2021. The fact that young engineers coming out of universities in this region will see a mission that they have their footprint on within a decade or less is amazing. I think that is something that we can celebrate from an economic development, talent acquisition, talent development, talent growth perspective. I'll get off my soapbox.

Scott Perry [32:05] Thank you kindly. Jon Yormick, the speakers earlier this morning, a number of them, Diane Howard, in particular spoke, a fair bit about, you know, over-burdensome regulations, and there seems to just be that sense that a lot of these things could be streamlined. In light of that, ITAR, it seems to be one of those stumbling blocks that companies just suddenly face. I'm not quite sure what it is. I don't know if they don't consider it up front, but it seems like they get to a certain point and then suddenly it's kind of, like, wham! You know? What's sort of different about aerospace companies? If there is anything in your experience, with your clients, and your contractors and so on.

Jon Yormick [33:00]

I've had a lot of experiences that sometimes are not very pleasant for the supplier, for the sub-contractor. Because, very often these lower-tier suppliers are learning about export controls from a higher-tier supplier or the prime. It can come up in a variety of ways, but often it means that I'm doing an internal investigation., and we're figuring out exactly what went wrong.

Sometimes, it's a matter of 'we had no idea,' and that's kind of a tough story to tell to the State Department or Commerce Department when you're writing a voluntary disclosure saying 'we really didn't mean this,' however, and then you go on from there. It's at that point when there's the opportunity to right the ship and get these companies to understand that those controlled drawings that you received with the fine print that not only says 'confidential and proprietary, not to be disclosed,' but also warned at their export control. Someone has to read that and pay attention to it, and then know how to handle it both internally as well as potentially externally in order to remain compliant.

Very often, they do not have a technology control plan, so that when they are having communications, which can be a Skype call, it could be a webinar, Webex type of discussion with engineers elsewhere, do they know whether or not the information they are discussing about a particular program is not only confidential? Certainly, they're in tune with that, but, are the engineers aware that what they're discussing with colleagues in outside companies or perhaps an affiliate that's overseas, are they aware of the fact that that information is also subject to export controls? That they might actually need to have an export license from the State or Commerce Department? More so Commerce these days, in order to carry on that work? It can be a stumbling block.

It can be streamlined, certainly. Did I mention I have four sons? You know, if there's too much streamlining, I won't have any more clients that I can advise, and put food on the table for my kids, and put them through college. But we have seen a great deal of streamlining through the export control reform that began back in about, I think Secretary Gates first announced in 2010. We're at the later stages, but now we're circling back around to say, 'well did we do this right? Did we do it well enough?'

There's still comments out there, public comments from a proposed rulemaking to modify some of the ITAR categories that went through export control reform in [the] 2014-2016 timeframe. So, they're fine-tuning. That's all part of the process, and it should make the commercialization of space that much easier, at least, from the Department of Commerce standpoint. I don't know if all the sister agencies are quite keeping up, but I'm typically not involved with the FAA and FCC, to be perfectly candid. I'd be curious about regulatory reform in that regard as well, because we do not have a 'one-stop-shop' as we heard earlier. We all need to be rowing in the same direction, and I think that can lead to frustration to companies both large and small.

Scott Perry [37:34] Thank you. We also heard earlier this morning the idea of NASA being customer and enabler. Jay, I think that licensing for NASA has been a huge part of what NASA does for their technologies, and innovations, and so on. It provides a significant benefit to private and public businesses and institutions. I'm not sure that you do much of the licensing now, but you have in the past. What kinds of licensing has been streamlined sort of down to at this point? What are some of those key licensing steps or knowledge that people need to move forward? And just curiously, how do you document your work with other companies and who you take on?

Jay Jackson [38:32] Sure. So, licensing for NASA is done through the Technology Transfer Office which John used to head up for Glenn. Essentially, what we look to do there is level the playing field and make sure everything's fair. If we're going to do an exclusive license, we advertise that in the Federal Register. In some ways, that's part of our marketing plan. We hope somebody can contest the exclusivity because that means there's more folks that are interested. We also may do a co-exclusive license, but most of the time we're doing either an evaluation license where maybe a local company wants to come in and see some really cool intellectual property, and maybe even talk to the inventor and learn a little bit about it. Kind of lift the hood and see what's under there.

Then, eventually we may have some startup license and different types of licensed types depending on the entity that's interested, but, most commonly, we find our licensing to companies that are taking some NASA tech and trying to find

a commercial application. The application may be outside of space or aeronautics, and that's perfectly ok.

Right now, NASA has a major push to show NASA in your life. You know, everyone talks about Tang as being one of the greatest things that came out of NASA. There's quite a few other inventions that have made the standard of living considerably better for all of humanity. That is all done through generally the license regime of 37 CFR 404 where you'll find a lot of the licensing regulations, but inside there lives some flexibility.

As attorneys, you want to think creatively on not only: how can we license technology, but also how can we get this technology to the people faster, in a more efficient and a more meaningful way? Often times, that may be a commercial-type license where we may do an exclusive license. They're going to go ahead and invest significant resources. They're going to scale that up, and push it out to the end user very, very quickly. In other instances, you may take an evaluation of the circumstances. That might be a local company, could be Cleveland Clinic, or there's a health application and you want to limit that license just to that exclusive field, that field of use. It's really kind of a comprehensive analysis that's done in concert with the attorneys at NASA, but also with the commercialization plan in hand from the tech transfer office.

Licensing really provides another opportunity for businesses to come in and play. Maybe not in the traditional launching things into space type of way or flying planes, but on a local terrestrial everyday life scale. In a very meaningful way as well. I wanted to address something that Justine said, and I agree with her, is that the existing regulations are necessary. I'm agnostic to whether they're good or bad. But, I will say that there's a tremendous push within NASA to look at those regulations as enabling, instead of seeing them as limiting, which may be historically how they've been viewed.

In particular, looking at the federal acquisition regulations, 48 CFR, we found that we've done some creative procurements, CLPS being one of them, with tremendous success. The Science Mission Director at Associate Administrator, Thomas Zurbuchen, really led that initiative. Saying, 'hey we're going to move quick, and we're going to experience some pain in doing this, but we're going to try something new.' It's been very successful, as shown by Astrobotic. Additionally, PPE was

another way of looking at that, but there's also other ways. The 1958 Space Act as amended, really has a tremendous amount of flexibility in the "other transaction authority." And we found some space to play in there. We have a prize and challenge authority that has been used successfully by the Aeronautics Research Mission Directorate, where they have done a grand challenge and been able to, kind of, inspire creativity that way. We also have gift authority where, you know, people can give stuff to NASA, and we can do it when it's not solicited and is unconditional. We can use that. There's a lot of ways to work within the existing framework. It's just incumbent on us, again, to think creatively and stretch ourselves to really challenge ourselves to get out of what has been done and try to do new things that are still prudent and well-thought through. But again, challenging.

John Sankovic [42:49]

I want to follow up on something you said. I'm glad you brought up the Space Act and since this is a law forum, and I'm a lawyer I'll talk about the law. That's an amazing law, right? I suggest everyone download that and take a look at it. The flexibility that NASA administrators give under the 1958 Space Act is huge. Frankly, NASA is not using all the authority that it has under that. A lot of the other agencies have been just recently getting authorities that NASA's had for many years. That was really done to move things along faster, right?

Let's think about where we were in history: Sputnik just went up, and we were trying to energize our space program. We wanted to make sure that we could do things fast, and get the best talent in the country engaged, to get the industries engaged. There hadn't been a space industry, right? We were creating it. We were taking industries and bringing them in. We're creating these public-private partnerships. We want to get back to that. Things like the transaction authorities, which the DOD [Department of Defense] is really moving forward with right now, NASA's had since the beginning. And you see some of the great successes of the Space Act, that was done under other transaction authorities, under the Space Act, refundable Space Act agreements. Now, NASA has shied away from that. They've dipped their toe in the water and the authority they had, and, all of a sudden, they pulled it back out. It was successful, and then, it's like they started playing with this toy and 'I'm going to keep it in the box on the shelf.'

I think NASA really needs to take a look at the authorities that it already has, if it's really serious on moving forward and getting things done. You have a lot of flexibilities that can enable companies to go ahead and do that. It's just the will to go ahead and take that authority, but again, I suggest we take a look. He's right. The administrator can take gifts, he can give contracts, he can throw away the FAR [Federal Acquisition Regulation]. Businesses don't like the FAR. So anytime you bring up the FAR, any other transaction authority away from the FAR, especially small businesses, right? Except for the compliance people. The business overhead of having to comply with the FAR, having your accounting system, and auditing, and all that is a nightmare. And so, other agencies have seen that. They're trying to be more creative, and NASA was pioneering right from the beginning. And again, I encourage the agency to go back to its roots and see the authorities that it has and use those.

Jay Jackson [45:20]

I would love to respond to that point by point, but it looks like we're out of time. I will say just in response, there is a tremendous amount of flexibility in the Space Act, and that is constantly a point where the attorneys, not only at Headquarters, but at the Centers, are really trying to lean into that and embrace that. We have a culture inside NASA that really values safety and a number of other principles. Integrity, exploration for the benefit of all, those things means a lot to us. Sometimes there's going to be competing interests, but the goal is always, as John referenced, is really to advance. I think we're in a place where we are with this Artemis program. We need to continually put pressure on ourselves to think critically on how we can use that other transaction authority as broadly as we can, but still not without a significant risk or compromise to who we are as an Agency.

Justine Kasznica [46:10]

I would just add from my young company perspective and representing others beyond Astrobotic, there seems to be always a direct opposition between working with the agencies and the company interest as somehow being in conflict. I would actually say, having worked with the agencies, that we're in the breakthrough of a new industry. In that situation, both the agency and commerce are working to try to figure these things out together.

This is a highly reasonable exercise conducted by reasonable people, and I've never found that you don't find an interested

ear when you talk about concerns around proprietary intellectual property issues or concerns around licensing issues. Not to say that it's perfect, but I think we're starting to see, in the changes of the different mechanisms that have been used by NASA and other agencies, that were making tremendous progress in the right direction.

A couple points: Space Act agreements that we enter into with NASA. You know, there's a whole host of resources that we are able to avail ourselves of, including in some cases in-kind support from NASA, where NASA will send us their top talent and their people to help evaluate our technology. If you want credibility in the international marketplace, there's no better way than to say our top customer and the agency that's going to approve us to go has sent their engineers to be embedded with our team to be making sure that our spacecraft is actually sound. That's an in-kind contract, IDIQ [Indefinite Delivery, Indefinite Quantity], which is the CLPS program. Where the government basically said look, rather than using the TRAX traditional FAR procurement process, we're going to be buying services from a company, a transportation company like Astrobotic, to deliver services to the moon. That's the contractual mechanism by which money changes hands. In that sense, the IP is preserved.

NASA recognizes that a company, in order to be successful, has to be able to point to its bundle of assets in their IP as something that they hold and own on their own. Then you have the FARs, but even in the FAR context the contract that we enter into with NASA, we are very careful and work together with the NASA teams on carving out data rights under FAR clauses to show which licenses that the government has may be restricted because some of the technology that we created was created under private funding instead of any government support. We have these mechanisms, [and it is a] question of understanding how you play with them to advocate your own commercial outcomes.

Scott Perry [48:50]

With that, unfortunately, it does look as though we're out of time. I feel like you three have had some sort of a final comment, but, Jon, any last point you'd like to raise or leave us with as we move to the next panel?

Jon Yormick [49:06] I would be in favor of getting rid of the FAR. Sometimes, I'm the one who has to point out to these smaller, lower-tiered companies, well, see, this was an export control provision that flowed all the way down to you, and then some. Perhaps you'll cut it off at the second tier. Exercise some authority when available. This has been great. I've learned a lot from my esteemed colleagues here on this panel as well as the prior panel. So, thanks again.

Justine Kasznica [49:42] From my perspective I really thank Mark, and the opportunity to come and actually put more of a theoretical head on for a Friday afternoon when I could be billing hours, right? Because I think we get, in our end, stuck in the weeds of commercial contracting, government contracting. Sometimes, it's really great to be refreshed on the Outer Space Treaty and the principles that we're all trying to advance from our perspective disciplines.

John Sankovic [50:10] One last sentence. We're very much focused on what we're doing here in the United States. I think what we need to recognize is whether we do it or not, others are going to the Moon. There are other countries that are as aggressive as we are, and even more so on going to the Moon, the whole space commerce area, mining the Moon. There are many other countries that are interested. We're part of that. I think it's great starting with the Outer Space Treaty, because it shows that we're doing it collectively, but whether we're a part of it or not, it's happening.

Scott Perry [50:42] Great. Thank you very much to the panel. . . . Thank you very much.

PANEL 4: HOW WILL WE GOVERN A MOON VILLAGE? JURISDICTION, ENFORCEMENT, STANDARD SETTING, AND INTERNATIONAL COOPERATION

Panelists: Michelle Hanlon, National Center for Air and Space Law, University of Mississippi/For All Moonkind, Inc.
Jessy Kate Schingler, Open Lunar Foundation,
Dennis O'Brien, Space Treaty Project/Moon Village Association,
Dr. Giuseppe Reibaldi, Founder, Moon Village Association

When lunar actors expand beyond states, what laws will govern the emerging Moon Village? Is the Outer Space Treaty enough? Is the Moon Agreement the answer? This discussion covers various organizations and how they are endeavoring to create structure for governance to protect human rights, provide certainty for investors, and find a way forward in this historic time. Current jurisdictional questions and hypotheticals also make an interesting appearance.

The conversation focuses much on the bottom-up approach of creating standards and building blocks for actors to implement in their activities and contracts. This method seems, to the panelists, to be the approach most likely to create some working rules and standards. Among the soft law implementations are the Moon Village Association Principles announced by the founder of the Moon Village Association from Rome.

Mark Sundahl [0:00]

Welcome. Good to have you here. We're gonna really delve into it, I think, the most fascinating issues related to the Artemis project and return to the Moon. We're gonna have these two final panels. The first one, it will be how do we govern the Moon? How do we govern the Moon Village?

Let me paint a little picture. When I say Moon village, let me try to explain to you what it is we're regulating, before we try to regulate it. Imagine a lunar village, where NASA works with a number of other space agencies from around the world to establish the first habitat, and then a laboratory, and then perhaps a 3-D manufacturing space, farming facilities. Then, private actors join and start establishing their own facilities - maybe open up a business, maybe someone goes up and starts a farming operation of their own and sells the vegetables to

NASA. Maybe, someone goes up there to open up a therapy practice because it can be lonely being up on the Moon. Really, a restaurant, a movie theater.

Everything we have here on Earth, eventually migrating to other celestial bodies, to the Moon and beyond. Imagine that we have this public, governmental facilities, and we have private facilities, and they are all in the same vicinity with similar needs. There's a need for everything that sustains life. There's a need for power, water, fuel. And imagine that this settlement grows relatively large. It starts out with just a handful of astronauts, but over the years, we have, maybe, fifty people living there 24/7, 365. This is the idea of the Moon Village that we need to regulate.

The question is: how will we govern such a society? Is it existing law - Outer Space Treaty and the other treaties? Is that sufficient? Or, do we need something new? That's what we're going to get into here, and I'd like to introduce my panelists. Here, we have some new faces. I'll start at the, at the very far end there is Mr. Dennis O'Brien, and he is a member of the Moon Village Association. We will have the Founder and President of the Moon Village Association joining us from Rome, fingers crossed, by Zoom again, courtesy of Zoom. So, Giuseppe Reibaldi will be joining us, but Dennis is also a member of the Moon Village Association and recently has been working with me too, on a special project that we will get to in a little while. But he is also the founder and principal of his own organization, the Space Treaty Project.

I'll give you a chance to say a little more but let me introduce Michelle Hanlon who is the Co-Director of the Air and Space Law program at the University of Mississippi. Which was formerly headed up by Stephen Gorove and now, those are big shoes to fill, but Michelle has filled them. She's not only the Co-Director, but she is also the Founder and President of a nonprofit organization called For All MoonKind. They have been floating legislation and other policy ideas, so I look forward to hearing more about that. I had to, of course, invite Michelle when I decided the Moon was gonna be the topic.

And so, we have For All MoonKind. We have the Moon Village Association, and we have the Open Lunar Foundation. We have Jessy Kate Shingler here representing that organization. Why don't I ask you, Jessy, to say a little bit more about Open Lunar and exactly what your goals are.

Jessy Kate Schingler [5:23]

Okay. The Open Lunar Foundation. This is going to be easier now that we just heard from Astrobotic. I can build off that and say that Open Lunar is a nonprofit version of Astrobotic that's about 13 years younger than they are. We're right at the beginning of our journey and we're really inspired and motivated by seeing the emergence of a relatively large number of small actors starting to enter into the lunar ecosystem.

We're funded and founded with the basic idea that we would like to see there be not just government actors and commercial actors, but to also see a nonprofit actor have a seat at the table as lunar development starts to accelerate. Primarily, we are funded by private individuals with technology backgrounds who see this pace of activity accelerating at the Moon. We realize both that means there's an opportunity to get in there and accelerate, but also too that there are important questions to be asked about what that future is going to look like. That there's a role for a sort of higher risk-taking organization, both from a policy perspective and from an engineering perspective, where we can really lean into more agile and iterative development approaches, and also be a lightning rod to help to demonstrate positive and cooperative precedents towards this Moon Village-type vision.

We have two main activities, really. We have an engineering activity. We have about eight engineers working full-time on spacecraft development in our downtown San Francisco office. Then, a tank arm, I guess, which is mostly what I focus on, and that is doing research on governance and coordination mechanisms to bring to bear on these lunar activities. We work together to think about how we can deploy some of these concepts, or even to the conversations that were happening this morning, how we might construct specific opportunities to fill in the gaps that exist in the Outer Space Treaty - in which there are many, of course - through coordinating activity between actors themselves and looking to sort of bottom-up process, as well as a top-down process for constructing the certain normative environment for Lunar activity. I'll stop there.

Mark Sundahl [8:20]

The phrase 'the bottom-up,' rather than a top-down approach to creating norms. We are going to be talking about that in a moment and it rang a bell. Michelle, you want to tell us about For All MoonKind?

Michelle Hanlon [8:43]

I will save the heritage soapbox for the next panel, if I may? I'd like to talk a little bit about University Mississippi and our center for Air and Space Law. We are here, the only Global Space Law Center in the country and we are the only Air and Space Law Center in the country. We're really focused on the expansion of commercial space- that's what we are focusing our research. My co-director, Charles Statler, and I are really keen to ease that transition from, - if you look at the Outer Space Treaty, it governs the activities of states - so we really do need to think about how we're gonna either use that to govern the activities of non-states. We're gonna have more and more commercial actors, so whether we can do something within that framework.

My personal research is into human rights in outer space, and how we will move when we have communities - Moon villages - in space. How are those people, how are our counterparts in space going to be guided? How are their rights gonna be protected? We really need to start thinking about - and again, my background is in M&A Law. I spent 20 years in firms in New York and London. I came to academia a little bit late, came to Space Law four or five years ago. I kind of like to think that I'm sort of shaking things up a little bit. I think I am, definitely through For All MoonKind. We are working on it at Mississippi but, again, I think it's really important to focus now on what we need to do today to assure that our progeny on the Moon in the future have human rights and good rights and democracy and so forth and so on.

Mark Sundahl [10:33]

Thank you, Michelle. Fascinating. We look forward to talking about those issues, and, Dennis, would you like to explain a little bit what your organization is about?

Dennis O'Brien [10:46]

The Space Treaty Project was started three years ago. I did that because it became apparent, even then, that the current state of Space Law concerning private activity on the Moon and beyond is, at best, uncertain. I think after listening to this morning's discussion that we can pretty much all agree on that. Businesses and investors hate uncertainty. It's our belief that the best way to address this and to support all private activity on the Moon and beyond is to have an international agreement- hard law, as some people would say, and not just rely upon the Outer Space Treaty. We've heard all the little gaps in it.

Now, there are a lot of people that would believe that the Moon Treaty is bad for private activity, and we could talk about that forever, and the common heritage of mankind phrase, et

cetera, et cetera. However, with the proper implementation agreement, the Moon Treaty actually becomes supportive of private activity, all private activity. We've come up with some basic principles for what that implementation agreement should be. The first is that it would support all private activity; not just commerce, but also nonprofits, private settlements, all that, the whole range: restaurants, hairdressers, therapists - supports them all. The second principle is a grand bargain for private actors to have those rights. Some would call them priority rights of the use of land or space up there, or the extraction materials. In order to have those rights, they also have to accept obligations. I believe rights and obligations was also a topic of our first [panel], of the essence of any treaty, any international agreement. Those obligations are actually listed in the new treaty. They are also in every other treaty- the OST, the registration, liability, rescue, except for one, and that is to report the discovery of resources. The new treaty is very specific about that, that private actors must report that. So, that's one of the big things we have to address.

Mark Sundahl [13:21] Dennis,. . . now is maybe a good time to explain what the Moon Treaty is, the Moon Agreement.

Dennis O'Brien [13:34] Okay, great.

Mark Sundahl [13:35] I did mention at the very outset. . . that there are four successful broadly ratified treaties that were drafted in the '60s and '70s. In 1979, the fifth space treaty was adopted, the Moon Agreement, as it's known, and it has not been ratified by any of the major space powers. I think we have, maybe, 13 countries that have signed it, but it did not succeed.

Dennis O'Brien [14:16] It does attempt to set up that international framework of laws that people are talking about to make it all work. It has not been adopted by most of the space-faring nations, indeed, most nations. It has only been adopted by, I think, 18 now, and it's that five words in Article XI, 'the common heritage of mankind,' humankind. The main reason it's not accepted is because that's not defined.

The Moon Treaty says common heritage of mankind as defined in paragraph five of this article, but no one actually works for that, and that's because no one's ever defined it. There has never been the gathering of the states' parties to actually define what that means. 'The common heritage of mankind' has no legal meaning other than what we give it by international agreement.

What we're doing with this implementation agreement, is defining very limited responsibilities that nations and their nationals must accept. But, here's the key: if a nation does agree with it, if the United States or any country does become a signatory to the Moon Treaty and the proposed implementation agreement, then any private activity that that nation authorizes and supervises automatically gets those rights, those priority rights for use of land or engage in activity or space mining. They don't have to go through any other process.

We're not setting up any new agency, or overwriting, or whatever you want to call it. The thing that people fear, and that countries fear- they don't want to lose their sovereignty. You don't have to lose your sovereignty under the Moon Agreement with this implementation agreement; all you have to do is agree to the obligations, and, as I said, they're mostly in all the other treaties already. We added little extra things like how to resolve disputes. We support the use of the PCA for arbitration if the parties want to go that route. We pay attention to personal rights. We actually cite the Universal Declaration of Human Rights and guarantee the autonomy, or that equal settlements can seek autonomy, or even recognition as independent states when that time comes. It is very far reaching, but it's not long. It's only 10 paragraphs long, a page and a half basically.

Dennis O'Brien [16:52] A lot of you have already gotten [the] pamphlet. The four principles, and we covered the two important ones, are on the back, the ten paragraphs are on there. So, if you want the details, you can go into that, and I'll stop monopolizing the time right now.

Mark Sundahl [17:05] To add to your description of the Moon Agreement, it does contemplate resource extraction to support whatever mission is being undertaken. It also calls for future rulemaking process that the signatories would be bound by.

Dennis O'Brien [17:29] We call that adaptive governance.

Mark Sundahl [17:32] Yes, and that made the United States nervous as well to agree to something. Although we are willing to agree to future international law, we weren't willing to agree to a regulatory regime that we hadn't yet seen.

Dennis O'Brien [17:47] That's why it's so important to propose one. So that they have something to argue about.

Mark Sundahl [17:53] Yes, and we are trying to move forward and create and ensure that there's law and order without the Moon Agreement. We don't have the Moon Agreement; it isn't supported broadly. We need another way, and that's, that's really the question on this panel is: do we need more laws? Do we need additional laws? And what should they look like? Dennis is proposing a treaty, and I would love a treaty too, but I think the chances of a wide-ranging international treaty are zero.

Dennis O'Brien [18:37] This year.

Mark Sundahl [18:38] This year. Yes, we shouldn't give up entirely, but there are political realities. It's not likely that we're going to see a multilateral space agreement of the kind, but, yes, Jessy.

Jessy Kate Schingler [18:51] Thanks Dennis for that introduction to this, the Space Treaty Project.

Jessy Kate Schingler [19:01] As someone who attended a few of the most recent Hague Space Research working group initiatives, I guess what it raised for me is maybe in the context of the seminar that we're having today. We've talked about what that formal legal framework is for space activities, and we talked a lot about the history of where these laws came from. But what is the current landscape today of what's happening in terms of pursuing a new, either laws themselves in in the U.N. copious or in sort of more multilateral mechanisms or even all the way down to commercial coordination mechanisms? Like, what's the kind of cutting edge of activity that's happening there, in terms of following for folks who might want to follow what's going on?

Mark Sundahl [19:54] Yes, I will ask Michelle about this, but I will mention the Hague Working Group. The Hague International Working Group on Space Resources Governance, I believe that's the name of it, and that was one initiative that has completed its work and proposed principles that will govern resource extraction. That is now been forwarded to the United Nations, and there will be a general exchange of views at the legal subcommittee meeting in April. We will be talking about asteroid mining or resource extraction in the next panel. We're really going to focus on that, and I'm going to be bringing in, if the technology works, Professor Steven Freeland from Australia, who will be the chair of that exchange of views. So, there is the Hague working group principal, and there is the Moon Village Association, which I will bring Giuseppe on in a moment. It looks like he is here, but did you want to add anything at this point, Michelle?

Michelle Hanlon [21:16]

I was just going to say, harking back to what Jessy said from the beginning, and that's the bottom-up. I agree, your implementation agreement seems really reasonable, and I've read it several times and I agree we would all love to see hard law, but I don't think that's gonna happen, except under preservation; but that's for the next panel. If we're looking at a bottom-up approach, and as lawyers who are gonna be advising commercial clients who are implementing space activities, I think we really want to push those clients to think about things like, okay, what can we do, what do we put in our contract now? How can we work together to standardize, and maybe self-police, you know, maybe if commercial actors can get together and make decisions about standard items. For example, I've written a paper about making it a standard for space tourists to agree to certain things and space tourism operators to agree that their tourists have certain rights. It's not really necessary for the contract, but if we have contracts, standard contracts worldwide, that say the same thing, then we start building this standard practice. We start building in these rights from the bottom up and hopefully they will percolate up into a treaty.

Jessy Kate Schingler [22:40]

I think it's really interesting the ways in which that kind of contract mechanism could lead to cooperation. If we're sharing those contract mechanisms, and all of a sudden, we're creating interfaces for different actors to cooperate with each other and to think about what some of the short term activities that we expect will be happening on the lunar surface that might warrant or require some of these mechanisms. Some of them that have been a rich discussion in the community recently have been around proximity operations.

You [addressing Professor Sundahl] talked about that earlier today in terms of Earth orbit. Proximity operations on the lunar surface, you know, if we don't have shared understanding of how those interaction mechanisms are gonna function . . .What distance do you need to remain away from another spacecraft on the lunar surface, or if you want to approach one how do you do it? If we have landing sites, and Michelle, me, others have done a bunch of work on looking at the implications of dust on the lunar surface, not necessarily from a technical perspective but also from an operational perspective, then how do we create institutional mechanisms that would support many actors using something like a landing pad on the lunar surface? Again, using contract mechanisms that allow us to create unspoken agreements can be a way to develop these bottom-up tools.

Mark Sundahl [24:21] Excellent. I think we are all agreeing on this approach, of the bottom-up approach, except for Dennis. I know you'd still like to see hard law. . .

Dennis O'Brien [24:32] But it's bottom-up hard law.

Mark Sundahl [24:33] It is. [laughing]

Dennis O'Brien [24:34] It supports the individual.

Mark Sundahl [24:36] I see what you mean. Okay. At this point, I'd like to introduce Dr. Giuseppe Reibaldi, who is an esteemed expert in Space Law and Policy. He has a long career in the field, he's written many books on the subject and articles. He was the prime mover behind the Hague International Working Group on the Governance of Space Resources and made that very, I think, successful project happens. As soon as that was concluded, which was a multi-year project, I think four years, or even before it ended, Giuseppe launched another project: the Moon Village Association. We're fortunate because, Giuseppe, Dr. Reibaldi, has agreed to make a special announcement during our symposium about one of the projects of the Moon Village Association. So, we look forward to your words, Giuseppe, and welcome.

Dr. Giuseppe Reibaldi [25:51] Well, first of all, good afternoon to all of you. Thank you for having me here from Rome and, of course, the panel, I have to say they're all the members of the Moon Village Association, so I feel definitely like we are at home. Very briefly, I don't think I would like to spend much time talking about the Moon Village Association. I do hope that many of you know what the organization is.

Dr. Giuseppe Reibaldi [27:15] The Moon Village Association, I think many people know, so I just spend couple of words saying that it is a recent organization, registered in 2017. We are basically an organization which has been created with a goal to be a forum, basically, for the development of the Moon Village, that is a concept of global cooperation. Of course, concepts cannot stay as such, otherwise they do not bring anything concrete. So, they need to be implemented. And so, yeah, the association is being created to foster the implementation and, so, the organization is dealing with issues which are from the legal, to the technical, to the cultural, and all these different aspects for today's topic. I thank you again, Mark, for having organized this very timely event, even if I have to remark that I do not see the NASA participant, not the U.S. the State Department,

physical, so probably, they were kept away from the place. But…

Mark Sundahl [28:29] Giuseppe, we do have NASA in the house.

Dr. Giuseppe Reibaldi [28:33] Okay.

Mark Sundahl [28:34] Steve Mirmina is here from headquarters. He's just not on this panel, but he can hear you.

Dr. Giuseppe Reibaldi [28:39] Okay, that's good. Okay, so what I want to say that because today, we are discussing about legal. You may know that one of the major concerns in the multistate culture type of activity is how to get the people to know the rule of the games. Basically, how to behave with each other. One of the first priorities was to try to set up, basically, building blocks for what you just explained, for the space resources. I think this is now reasonably well-defined by these building blocks, which will then be left to different individual governments to absorb some of them in their national legislation.

The Moon Village has been talking a little bit beyond that. Not by any chance it but thank you for the introduction. I've been at the root of those initiative. I think what we wanted to announce today, which I think you have alluded, Mark, is the fact that we have, in the past, already issued a Moon Village principal. There were nine principals, which, basically, we are defining the boundaries of the Moon Village and those have been already issued a couple of years ago.

Now, we have gone with today yesterday, a step further. That is, we have taken this principle, and we need the coordination and cooperation working group. We have introduced basic elements of the Hague Building Blocks, as well as the sustainability guidelines, which have been approved by the United Nation. All of this is now been consolidated and used in the Moon Village Principles, which we would like to see considered as best practice for sustainable lunar activity.

It's a document which Mark has been, basically, the book captain of this. Together, we need the coordination, the corporations that is, has also been quite well involved in this. So, I do not wish to go through the introduction, but I will leave it to you. I just want to say that the rationale of establishing these new set of principles is to try to put [it] all together. Of course, it is very challenging. We have fifteen principles and, basically, we have opened, yesterday, the public consultation. You can check on the website, and today is the

first opportunity to present this publicly and with that, I will leave it maybe to Mark, to you, if you want to say a few words more specifically about those principals. Thank you, Mark.

Mark Sundahl [31:29]

Thank you, Jessy, and thank you, Giuseppe. Thank you for sharing this exciting news during the symposium. I think this is going to be news in the space world, that the Moon Village Association Principles, the draft principles, have been released and are now open for public comment.

This is an attempt to create norms, but to do it in a realistic way. When we realize that we cannot conclude treaties as easily as we used to do. Even if you do conclude a treaty, it can take decades for it to be drafted and then ratified to an extent where it's really effective, and we don't have decades. We're trying to make use of soft law instruments to try to instill some principles, rules of the game, as Giuseppe mentioned. That's precisely what these MVA principles are. They're largely, well, they certainly track the Outer Space Treaty.

One of the things that I tried to do in drafting them, and I should point out Ms. Daria Chalupa is here, who is my student research assistant that helped me in drafting these, and one thing I did was track the Outer Space Treaties, but, in the Principles, expand the obligations to private actors. The treaty doesn't reach [them], except through domestic implementing legislation. So, that was one part of it. Another part of the Principles calls for legislative initiatives to address issues that will enable the establishment of a Moon Village, such as the setting of standards, so that the air locks fit together or we use, you know, certain types of infrastructure. Building infrastructure that everyone can use, so that's where these principles are specific to the Moon and have some elements that are not in the treaties.

And then, possibly as the most contentious, I think the most exciting but essential part of the principals - it is also essential part of the Hague Working Group Building Blocks on resource extraction - is the need for a registry of land use. We propose one in these principles, if you are planning a project on the moon and you will occupy a parcel of land, regardless of what the activity is. The Hague Working Group Building Blocks also calls for registry, but only for mining activities, extraction activities. This goes beyond that. It embraces the Hague registry, but goes beyond it to cover the use of land for any activity: for farming, for hair salon, whatever you're opening up on the moon. The purpose of that is to ultimately avoid war and conflict and to put the world on notice by registering. Put

the world on notice that you're there, and letting the world know what you're doing, so that they can then fulfill their obligations to operate with due regard. If they don't know what you're doing, then how can they operate with due regard? How can they avoid harmful interference if they don't know where you are or what your activities all about?

So, this is the point of the Moon Village Association Principles. This was the soft rollout. There will be, if the meeting goes ahead, it will be rolled out as well with a presentation in Vienna meeting of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space. We got the first rollout here, we've made the news, and hopefully it makes it to Space Policy Online or something.

This is a bottom-up approach. What we're doing is creating the principles and getting people, space agencies, and private entities- the whole community- to join us [in] adopting these principles and making them part of the custom of space activity. And who knows, maybe even rise to the level of customary international law someday. But, the idea is that this is a nonbinding voluntary initiative for establishing norms. . . .

Jessy Kate Schingler [36:24]

Sounds very exciting. Well, I was just thinking, maybe, we can stay on the topic of registry, for a second. We've all been kind of chatting about it, and I think it's an example that bridges actually these idea[s] of informal norms and formal international agreements. We have international agreements about registration - as was talked about this morning- but if you go and look at the U.N.'s registry of space objects, which is online, you can Google it and go look at the table. It's fascinating to see just how minimal and sparsely populated that table of space objects is. There's not a lot of information about each of the objects or space crafts that are out there for various reasons, a lot of which are understandable.

But, then you think about: if the volume of activity is going to increase by orders of magnitude, then the system that is already sparsely populated, and not crumbling yet, I would say, but how is that system gonna keep up with increasing activity and how are the actors gonna keep up with registering? If, as somebody said earlier, if you have one space object that's essentially delivering another space object that might deliver itself other space objects, that might manufacture other space objects. Where [does] the registration requirement extend to, or end, and what is the timeliness requirement of that, and all kinds of questions that I think the lunar surface activities really raises. I know For All Moonkind has been thinking about this.

But, yeah, I also find it interesting the ways in which it bridges kind of informal cooperation mechanisms, incentives for transparency, and formal international law.

Mark Sundahl [38:20] Yeah, interesting. Maybe, Michelle, can you give the room kind of a primer on the registration requirement and what the registration agreement is about? We're talking about registration…

Michelle Hanlon [38:35] Put the professor on the spot. . . .

Mark Sundahl [38:37] Yes, exactly. I mean, just give an explication of the international law.

Michelle Hanlon [38:40] The Registration Convention requires every nation to inform the United Nations when they are going to launch an object into space. What's interesting about the Registration Convention is it, and why the U.N. registry is so sparse, is because that's all it asks is: are you launching an object into space? Let us know and give us the orbit. It doesn't say update the orbit when you change it, when you raise it, when you lower it. It just says give us the orbit. So, that's all we're required to do under international law right now. . .

Mark Sundahl [39:11] It doesn't have a description of activity, but it'll say, like, government activity . . .

Michelle Hanlon [39:17] Right. . . .

Mark Sundahl [39:20] It doesn't really tell you the nature of it, so that's not very helpful. We need more information. . . .

Michelle Hanlon [39:23] . . . and I think it was really interesting, to piggyback on the conversation this morning with respect to the Department of Commerce and the FAA and the charter grades. We do have the opportunity in the U.S. to actually create a very robust registry kind of system. But we don't really. Right now, we're relying on the FAA to look at all of our payload, and they don't have the capacity to do that. And so, who is gonna take that on? Who's gonna decide to ask Beresheet the hard questions? You know, what is there? And say, okay, well, we're gonna do the deep dive on our commission foundation and find out what they're putting on there as well.

These are things that are slipping through all these gaps in Space Law, but this is something we can fix domestically, at least. Of course, the problem with that is if we put the burden on our people and other nations don't, then it's more expensive

for us to launch and to get into space. So it's a really important balance, and I think the U.S. has done a really good job of leading the world. That fine balance between leading the world and overburdening our own actors is really hard to make.

Dennis O'Brien [40:34]

If I could just add in, anyone who reads the Registration Convention or has just listened to us here, understands that it [has] also become out of date and that it could use a bit of amending. Adding some of the things that need to be registered. Going in so far as registering use of space on the Moon. As Mark and I have discussed, it's kind of like the registry or county registrar. If you record a deed or any other action concerning land, then it puts everyone else on notice, and they can't harmfully interfere with what you're doing. Same thing with the registration. If there is an internationally recognized method of registering someone's activities on the Moon, then you get protection by voluntarily, or by treaty, registering your activity. It keeps other people from harmfully interfering. If you don't register, you pretty much lose that protection, even on soft law. So, that is important.

Michelle Hanlon [41:42]

[That is a] good distinction, because the Registration Convention says, you know, if you launch the object into space, you have to put it on your own domestic registry, and if it is an object on your registry, then you own and control it. You're the proprietor of that particular object. On orbit, it makes sense, because you have your satellite there, or on ISS you have the U.S. compartment and the Soviet compartment. But when you get to another celestial body -you have an object that lands on the Moon - are you appropriating the space where its landed? This is something that we'll talk about in the next panel on heritage, but how are we going to balance that non-appropriation principal with this registration principle that says once you register, you're the owner. And, by the way, that being the owner means you're also responsible for anything, any damages it causes - so from the Liability Convention. Having that object on your registry also gives you that responsibility as well as that ownership.

Mark Sundahl [42:40]

One possibility for the creation of this registry is to use the existing registry - the United Nations registry - but I think as Michelle's pointing out [and Jessy as well], that it's not really well-suited. It's not designed for it and I think we will be better off by creating a new registry that's designed specifically for this. But the question is: how do we do it? Ideally, by treaty, and compel everyone just as where they're compelled to register now. Compel them, all space actors, to register their land use as well.

Then again, we run into the political problems with creating a treaty. This registry may turn out to be a soft registry that is just used by people through custom. It does give you protection, I think, even if there's no hard law, you're still protecting yourself by registering your land use because you are putting people on notice, and you hope that they will avoid you and try not to interfere. I think even if there's no hard law, we could have a voluntary registry and it could be effective.

Jessy Kate Schingler [44:05] One of the things that's happening on Earth right now is that many nation states are adopting domestic laws about resource utilization. One of the suggestions I've heard made about registration of surface activities, is that you could correlate recognition in the specific jurisdiction with registration. So, ways of incentivizing actors - whether government or private - to register their space activities, would be to say that, say Luxembourg, will recognize you as operating under their jurisdiction or even accept the responsibility of stewarding your activity if you participate in this registry, and perhaps other things. Like, perhaps they would require you to have insurance or who knows what. But I think there are ways of using, of thinking through the incentive structure and leveraging them to incentivize participation in such a registry without having to wait for treaty level activity.

Mark Sundahl [45:07] That's the kind of creative thinking we need. We're trying to figure out how to make law without making law and it's hard. . . .What are some of the legal issues we can think of that are going to arise with a permanent human habitation on the Moon? Are we worried about jurisdiction? [Dennis waves hand]. What are you worried about Dennis?

Dennis O'Brien [45:34] Jurisdiction has been discussed a lot. Generally, under the current Treaties, whatever nation authorizes and supervises the activity on the Moon, the laws of that nation are going to apply. They're even going to follow the actors from that location. If an actor from that location visits some other place, they'll still be governed by the laws of the nation supervising their activity…there is one exception. . . .

Mark Sundahl [46:02] Right… Just to recap that, it's the country, the state that registers a space object, [that] will have jurisdiction and control over that object and any personnel therein, even if they leave the vehicle.

Dennis O'Brien [46:20] Precisely.

Mark Sundahl [46:20] So, if there's an extra vehicle activity and there is something nefarious that goes on, like poke a hole in your fellow astronaut's space suit, you still have jurisdiction. Probably, we could argue all kinds of different types of jurisdiction, but under the Outer Space Treaty, they made perfectly clear that the state of registry has jurisdiction. So, maybe jurisdiction isn't a problem then.

Dennis O'Brien [46:45] Well, it's set up that way. I was gonna say there's one exception to that, even under current International Law, and that's if someone is seeking asylum. If they voluntarily remove themselves from their own country jurisdiction and place themselves in someone else's outpost on the Moon, saying 'hey, I can't handle this country 's laws, et cetera, I'm being persecuted, please allow me here.' Under that one exception, the person would leave the jurisdiction of the registration state and come under the jurisdiction of the state within [which] they're seeking asylum. Otherwise, it's all said. . . .

Mark Sundahl [47:25] Yeah, yeah. I kinda threw that up as a straw man because people always talk about jurisdiction and there's really not much of a problem. Yes, question, Mr. Diamond.

Audience Question [47:38] [So, for example,] an individual leaves their registered facility, and goes trudging, or with his vehicle goes to another facility and goes inside to visit and hurts somebody, kills somebody, or steals something. The way it's set up as you're stating, apparently, the location or the nation that has registered where the crime was committed has no jurisdiction over that person.

Dennis O'Brien [48:10] Not over the person, precisely.

Audience Member [48:13] Yeah, that's right.

Dennis O'Brien [48:16] It's like the old extraterritoriality laws that were in place hundreds of years ago here on Earth. Jurisdiction follows that person from the place, the nation, that granted them the authority to be there in the first place. It's a tough one, but that's the way the law is right now. I think we can agree on that and that to be changed otherwise.

Jessy Kate Schingler [48:38] Now, Steve certainly knows a lot more about this than I do, so, correct me if I'm saying it wrong. But, to the question of crime or the sort of like mixing, interacting of jurisdictions on the ISS, you know, you have apparent jurisdiction, which is the jurisdiction of the module. But then, if you get down to the level of crime, it's the perpetrator or the victim of the crime is

the dominant jurisdiction? [Someone in crowd says "the state"]. The state of the victim becomes the jurisdiction even if that crime happened in a module of a third party state and so what I think is interesting about that is its sort of pre-constructed.

Yesterday, I was saying virtual jurisdiction, in a sense, so it's been pre-negotiated what this jurisdiction looks like, what the implications of different types of activities would be. So on the lunar surface, again, when you're starting to talk about at least a hypothesized greater volume and dynamism of activity, can you pre-design, can you pre-think through a sufficient number of these scenarios to actually design what the jurisdictional treatment should be? And, do you even know who all the partners are going to be? One of the reasons that the ISS agreement works, and that a gateway agreement would work, is that we're sitting down ahead of time with a predetermined set of partners. But, if all of a sudden China comes up to you with a rover on the lunar surface that hasn't been pre-negotiated, what do you do?

Michelle Hanlon [50:17] A question to add complexity to that, - take the crime out and just make it negligence. Right now, everything is all activities, state-level activity. If a private U.S. company accidentally hits a private Israeli company, all of a sudden, it's a diplomatic issue, because the United States - and this was covered also on the panel this morning - the United States has the responsibility. Israel's responsibility as a litigator, you're not going to sue the private company, you're going to sue the United States government, because that's where the bigger pockets are. So you're just going to get a lot more complexity with respect to nation to nation diplomacy.

Dennis O'Brien [50:59] I'd just like to note that the ISS agreement is an example of how a gap existed in Space Law and a new international agreement filled that gap. I think that's gonna happen more and more as is needed.

Mark Sundahl [51:13] Yeah, I mean, Mr. Mirmina here is working on exactly those issues. How will we govern this new International Space Station orbiting the Moon? Will it be through the IGA [International Space Station Intergovernmental Agreement]? Then, how do we govern this lunar settlement? Will it be through something similar to the IGA? Maybe you could say something to that effect, Steve, in the next panel about how we're actually moving ahead to govern these projects. Yes sir?

Audience Member [51:47] I want to take the torts and other problems to the next level here, looking at your Moon Village with maybe thirty different countries participating in their own neighborhoods, if you will. Now you've got a joint venture of two or three different companies – drilling to get water or whatever underneath the surface – and, all of a sudden, you cause a Moon quake which causes damage everywhere. And, so you've got all of these issues that we're not looking at. I guess my question really comes to: what do we do in Antarctica right now for some of these issues and how does that apply?

Mark Sundahl [52:36] Of course. The Antarctic is one of the great analogs to outer space. This is no man's land or every man's land, and the same with the high seas. So, we look at both of those. How are these things handled on a ship as well, if you have a crime? How is that handled practically and legally? [Are] we [going to] have a prison on the Moon? Are we going to have investigations on the Moon? How are court procedures going to be managed? I'm not an expert in the law of the Arctic Treaty System, but it certainly is the place to look.

Dennis O'Brien [53:22] One of the other useful laws - it was just discussed earlier - is a possibility of arbitration. That parties can voluntarily submit to the arbitration process as outlined by the PCA, Permanent Court of Arbitration. The optional rules for space activities, or disputes in space, that is available and other than that, if it's a dispute between nations or the nationals of different nations, the only fallback into current law is consultation between the two nations to try to resolve it. Some of us are pushing for the arbitration thing as an easier way and usually one that actually produces results, because, often times, as someone mentioned before, consultation is just pro forma. 'Okay, we consulted, we're just going to go on.' But, when it comes to arbitration, and you also have to have an agreement that any arbitration decision or award would be enforceable. Because that's the only way you bring teeth [to] something like that. So, there is a way to resolve towards negligence, all those other types of civil claims, even criminal claims if you set up that basic foundation.

Mark Sundahl [54:33] We're going to wrap up this panel in a few minutes. I think one of the challenges that we're going to face is that our activities, our presence on the Moon - The legal framework that we have in a couple of places relies on the fact that there is a launch of a rocket. It's the launching states that are liable in the event of damage. You have jurisdiction if you register an object that you've launched into orbit or beyond.
But what about when we get to a time where there are no more launches, we just live on the Moon? We build things on the

Moon and 3-D printing will be critical. You'll be 3-D printing buildings, habitats. So, the idea of a launch kind of disappears, and then our law is outdated. So we'll be, eventually, one of the things that will be looked at. But, Giuseppe, did you want to say a few words before we wrap up the panel?

Dr. Giuseppe Reibaldi [55:53] Yeah, what I wanted to say that, having gone through sixteen years of International Space Station program, I am quite familiar with all these issues, even if not a lawyer, about jurisdiction and criminal laws and so forth. I think we have some precedents. Of course, when you look at the Moon Village, the best would be to try to have, of course, people trying to adhere to some common practice. As you said earlier, the probability that we going to get anything, - I agree - that's treaty level is very low.

U.N. COPUOS, as we all know, is an extremely long process and industry all over the place does require some rules of the games. I think investments, and many of you are in the investment part, do require who have insurance that their investment will be used. The bottom line is: let's try to move forward to try to push for having best practice, which is sort of a bottom-up approach, best practice for the sustainable lunar basic activity. The more people will be able to recognize that those best practice are useful or amended, the sooner we will be able to have some sort of agreement, even if indirect, to work to the common way of operating. With that, I will leave it there. I hope that these consultations with those basic MVP Principles will start and we will have more and more organization like NASA, EISA, and private industry, which will participate, give their comments, and try to make it operational. Thank you for having me on the panel, Mark.

Mark Sundahl [57:56] Excellent. Thank you, Giuseppe. Thank you for joining us all the way from Italy. We wish you a wonderful evening. Buonasera, I don't know, my Italian is terrible. . . .

Dennis O'Brien [58:11] Ciao.

Mark Sundahl [58:11] Grazie and ciao!

Dr. Giuseppe Reibaldi [58:13] Okay, okay. Thank you and the same to all of you, and I wish you a good continuation of the meeting.

Mark Sundahl [58:21] Thank you, Giuseppe. Dennis did you want to say something?

Dennis O'Brien [58:30] Yes, just a wrap, a final wrap on the Space Treaty Project. As a bottom-up organization, we seek your input. If you think anything, I said needs changed, please send an e-mail to Dennisobrien@spacetreaty.org. It's on your pamphlet. And finally, the Space Treaty Project, our mission is to provide hope and inspiration to all people by helping the nations of Earth to build a common future. I dare say that is all of our jobs. We must provide hope and inspiration to all of humanity or we are failing in our mission to use the Moon to help all of humanity. That's all.

Mark Sundahl [59:11] Thank you to my panelists. This was a lot of fun.

PANEL 5: LAND RIGHTS, NATURAL RESOURCES, AND THE PROTECTION OF SITES OF SIGNIFICANT HISTORICAL OR SCIENTIFIC INTEREST

Panelists: Steven A. Mirmina, International Law Practice Group, NASA
Michelle Hanlon, National Center for Air and Space Law, University of Mississippi/For All Moonkind, Inc.,
Christopher D. Johnson, Secure World Foundation
Professor Dr. Steven Freeland, Western Sydney University

Space - a giant leap for mankind. With it came a great rise in space activities, technology, advancements, and the question of limitations. How do we place a limit on our thirst for knowledge and exploration, and balance it with the use of outer space for peaceful purposes? Where is the line between peaceful purposes and exploitation of space? Can you stake a claim on the Moon or remove water from its surface? Can you hollow out an asteroid? How does one, if possible, stake these property claims?

This panel discussion highlights whether there is such a thing as private property rights on the Moon, and the land rights regarding resource extraction in outer space. The panelists focus on elements such as protecting certain sites on the Moon and other celestial bodies that have scientific, historical, and cultural value. How does one protect these sites? We on Earth recognize that preservation of our environment binds us as humans. Should we regard preservation as the starting place for the protection of celestial bodies, or do we write the hard laws and treaties to protect outer space?

Mark Sundahl [2:16]

Hello and welcome to the fourth and final panel of the symposium. And when this panel is over please do not jump out of your chairs and run for the door because we are going to finish this panel and continue with our question-and-answer session. We are going to have a short question and answer session. And then, even then, don't run for the door because I want you to stick around for a beer and wine reception after we are all done. So that is where we are headed, and I am going to introduce this final panel. You have met everyone that is here on this side of the daus. But for the benefit of our remote

panelist, I will say that we have Jessy Kate Schingler from Open Lunar Foundation, Steven Mirmina from NASA, Christopher Johnson from the Secure World Foundation, and we have Michelle Hanlon from The University of Mississippi as well as For All Moon Kind. And now I would like to introduce our remote speaker Professor Dr. Steven Freeland from the University of Wester Sydney where he is a professor of law and specializes not only in the law of outer space, but international law in general. He has written extensively and he's a friend of mine and of ours and welcome to the symposium Steven. I appreciate you participating all the way from Australia.

Dr. Steven Freeland [4:05] Thank you very much. It's quarter to seven in the morning here on Saturday morning, so coffee will go down very well. Thank you. It's nice to be here.

Mark Sundahl [4:16] Excellent. Yes, I appreciate you sacrificing your Saturday morning. We will not forget it Steven. So, the topic of this panel is resource extraction. I don't have it in front of me. I could read it off. If you turn off the light behind you Steven that might help with the video quality. Oh, now look what you did!

Soft laughter from the crowd as Professor Freeland disappears from the screen for a second

All right that's a little better. Okay, now we can see you, Steven. So yes, the title of this panel is Land Rights, Natural Resources, and the Protection of Sites of Significant Historical or Scientific Interest. Now we really are going to bare down on this issue: Can you really stake a claim on the Moon? Can you hollow out an asteroid? Can you remove water from the surface of the Moon? How do you stake these claims? Can you have property rights? Is there such a thing as private property rights on the Moon? We know that the appropriation by a state is prohibited but are private property rights allowed? Or is there something short of property rights. Maybe just a right to occupy the land and use it. What are these land rights? What is the law regarding them and resource extraction? And related to this, while we are talking about creating land registry and granting rights to extract resources, at the same time, part of the conversation is protecting certain sites on the Moon and other celestial bodies that are of scientific, historical, cultural value, such as the Apollo landing sites. So, all of those topics are tied together, and I guess I'm going to turn it over to our panel and have them speak as to the resource extraction. What are we trying to extract from these celestial bodies? What is

there to extract? Anyone? What is there to extract? What are we talking about?

Audience Members [7:13] Water.

Mark Sundahl [7:14] Yes, water. Exactly. I mean people are and there is this great slide that I show my students. It has a picture of an asteroid and the words "TRILLIONS AWAIT." I think that was the romantic vision that most people have of asteroid mining, that we're going to plunder the solar system and capture an asteroid made entirely out of platinum and haul it back to the earth and cash in on it. But that is not what we're talking about when we're talking about resource extraction. Primarily we're talking about water in various forms and how to extract them and then process them to break out the different molecules that can be used. And then perhaps also mining of regolith for building material. But we're not looking for precious metals quite yet or at least for the most part. The focus is really on water.

Audience Member [8:14] *Inaudible*

Mark Sundahl [8:21] Yeah, helium three . . . I hear that mentioned as well. That that is available in abundance on the Moon and very rare here on Earth and we could extract that and bring it back down to Earth. It's a possibility. I haven't heard of any business model that's pursuing that but that could be, yeah [looking at audience members].

Audience Members [8:41] *Inaudible*

Mark Sundahl [8:48] Yes, lava tubes might be used as a habitat protection from radiation. Alright. So that's what we're talking about really. We are looking for these basic resources to support life. That's going to be the most important.

Chris Johnson [9:05] If I can interject for a moment?

Mark Sundahl [9:06] Yes, please.

Chris Johnson [9:07] So, there is the investigations of what our sites and locations of interest and this was alluded to by an audience member that and I think I would point to a paper that should be, I think it's free and openly available to everyone. The first author is a man named Martin Elvis. He has written a paper on peaks of internal light on the Moon. That's not his concept but he's definitely expanded on this idea of peaks of internal light are. Essentially, there are in addition to the many locations on the Moon where there are useful resources – resources, which will

be useful for the development of manufacturing infrastructure, habitation, et cetera. There are thirteen locations on the Moon, and I think he was using el cross data [cross sectional data] where these locations have one component. One quality is that they're in almost perpetual sunlight where they're at the top of a ridge or a peak. That's important because you put a solar panel there and you will have unending continual energy. And yet, what is also interesting about the second quality is that they're within a close distance- maybe one, two, or five kilometers - from resources. Ice resources. And now you have a fuel source.

So you have an energy source and a fuel source. These thirteen pieces of internal light are rivalrous in that, if I get there, you can't get there. And I'd like to maybe exclude you from those locations. So, there's these thirteen peaks. A newer paper by him, I don't think it's out yet, where he's used al cross data, where him and a team of scientists have determined I think over 210 or 220 locations where it's not just the location of the resources that are there but it's as you pointed out you said you the word cave. There are caves in particular locations on the Moon. Some are large enough that you could drive into them. Other ones you would have to rappel down into them. So here the location is important not because of the resources are there but because the physical properties of it and these will be wonderful locations to place habitation's and installations because you will be protected from cosmic background radiation.

So now we have, and I would love to study more of the all the locations on the Moon that are of real interest of different interests. One of those locations' shackles and crater in the south pole. So maybe those could be locations that are useful for manufacturing. But what about scientific investigations on the Moon? The dark side, the far side of the Moon and a very small area on the far side of the Moon would be a radio quiet zone, where all the interference from Earth based astronomy, Earth based telecommunications is essentially blocked out. That's a place of pristine interest of the scientific community and I hope that there is also is a treasure trove of resources right underneath it because then you might have competing interests. So this is what we have to do. We have to learn from the scientists to map all the locations on the Moon which could be of value for different purposes.

Mark Sundahl [12:32] Yep, exactly. So that's a good way to frame the issue that we're up against. Maybe I'll bring in our panelists from Sydney, West Sydney. Steven, I understand that you are the co-chair of the

general exchange of views on resource extraction at the legal subcommittee meeting. Did I get that right?

Dr. Steven Freeland That's correct. Although, the formal term is co-moderator. Yes, and hello everybody and greetings from Australia. Just following on what Chris was just mentioning, again, the whole issue of resource exploitation, exploration and utilization has become very important and taking up a lot of interest in the international community again. It's not the first time. You'll recall everybody back in the late seventies we agreed by consensus the terms on a treaty on exactly this issue. Although, as everyone knows the Moon agreement and I am sure it'll come up again in your discussion.

Mark Sundahl [13:50] Yes, we did talk a little about the Moon agreement. A little bit.

Dr. Steven Freeland [13:53] Yeah, but because of the renewed interest and I may say that was really sparked even more by the 2015 U.S. national order on this issue and that's being followed by Luxembourg and then recently the UAE has looked at it and one or two others. All of that has renewed at a multilectal level the idea that this is an issue that is real, is coming, and needs to be addressed. And so, at the legal subcommittee of U.N. COPUOS, and I'm assuming everybody's comfortable with what COPUOS is, the 95 member states agreed this is issue should be discussed in more detailed terms.

There were attempts to establish what was known as a working group so that's just a formal process but it's a way in which COPUOS then works towards coming up with whatever framework is appropriate. That was defeated last year, but the committee agreed that we would have formal discussions and so myself, and a wonderful lawyer from Poland, Andre Mishdow, who is currently the chair of legal subcommittee. We were appointed co-moderators. Those discussions are scheduled as part of the formal proceedings of the legal subcommittee in two weeks in Vienna. Coronavirus permitting of course. And we wrote to the ninety-five member states already late last year. I think in late September, seeking any views they might want to give beforehand, but certainly opening the possibility for them to give views at these discussions. We've already received probably about fifteen (15) quite formal responses from countries, and they are going to be circulated to all the member states. One or two other countries have said that they may also provide us with some information beforehand and that's fine. Which is great. It makes life more helpful.

The whole idea of these discussions given that clearly there are differing views amongst different countries, although I think that issue is probably not as strong anymore, but how we should proceed in this. The whole idea is to have open discussions. Give everybody the possibility and the opportunity to express their views. Not only their views, but views they bring that might reflect those of industry. And the idea here is that everybody in the sense has a buy in to the early discussions. So that when the states decide how they want to proceed, everybody is ahead of you and nobody can come back and say hey I wasn't given the opportunity to participate. Obviously, there will be some differences and difficulties and there will be some political jockeying of course. That's the nature of the way the U.N. process works. But I and lots of people I've spoken to, are at least confident and optimistic that now there is this process where everybody can participate. Those with the ambition to do this more quickly and those that perhaps don't have the capability that are watching very closely. So, we shall see. We shall see how that takes us. It's certainly an issue that will not go away and nor should it go away.

Mark Sundahl [17:56]

Fascinating. Now, I understand that you are the co- moderator and want to maintain your impartiality, but if you take off your moderator hat and put on your professors' hat how do you see it proceeding? Are you at all confident that we may develop a hard law or treaty, or do you see there being great push back as to the legality of the entire venture under Article II? How do you, I'm just giving you sort of carte blanche here, but how do you see it progressing?

Dr. Steven Freeland [18:39]

Well, as I said, ones got be optimistic that there will be progress. Clearly, and you probably heard this already earlier in your conference, but certainly amongst the wonderful panelists that I am sharing this session with you. They can also expand on this. Clearly there are differing perceptions about what the current status of the legal framework is. As I mentioned, there is one treaty that expressly deals with this issue but it's not supported widely in terms of ratification. There is of course the overarching principles of the Outer Space Treaty and other treaties that are obviously relevant and there are other elements of international law that are relevant. So, we already have law relating to this, but clearly my perspective is that most people want to have a bit more clarity and certainty given that there are different views. There are also, as everybody knows, lots of academics and lots of other nongovernmental organizations that are looking at this issue.

People would be aware, for example, of the Hague Working Group, that has put together building blocks. Its own perception of the relevant consideration. So, there is a lot of work being done. Where will it lead? Of course, that will be up to the member states. But when we put forward our plan, as well as putting forward ideas about how the discussion will proceed from a procedural viewpoint. We made it clear that the idea is that most people want to have some clarity. Private enterprise wants to have clarity. Part of that clarity is of course provided, let's say in the case of the United States, under U.S. law, but the U.S. law, like the Luxembourg law and like others say well this is what U.S. law has to say about the possibility of having property rights, but it also makes it clear that this is also subject to the international obligations that the United States may have. And so, it's a bit of a circular thing. We need to know what the international frameworks and international laws is and we need to know with clarity what it may or may not become. And I think that is what the aim is. But how we get there, if indeed we get there is really up to member states.

Of course, I have my own personal views as well as everybody on the panel. But in the end, my own view at least, is that this issue is so big and so complex that we really need to move forward on a multilateral understanding. We may not get close agreement very quickly. But this whole issue redefines the way we view space and what is space and what is our relationship with space. Of course, there are potential benefits for everybody; the whole of humanity. Not just those entities and countries that are engage in the activity specifically. My own view is that sitting down and talking on a multilateral basis - sure it takes time and sure there'll be differences, but that I think is the way forward in terms of getting this clarity and certainty that will then determine exactly how we proceed. Most people seem to understand now, even though initially people were rejecting the whole idea. Most people 'I think understand that this is something that is not as I say is going to go away' and people will want to proceed so we need to understand the common understandings of what the rules of the road are. There may be others that disagree

There may be others that say multilateralism is a waste of time or let's go ourselves and just see how that pans out. These issues are really complicated, and the technology is really complicated and it's not going to be within the capacity of one or two private entities to be able to do this without a much broader scale of cooperation. Let alone all the other non-legal issues of culture, religion, humanity, science, exploration, strategy, and economics. Now there are many factors apart

from the legal and the technical that they will all come to the floor as we have these discussions. So, I think we will move forward. How we do it and when we do it from a framework perspective is yet to be seen, but I think the steps and the signs are positive.

Mark Sundahl [23:49] Yes, your comment that the technology is complicated is undoubtedly true, but I've learned that the more difficult thing, the more challenging process, is the drafting of the laws and to get lawyers and politicians to agree on the laws. We'll have men and women up on the Moon and mining I have a feeling before any treaty is written. It's surprising sometimes that the engineers can achieve extraordinary things and we lawyers are here sitting and we can't make up our minds about it, but that's the challenge of law.

Jessy Kate Schingler [24:37] I was just going to comment or build on the complexity comment that Steve's making and then also tie it back into what Chris was saying. Many of the resources that we are focused on right now on the Moon do have this quality of rivalrous or subtract-ability, but not all of them do and so in addition to the complexity of developing any singular framework or approach to managing resources on another planet is I think the important realization that there are many different kinds of resources.

And just like on this planet not all of them need to be governed in the same way. You don't govern rivers in the same way that you govern private houses in the same that you govern climate. So, the Moon has some but I think less kind of more public goods I guess you could say. A vacuum is one of them. A vacuum is something that I don't think we know fully yet how it will be utilized but could be utilized for commercial purposes to test or manufacture certain types of equipment or for certain kinds of extraction purposes. And if that is destroyed by one actor, then it's destroyed for all actors. Certainly, dust as another one that has been coming up a lot, because of the properties or the lack of atmosphere or what's called the exosphere. Once dust is left up to the exosphere, it stays there, and it doesn't behave like atmospheric dust. It doesn't settle in the same ways. So, the impact on other actors is great or can be great and so all of those can go into frameworks for managing these resources and should go into frameworks so that we're not treating them all at once like they are unilateral.

Mark Sundahl [26:39] I would like to just take the conversation now in the direction of these cultural sites of particular cultural interest or historical interest. This is all tied together. We want to ensure the orderly

use of land and we want at the same time to ensure protection of these sites. And I think Michelle you've been doing some thinking on this. What are your thoughts?

Michelle Hanlon [27:09] Thank you. So yeah, this is my baby. So, when you think about it, when you think about Apollo, it was more than fifty (50) years ago right? Two humans took a walk on the Moon and they left their blueprints there. That is, I would say inarguably the greatest technological achievement of humankind and those blueprints, you know, we've heard a lot about the law on the Outer Space Treaty, but those blueprints aren't protected by anything. Nothing. Nothing in the Outer Space Treaty protects those sites on the Moon from anybody else coming running over them, grabbing them, filling the blueprint dust up and bringing it back to sell here on Earth.

We know that Apollo items, Moon items are very dear and precious. The first moon bag sold for 1.8 million dollars at an auction. So, we really need to protect these sites. When you think about it, it's not just about Apollo really, you know, when we're talking about how we're going to find this unity and how we're going to create some kind of collaborative spirit we need at the U.N., is we really need to build public support for universality. For the universality of space. So, what we really need is to make the world realize that those boot prints on the Moon are just like those footprints in total Tanzania.

We look back at those footprints made three (3) million years ago and we say wow we are all from that footprint. Right? Well, we should be looking at the boot prints on the Moon and saying, 'wow we all did that.' We humans did that. Not just Americans. We did that. We, all human did that and the only way we're going to be able to replicate that kind of technological achievement is if we go back together.

So, when we look at what resources and this is a really important place to start - and poor Steven is going to get an earful from me if coronavirus doesn't interrupt us - is preservation. We need to, we on Earth 's UNESCO world heritage convention has been ratified by a hundred and ninety-three (193) nations. Everybody on Earth, every nation on Earth recognizes that preservation is important. That this cultural heritage is what makes us human. That what we've done in the past is what binds us and what will guide us into the future.

We don't want history to repeat itself, but we want to learn the lessons of history and we can't do that if we erase them. So,

when we look at things like non-appropriation and when we consider things like asteroid resource extraction, the Outer Space Treaty definitively says freedom of use and freedom of exploration. But as we learned this morning after that is that it also has these obligations, right?

One of these obligations is due regard. What does that mean? So, one of these things we have to understand and what I'm hoping this working group will start to sort of put together is what do we mean when we say due regard? What do we mean when we say the province of humankind? What do we mean we say common heritage of humankind? These are the questions that we need to answer now and that we need to answer before we can identify what property means. We need to think about zoning, and we've talked a little bit about the plume effect and how regolith can harm so many things. Arguably, if you have an operating robot up there like Astrobotic, then due regard means you can't do something that would make it stop working. Well, what does that mean for heritage? That stuff isn't working anymore. What does due regard mean for that boot print?

For All Moonkind believes that preservation is a great starting point to get everybody on the same page because I have not talked to one person who has said to me that's a really bad idea who cares about the boot print? So that's a really good unifying point I think to start and then when we start to think about how NASA has promulgated guidelines, recommendations, that are completely voluntary, that say 'we would really like it if you go back to the Moon if you would stay two kilometers away because we don't really know what the regolith will do if you land too close.' We worked with Senator Peters and Senator Cruz. We have the one Small Step Act, which is the first act anywhere in the world and certainly the first in that United States that doesn't say, 'hey we need to make those sites a national park.' No. It says you know what, we know we can't appropriate. We know we can't call them American national parks, but we can say to the world 'we are going to ask our licensees and we're going to make those guidelines binding on them.' We're going to put our licensees at a disadvantage to the rest of the world, because we in the United States recognize how important this cultural heritage is and that's the first step.

If you want to call your congressman, it's passed the Senate unanimously in July and it's languishing in the Congress. So, please call your congress people and tell them we need to pass that act because it will also ask the executive branch to start talking about negotiating a treaty on the preservation of culture

heritage in outer space. and that is a hard law that I think we can pass.

Mark Sundahl [32:22] Yes, Steven?

Steven Mirmina [32:25] Thank you Mark and hello again Steven in Australia. I thank you for waking up so early or for having stayed awake so late in order to spend time with us.

There are two things I want to say to follow up on Michelle's point: something NASA has done and something that we are planning to do in the future. Going back to what Michelle had said about the guidelines. We have to rewind time a little bit back to the Google lunarX prize, where Google had a promotion and they said that they were gonna give I think five (5) million dollars to the first commercial entity to go to the Moon and perform certain tasks including imaging the Apollo spacecraft and the footprints that were on the Moon. And as Michelle said correctly, there's no way under existing international law to prohibit a commercial entity or any other entity from going right up to the footprints. And I mean, in fact, they could drive right over them and there's no reason not to.

One thing that NASA did besides creating these technical guidelines where they have a certain perimeter of how low you can fly over the footprints of the pole landing sites or how close can you drive. Those are voluntary. But NASA through bilateral agreements has found a way to make them binding and this is what I want to talk about, because over time these bilateral agreements can make something that's non-binding into something that is legally binding, and it could also become - from bilateral - it could become plural-lateral and then multilateral.

So, for example, we said to the competitors in the Google LunarX prize who wanted NASA's support maybe they wanted some teachers support or support from the deep space network. We're happy to give that support or sell that support. But one of the conditions of NASA supporting you is that you observe these guidelines and for those entities that wanted NASA support, they made that a condition of NASA helping them so that they wouldn't drive their buggy across the footprints. They needed some NASA support, like I said, for deep space network communications and if the other space agencies or if other national legislatures were to do similar things, then we can take these nonbinding mechanisms and make them legally binding. So that was one. The second thing

that NASA is considering doing and we need to work this with the state department and through the U.S. government is coming up with a series of best practices and asking states voluntarily to protect human heritage.

So, for example, if other states want to work with NASA in the Artemis program that one of the conditions are doing that would be to have respect for not just the NASA heritage on the Moon, but all human heritage on the Moon. Including Russian rovers that have been there. Of course, there is the Israeli Rover, there's the Chinese Rover as well. Even when the one hundredth (100) country makes it to the Moon, for that country, that'll be part of that country 's heritage, part of it first footsteps or the first rover on the Moon. So, even though these guidelines are not legally binding I think having technical guidelines in place that we could agree to observe through legally pay mechanisms, will be the start eventually of creating customary international law and given that we can't seem to conclude a new treaty that might be one way we can move the law forward.

Mark Sundahl [36:10] Interesting. I'll just to follow up quickly. One question came to mind Steven, and then I'm going to move to Chris here. But in these agreements with other partners when NASA makes it binding that they respect the cultural heritage sites, the landing sites, does it also provide any kind of language or provision for respecting or avoiding harmful interference and managing land use and recognizing that every party has a right to occupy and operate and not interfere with other operators and anything that gets to that point that you've been discussing.

Steven Mirmina [37:00] Well, we are drafting them now. So, I welcome input from the audience and from discussion but in the draft that we are considering and they're still literally on our desks right now. There are provisions about the requirement that's in Article IX already in the Outer Space Treaty to avoid harmful contamination and we actually call out the due regard principle because, like Michelle said correctly, the due regard principle has been in effect since 1967 in outer space, but my own personal views that it's been ignored far more than it's been observed, particularly harmful contamination, because there have been numerous examples where there's been, I think, the harmful contamination of space. But I'm not aware of any states actually presenting diplomatic claims and asserting that there's been harmful contamination or a treaty violation. So, I think we need to put some teeth into that to show what does due guard really mean and one way to do this would be through a future agreement. interesting.

Mark Sundahl [38:16] Interesting. Chris . . . .

Dr. Steven Freeland [38:16] May I?

Mark Sundahl [38:17] Yes, yes absolutely Professor Freeland go ahead

Dr. Steven Freeland [38:21] Just a couple of things and I don't want to harp on the Moon Agreement, because I understand clearly that that's not . . . but it does reflect even in the late seventies on some of the issues that Michelle referred to. Albeit it not very well, but in Article VII of that treaty there were reflections on not disrupting the environment, and reflections on the possibility in a sense, zoning particular areas that have unique scientific interests. Scientific could be in the broadest sense, I think, include cultural.

My own personal view is that it's the wrong way around. We shouldn't be saying we can do anything on the Moon except in these areas. I think it should be the other way around. We should work out what areas we want to do things and leave everything else. But that's for another day.

But already there is an idea that we could take as part of any future framework and build on some of the points that Steve and Michelle were saying just then to reflect on the idea that even if we decide it's a really good idea to exploit the resources be it water or whatever else that we got to be very careful to ensure that we don't in any way infringe on important areas that have historical, scientific, cultural, or whatever. We also don't want to have scholars on the Moon so to speak.

Could you imagine what the public reaction would be for example and this is an extreme example. But if at home with my local telescope I can look up and see mining and scars on the surface of the moon. What impact would that have on the way people are reflecting on these activities. I mean obviously resource exploitation may take place elsewhere, but on the Moon, itself has particular historical, cultural, religious, societal impact on us over history so we just have to be careful about that. And then on the issue due regard and I completely agree with Steve and with Michelle that we need more clarity that the Outer Space Treaty when it talks about due regard, it talks about due regard to the corresponding interests of the state's body and corresponding is one of those tricky words that lawyers could interpret to mean, you know, whatever they wanted it to mean.

I completely agree. It is an important principle. We need to work out what the obligation of due regard is but we also need to ensure that whatever that means it takes into account a broad range of factors and not just I can't impact on the interest of someone else who wants to do exactly what I'm doing. For example, which is one interpretation and I'm not agreeing with it of what corresponding might be. You know, we need to look at this holistically from all of the perspectives that have been expressed by the panel and others as well. It is not just a question of law. It's a question of so many other things. But I think we've got a lot of tools to start working with, plus I think there is genuinely goodwill in the sense that if we are going to do this we've gotta do it sustainably et cetera for the future. And I think we just need to take into account all these other factors. Sorry to interrupt Chris.

Mark Sundahl [42:30] Yeah, just a quick aside, I wonder if everyone agrees with me, but I have sensed an evolution or clarification in the meaning of *due regard* when dealing with respect to anti-satellite tests. When the Chinese destroyed their satellite in 2007 and created massive debris clouds that will be in orbit for hundreds of years no one said that that was illegal. I think Prime Minister Tony Blair at the time said it was legal. But when the Indians carried out their kinetic anti-satellite tests just recently. There was real uproar. I felt that it is now considered illegal. That it is not proceeding with due regard to the corresponding interest of others. So, it's kind of an aside, but I think we are making some progress there at least. Steve? Yes?

Steven Mirmina [43:32] So I wanted to ask a question to Professor Doctor Freeland just to follow up on your point. You're right in terms of the treaty text that says you need due regard for the corresponding interests of other states parties and my question to you is: If there are no other states parties present, does that mean that they have no interests that need to be taken into account?

Dr. Steven Freeland [44:00] Yeah. Sorry, thanks Steve. Did you say there are no other parties present?

Steven Mirmina [44:06] Correct. If there are no other states in the vicinity of a particular activity would you contend that there are no corresponding interests?

Dr. Steven Freeland [44:14] No. I wouldn't at all. I always, when I look at this, to give an extreme example, just so we can work out what it is that we are talking about. Let's assume activities go ahead for I don't know, platinum, as you mentioned in your introduction Mark

and somebody is able to secure a huge amount platinum and bring it to Earth. I know this isn't necessarily going to happen, but let's assume, and therefore makes a lot of money out of that, but by bringing that to Earth, the worldwide price of platinum plunges and another country whose economies is dependent on the platinum, as an example, suffers very greatly because its economy has collapsed due to the results of this mining activity. Would that, for example, be a corresponding interest that should have been taken into account. i.e., if I got hit with this venture. I'm going to affect the economy in another country.

I know it's an extreme example. All I do is raise it to highlight the fact that we need to be conscious of what it is that due regard is at the moment and clarify as we move forward because I think the example that Steve gave is a really good one. And Steve, thank you for calling me Professor-Doctor, but there are so many accolades I could give you. I think Steve's example is obviously a much more relevant and realistic example. I would certainly personally think that due regard still needs to be taken into account for the interests of others evening if they're not in the vicinity. All I'm saying is that little word could give rise to different interpretations by people making arguments. What we want is clarity. We don't want people sitting down and arguing about these things and therefore, it goes ahead and irreparable damage or bad will is created or whatever. We want clarity. An excellent example Steve. None of us I think have the answer, but I think we're all sympathetic to the idea that it's not limited so tightly that you have to be there, otherwise we don't have to worry about real interest.

Mark Sundahl [46:53]

Steven, you just joined us so you're maybe not aware of this but Giuseppe Reibaldi just joined us in the prior panel to announce the publication or the opening of the new draft Moon Village Association Principles. And now they're open for public comment and part of these principles maybe, well, most important to this discussion, is that the principal call for a land use registry. Where are all actors on the Moon will register the location of their plan or existing lunar activity and describe the nature of that activity thereby putting the world on notice of its activities so that the other actors can exercise due regard and avoid harmful interference. It would be not only for resource extraction, as is proposed by the Hague Working Group, but it would be for all types of land use. What are your thoughts about such a thing?

Dr. Steven Freeland [48:10] I'm sure other people on the panel have thoughts on this as well. My own view is that of course we have existing principles that everybody has respected very well in the Outer Space Treaty, and others, about freedom of access that Michelle referred to before and freedom to engage in peaceful exploration and use of outer space. So if you were to introduce any form of process and it makes, it's a commonsense process, but if it were a process that essentially gave priority rights or exclusive rights or whatever over particular areas of any celestial body, then clearly that may have been seen not entirely square with the existing principles and so you need to have a complete buy-in from all of the state's parties or an understanding. So, of course, all of those things make sense.

It makes sense to have order in the way we move forward in the exploitation and utilization of resources because you don't want chaos, you want it to be done safely and you want to be done securely and you want to be done sustainably. So having that sort of notion is a commonsense idea, but it cannot be unilaterally imposed. It needs to be something part of a much broader idea about how we move forward to ensure that everybody recognizes that it's going to be a consistent with or complimenting the existing principles that have served us so well. Those principles are based on cooperation and they're based on not having exclusivity or priority rights in a particular area. Obviously, when you start having exploitation activities going ahead, you can't have two people digging in the same hole or whatever it might be, so you'll need to work out a system. I think everybody recognizes that to be the case, but it needs to be a system in a much broader framework. You can't just say hey let's have this register if we don't understand exactly what it is in a much more holistic way that we're trying to achieve and what the framework will look like with all the other factors taken into account. So, it's an interesting idea. It's a useful and practical idea, but it will be just part of a much broader framework I think as we move forward.

Mark Sundahl [51:08] Thank you. Chris did you have something?

Chris Johnson [51:11] Yes. Certainly, there is so much to respond to and comment on what's been said, but I think I'll keep my, I have ideas I want to put out there. One is that forum and avenue as we develop new frameworks. Forum matters, and the second one is form matters. So, the first comment: forum or Avenue that how we develop these new governance frameworks matter. and I would point to three international, recent international, exercises in governance for space activities. The PPWT [Treaty on the Prevention of the Placement of Weapons in Outer

Space]- prevention placement weapons in outer space, the draft treaty by Russia and China, which was introduced in 2008 and has languished in the conference on disarmament ever since. U.S. resists it as being unverifiable and lacking a definition of space weapons. This is an example, the PPW T of an instrument, the form of it, a hard binding treaty with explicit prohibitions on particular weapons. There is no future for the PPWT.

The second example I would point to is the European union code of conduct for space activities, which was put forth by the "EEAS" - European External Action Service out of Brussels. This is a code of conduct non-binding but reflecting best practices and creating new best practices for space activities. However, the code of conduct failed also because the E.U. brought it to the international community already written, already finalized, and essentially already negotiated and said here you go congratulations we've done the hard work please sign our instruments. So, there it is not what is in the code of conduct that people didn't like it's the fact that they weren't consulted. So, forum and Avenue matters.

The third example, when I talk about forum and avenue matters, is the LTS guidelines, the long-term sustainability space activity guidelines, a non-binding set up best practices and principles. Twenty-one (21) in total. Negotiated over the course of almost a decade at COPUOS. But there because it was done within COPUOS, merely reflecting best practices and has by and by eighty-seven (87) member states of the Committee and Peaceful Uses of Outer Space, it is seen as a successful negotiation exercise because it took a long time to do. They had experts. They had industry participation. So sometimes what is in the treaty matters. Sometimes it is whether the treaty is binding or non-binding. Sometimes it matters the avenue that it is developed. So, forum and Avenue matter.

The last thing I would say, the last comment is that the form matters. When we look at the history of space law when you get your treaty booklet there's binding treaties, but after the era of treaty creation, there is the era of general principles and best practices and others specifically negotiated documents that are not binding in nature yet have some type of normative force. And this is maybe where we're at now. The treaty booklet ends with U.N. negotiated instruments on. enhance registration practices. Advanced ideas on the concept of launching state. So if we are to develop rules in a normative framework for the use of resources or protection of heritage sites I think that a

treaty is going to be tougher to do, however, there's these other avenues and other forms that matter and certainly the way that it is approached in a difficult geopolitical context also crucially matters. And are not merely the lawyers who need to work on it. This is when we consult the diplomats and the political scientists.

Mark Sundahl [55:03] Well now we are really getting the inside of the operation of the United Nations and the making of law. We're are being very strategic about and realistic about how we are going to create these norms. What is likely to work. What are the tools in the tool kit? And I agree that an instrument, a soft law instrument, is likely to be the product of the U.N. process. Although, I wonder if I'm, and now I'm being strategic again, if we just limit with the nature, the substance of the treaty to the creation of the registry, which does nothing but provide information. That should not be controversial. I mean you kind of strip out a lot of the more controversial issues. There are many different ways to go about this, but this was something that came to mind. Michelle?

Michelle Hanlon [56:09] So just want to talk about this registry. you know how many how many sites do you think there on the moon right now with human material on them? How many Apollo landings lunar landings? what do you think there are more than a hundred and eleven sites on the Moon right now that already have human material on them. We don't know exactly where they all are. We think we have the lunar reconnaissance orbiter so we're able to map this stuff. So that's a hundred and eleven (111) sites already on the Moon. Some of the sites have important scientific cultural heritage properties. Some don't. So, For All Moonkind, our first job is to figure out what's up there and what needs to be protected and how we protect it. So, it just makes consummate sense going forward that we have this kind of registry and again it doesn't need to come with any rights from the beginning. Let's all agree that if we're going to go to the moon we're going to tell somebody where we're going where we'd like to be going, what we'd like to be doing, what kind of activity we'd like to be doing, and then, perhaps, rather than saying and then 'I get these rights,' we just used due regard, common sense, to say okay well I'm not going to go there because they're already there so why would I do that?

Mark Sundahl [57:34] I agree with everything you said. Josh [audience member]

Audience Member [57:38] When you're talking about these over a hundred and ten sites so are you saying that you're wanting for every crash landing to be a historical and protected?

Michelle Hanlon [57:56] Absolutely not. We believe that we need to manage what we protect him and then in archaeological anthropological parlance you memorialize, you protect, or you preserve. And so a lot of these sites we think just need to be memorialized, but certainly Luna two (2), Apollo eleven (11), lunar nine (9), those are historic technological achievements that we believe ought to be protected. But you know to Chris 's point, this isn't For All Moonkind's decision. This is the decision of the international community made in the right forum. So, we are not suggesting what needs to be protected. We're just suggesting we need to think about protecting and we're hoping that the international community will be able to talk about the management of that heritage in a forum.

Audience Member [58:45] So do you really need a treaty, or do you think we could settle for . . . .

Michelle Hanlon [58:48] I want a treaty, damnit.

Mark Sundahl [58:49] Yeah. I want a treaty too. A treaty-based registry. You must have extensive thoughts about how you would actually do this. How would you decide? How will the international community decide what should be protected and what should not be protected? They're going to be so many sites of human contact on the Moon soon that you can't protect them all. So, what with the process be and same with sites of scientific interest. How would you decide? What would the standard be?

Michelle Hanlon [59:27] So the first thing I would say is I disagree with this concept of every nation that gets there, their first should be preserved, because the concept of going to space is a universal concept. A human species concept. So we want to preserve all the firsts, but not by nations because that sort of defeats the whole purpose, right? If we have a hundred ninety three (193) nations all of a sudden we have a hundred ninety three (193) different firsts to protect. So, I think because you have to look at it universally. In first ….

Mark Sundahl [1:00:03] America first. America first.

>>>>>>>> Audience laughter <<<<<<<<<

Michelle Hanlon [1:00:07] So, here on Earth, the World Heritage Convention you choose something within your territory, and it starts locally in the United States. You'll go from your county to your state to the federal government who will take it to the U.N. So, we are

working with a preservation team, the team that includes several of the lawyers that negotiated the World Heritage Convention about how to do it and one of the gentlemen said to me 'you know we're really anxious to see how you do it because we've got to do it for the high seas.' We are facing the same issue on Earth with respect to heritage that is in the high seas because you can't claim something in the high seas. So, the short answer is I have no idea. What we need to do is get the right people in the room and in the right forum to start thinking about it and talking about it. We have all sorts of models. We have Antarctica. We have UNESCO. These all have things that we can call from to get the right kind of agreement for space.

Mark Sundahl [1:01:10] Why can't we use the UNESCO Treaty to simply declare it the side of cultural significance?

Michelle Hanlon [1:01:21] Under UNESCO you can only suggest a site within your own territory, and we know from Article II in the Outer Space Treaty that you cannot appropriate anything in space. So, for us to say we would like, if for the United States or for Russia to say, we would like Luna two (2) to be World Heritage Convention. You are already then suggesting that that site is within your territory which is a violation of the Outer Space Treaty.

Dr. Steven Freeland [1:01:46] If I may just add to Michelle's comments. I mean, there has been quite a few discussions in the past about having a space heritage convention. You know with a similar idea but obviously a different process to do it. I think in terms of protecting, my own view is not to say let's identify a hundred (100) or whatever sites it is that we can't touch, but then everything else is open for business so to speak. my own view is that much like mining on Earth, that if mining is what is intended, that if a group of states or whatever identify through careful mapping and careful testing that a particular area or a celestial body or the Moon is an area that they would like to explore, then assuming that we've got a process in place and these are big assumptions. But assuming you got a process in place to determine how that goes ahead. That group would put in and the analogy would be an environmental impact statement and cultural heritage statement and a whatever. As part of its process and this happens already in the law of the sea with people looking to make applications for looking to make applications for exploiting the big seabed. A report to whatever reporting institution you have in place and everyone

has an open mind as to what that may look like, but I am making mass assumptions. As part of that it will say based on the information, this does not impact on any site et cetera that are well known.

I know Michelle has got her own registry in mind. It does not affect environmental impact et cetera. So, rather than, as I say cording off areas and then saying everything else is okay, I think any activity like we do on Earth requires a careful examination before it goes ahead and part of that process would be to obviously ensure that whatever activity is envisioned does not impinge on important sites of culture, history, science, et cetera. But a whole lot more. So, as I said all the ideas of having – Mark, you said just a treaty on registering with a register - all of that makes sense. Although, we are probably in a geopolitical year, where now getting multilateral treaties is getting harder and harder and harder. And that's not unique to space. We are seeing it in other areas, but I still believe, even though it will take longer, I still believe we need to sit down and get all the pieces of the puzzle. Or at least all of the pieces that are currently envisioned with the technology and knowledge that we have together. Rather than bits and pieces, because in the end, if you get bits and pieces and then try and have a process based on pieces that aren't t necessarily in synch, then you'll have problems down the track. But I think absolutely. Whatever framework in the end is put together. And it's most likely to be, as you say, in some guidelines or soft law. If that is the case, we will have to as part of the process make sure that we do not infringe on areas that clearly, we should not be infringing on.

Mark Sundahl [1:06:09] Thank you Steven. Sorry for the radio silence we are trying to get Jessy-Kate a working mic. And here she is.

Jessy-Kate Spindler [1:06:11] And here I am. What you just brought up, for me, Steven, thinking about not just the individual actions or the actions of individual actors, but also the system level affects that might come into play when we're thinking about due regard. And that it's not just, for example, if somebody were to make a request or propose to land in a certain location and if you step back one level it might matter whether other people are landing in the same location with similar interests.

So, we talked about the radio silent zone concept earlier. We also talked a bit about landing pads. If you have a landing pad you might end up with a sort of more industrial or manufacturing zone in which it makes sense to land close to it if you plan to do similar activities. Now if we don't have the

transparency between actors about what they are planning to do, then you might not know that it does or does not make sense to land near them or to land in a specific location. So, I'm just layering on top of what you are saying about what we're all saying about due regard and thinking about the complex interactions on a systems level as well as for a resource management and stewardship of size. There's just a lot more to peel back. That's a cool concept.

Mark Sundahl [1:07:41] Well, I have a question for all of the panelists. I think this is one problem that we're going to face. What if we create a registry of a binding treaty requiring that registration of all lunar activities and the day after it goes into effect China makes a registration letting the world know that it is planning to harvest all the ice on the south pole of the Moon? Do they now have exclusive rights to all the ice on the south pole of the Moon?

Jessy-Kate Spindler [1:08:24] I guess, I can go as the non-lawyer first so that people who know more things about this can say correct things. I think that just underscores the points that have been made up until now on the panel which is that just having a registry isn't enough if we don't have conversations about the standards of what does it mean to register. Does it give you rights? Does it give you rights for a certain amount of time? Obviously, the Hauge Building Blocks propose a certain radius and deration be identified when folks register at a certain location so they're not rights in perpetude, but they are temporally bounded and spatially bounded. There are all kinds of different frameworks and understanding what goes along with that I feel would be an important component.

Mark Sundahl [1:09:07] You sound like a lawyer. You do. That was very lawyer like. Yes? Question in the back.

Audience Member [1:09:17] Your question kind of leads into what I was thinking about and that was whether or not Michelle's organization has thought about ways to enforce the protection of these historic sites. So, for example, do you envision video cameras on the Moon to monitor what's going on with these important sites?

Michelle Hanlon [1:09:43] Everyone's mumbling Space Force up here. No, I mean it's international law and that's one of the most difficult things about international law is that enforcement is always difficult and so its name and shame and wag your finger. When we are asked about how we are going to protect, we actually talk about things like the NASA guidelines. Things like working to create

shared landing pads on the Moon so we land and don't create that plume effect and those damaging blasts of regolith. We do also have the LRO constantly in orbit. So in a sense we do have video cameras on the Moon. We can't prevent but we can certainly see if these sites are different. You should go online and look at the sites because you can see the astronaut paths. It would be very clear if something was going over them or going too near them or something. But no, I think we've heard all day that enforcement is one of the toughest issues with respect to anything in international law and space law as well.

Steve Mirmina [1:10:46]

So in terms of prevention it's just like Michelle said. It is very hard to prevent but I think it's important to remember that, at least currently, the countries that are space faring they're small in numbers but they also, generally speaking, cooperate really closely together. So if there is a bad actor out there I think if that bad actor were ostracized from the rest of the space faring community, that would be enough of a disincentive to punish bad behavior. So, for example, let's just say hypothetically I'm going to choose China. If China did something bad in space and the rest of the world said you know what we're not going to let them come into our moon village. We're not going to let them launch from our facility. We're not going to launch their payloads or whatever the appropriate penalty would be. I think that might be enough to encourage them to change behavior and it may not be China, it could be any country, right? But if there's a bad actor out there in the rest of the countries decide not to work with them. We're all so interdependent on each other in space even if it's just transmitting signals or passing radio waves back and forth between each other or transmitting downloading data. there are lots of ways that we're interdependent and I think that's where we could encourage good behavior is by letting people inside the tent.

Audience Member [1:12:24]

And your question of China saying they want to mine all of the south pole ice. I'd like to throw out the Oklahoma example: you send people out on the moon or map it initially and say these are the ten thousand (10,000) sites that people may want and we're going to have a lottery for claims to be able to extract resources from those areas and go through that lottery and they've got two (2) years to be able to get something ten (10) years to get something, you know, to start that activity. And if they don't then they lose it, like a lot of oil leases. So, to use that sort of Oklahoma/oil lease example. Is that something that would work for the Moon?

Chris Johnson [1:13:14]

Well, so that's good that we'll get back to a question that is kind of at the heart of this panel and also previous panels. Space is for the exploration and use and outer space is the province of all mankind. So does space belong to everyone? Or does space belong to no one? I think space itself to say that it is in the domain of humankind that somehow the Moon belongs to humanity or that other planets. somehow belong to humanity. Honestly, this is the height of absurdity. The height of anthropocentric, we own everything that you can see with a telescope. I believe space belongs to no one; Individually nation state, or collectively as a species. But we're allowed to go there and use it so long as we agree on the rules there.

Steven Freeland [1:14:17]

Can I? Sorry. I don't want to interrupt. Two points that I wanted to make in closing. In answer firstly to the question which I think heard properly. When you think about it, we've already devised an international framework to exploit natural resources of space. In this case I'm thinking about radio frequencies and its association with the geostationary re-orbit . . .

Oh sorry. I'm back on yeah. Sorry. My apologies. The screen froze for a moment. Can you hear me now? Can you hear me . . . yeah?

So, we have a system, the geostationary orbit and everybody knows it has this priority system that has been agreed, and there have been hundred ninety-three (193) states parties to the relevant conventions that do that. So, in the end multilateralism. We've worked out a system that works reasonably well for an actual resource because it's in all of our interests to do that because the issue is too big for, one, or two, or three countries to try and do it alone. As is indicated by Marks hypothetical question and I think the same issue here and I completely agree with Steve 's point that we cooperate a lot and there are a lot of common interests amongst the major space fairing nations. Sure, they may have disagreements on various issues terrestrially, but in the end, there is a common interest that we don't condone, or allow, or tolerate bad behavior that goes beyond those lines whatever those lines may be. And that if that happened then you have a program and appropriate penalties and sanctions as Steve said. So, I think your question Mark and the gentleman's question from the audience highlight even further the idea that it's positive that everybody can sit down and talk about these things and have short and hard discussions and negotiations. But in the end, you got to find common interests and commonality and that will allow the development of any framework that makes sense

in the circumstances. We've done it before and depending on how the member states react in U.N. COPUOS discussions. I have no doubt that we could do it again. Although, it will take some time.

Jessy-Kate Schingler [1:17:24] I was just gonna sort of agree strongly, and also, speak to the specific question because I think it goes right to the heart of what we're talking about today and I guess that when you come down to it if we want to have resource usage, extraction, withdrawal, and utilization on the Moon and other celestial bodies we have to come up with some framework for doing so and if we would like to do that in line with the outer space treaty or even perhaps even perhaps if we don't want to do that. It kinda comes down to questions about fundamental fairness norms. Where do our norms of fairness come from? If we want to have a system that addresses the notion of benefit sharing or for all humankind. Do we do that through a lottery system? The fairness norm underlying that I think is something about randomness is fair because we're not intentionally being asymmetric or is it actual kind of mathematical equality? That's another fairness norm. Is it redistribution through taxes? That's another kind of fairness norm. These are such fundamental questions which I think is why this area of law is so interesting because we get to revisit these questions of basic designs of social systems. And is there an argument for one of those over the other? I don't know. I guess, that's what you all can figure out.

Audience Member [1:18:59] So I kind of wanted to talk about how you were talking about name shame and ostracize, and you gave the Chinese example. We do have a lot of collaboration but is there a lot of collaboration with China? So, when you were saying that you can't use our landing pad. You can't use our station. I think a response from them would be okay we don't care we're going to build around it. So, I don't really think that that would be enough when it comes to a powerhouse like China and they're like okay we don't need your station anyway we're going to build our own. We're still going to do these things. Sure, the international community is shaming you and against you, but will that stop them? I don't know the answer, but I don't think it will.

Steve Mirmina [1:19:50] So I was in a meeting with a NASA administrator a couple weeks ago and he pointed out something which I thought was really interesting. He said that whenever you point at somebody to remember that you have three fingers pointing back at you. And if you took everything you just said and you

substituted United States for China, I think it could be really interesting.

Mark Sundahl [1:20:41] Okay. Yes, I think that was a very interesting comment and a very interesting response Steven. You may be wondering where we're going from here and whether we're on schedule or not. We are, but I think we could continue the conversation and kind of roll it into eventually this question-and-answer session that we are going to be holding to answer those questions that you guys have been putting in the basket throughout the day. So that's kind of the direction we're headed. Professor Freeland if you have other things to tend to, I don't want to keep you. I know you agreed to be on the panel, but you're welcome to stick around and continue the conversation of course.

Steven Freeland [1:21:37] No. I'll probably take my leave and go and have some breakfast now. Thank you for including me in what has been a fantastic discussion. I mean all of the panelists just made such good points and I appreciate the question from the audience. I don't know how many people are in the audience, but they certainly sound like they are very interested in the activity. And, oh, I am going to find out that find out fourteen thousand people are here. We've got a pretty good crowd and I think we all will join me in thanking you for participating.

Steve Freeland [1:22:19] Thank you, thank you. Bye-bye, thank you very much for inviting me and I hope the rest of your day goes well. Thank you. Bye-bye.

QUESTION & ANSWER

Mark Sundahl [1:22:31]

Bye Steven. That was fun. I absolutely feel blessed how well, the technology has worked. I was totally prepared to not have any of our guests call in or to call in at the right times. I had to do all these calculations through the time zones. Everything came together. Really, I'm feeling proud. I don't need applause. I'm not looking for an applause but thank you that felt good. But let's continue this conversation. Are there any questions from the audience? We'd like to do some of those questions, okay. We might as well just dive right in. Well, my plan was to have the students actually read the questions so any of the students Daria are you here or Kristina? There's Kristina. Good there's Kristina. There was also Steve Robertson. He stepped out. So these are service members of . . . and Aimee Fanter was not able to attend today. These are all members of my student staffed research council of the Global Space Law Center and they do an amazing amount of work for me and help support me in the different initiatives that I'm a part of.

Jeff, for example, recently traveled to a conference in Georgia with me and I'm sorry Steven can't hear this, but we are publishing a paper in the Georgia journal of international and comparative law on the creation of a registry that is based on the model of the master register that is administered by the ITU for allocating the radio frequencies just as Steven was suggesting.

That is a great model and the way they do it is if you want use of radio frequency, you publish it and then there's time for an objection to be made if it interferes with anyone's radio signal. If no one, of course, this is a nutshell, but if no one objects when you get published in the final master register and you have priority rights with respect to the use of that frequency. We could do similar things for land use on celestial bodies. If you plan to go to the Moon and for whatever reason you register that interest and then there should be a period of objection if anyone's in the vicinity. If not, then you can be registered and have some type of priority right. But that's a kind of good stuff Jeffrey Murphy has been doing so just to give you a sense of what the research council is all about. So, you have some questions for us?

Jeff Murphy [1:25:35]

I do.

Mark Sundahl [1:25:36] Okay. I am going to leave briefly. No. I won't. Proceed. Proceed. I changed my mind.

Jeff Murphy [1:25:43] Alright. So, I put them in order of most general going all the way back to you know the general space law of the Outer Space Treaty. So, based on the budget deficit that we have now for the federal government, can we afford a space stationed around the Moon and a new expensive rocket. So, why go to the Moon? And this question was specifically for Steve Mirmina. The purpose of the international space station is to find cures for human diseases. How successful has that been? So, let's open it up to the panel.

Mark Sundahl [1:26:25] Were those all the questions?

Jeff Murphy [1:26:27] No. No. That was the first.

Mark Sundahl [1:26:29] That's just your first selection, okay. This is good.

Steven Mirmina [1:26:38] Thanks. I'm going to answer. I'm going to take those two or three questions and put them together Jeff and just kind of answer collectively because I think the fundamental question boils down to why should we explore outer space? Why should we spend the money on it when there are so many things that we can spend the money on down here? So, rather than getting to the specifics of have we found a cure for cancer yet on the space station, I think the reason we want to spend money on space exploration, and I mean there are several.

One of course is geopolitical and I'm from a strategic standpoint there's always a benefit as some people are say to having the higher ground so to speak. Setting that aside, we don't know what we're going to find if we were to get humans on the Mars or have a human outpost or put humanity on another planet or on another celestial body. On the quest to put humans on the Moon in 1969, we found incredible technologies that we had no idea that we are going to find. Same with the building of the space shuttle and same with building the space station in terms of radio communications, with mobile telephony, with GPS on all of our hand-held cell phones. The breakthroughs that we've made in space technology that has Earth applications are profound. So, for example, everyone is familiar with the Hubble Space Telescope and the images that Hubble brings back. Well, the very same technology used in the Hubble Space Telescope has been used by breast cancer researchers where they can find breast cancers before they met metastasize and they can find them much earlier and the survival rate for these types of cancers is far

higher now than it was before they had this technology. Same thing for remote medical observations like people have these rings now on these watches that count their aspirations and aspirations is not the right word.

Jeff Murphy [1:28:54] Respirations.

Steven Mirmina [1:28:55] Their respirations. Thank you. You can tell who's a lawyer and engineer for telemedicine, for the Internet, for satellite communications. Again, it's not a question of if we spend money on this are, we not spending money on that. I remember when I first started at NASA and I don't know if this statistic is still true, but Steve you might know in the back. I've heard that for every dollar that we spend on space we get seven dollars back in terms of revenue. Precisely. So again, it's not a trade. It's not as if we're going to take that twenty (20) billion dollars NASA gets and put it into something else. It really helps the economy in tremendous ways. Innumerable ways. So, I'll just pause and see if anybody else wants to respond.

Jeff Murphy [1:29:41] There's an ancillary to that that can go with it as well. How will you share the benefits of outer space?

Steven Mirmina [1:29:48] Sure. So again, like Mark said earlier, we're not talking about like going to mine platinum and bring the platinum back and then divide the profits, so we all get a dollar back on our income tax or something like that. The way we share the benefits of space exploration are many. In terms of medicine. In terms of Internet. In terms of education. For example, taking satellite internet and bringing it to Africa or South America or Asia or these areas that would not otherwise have land lines right you can't string lines all across Africa it's just far too big to be able to bring education to these remote areas or to bring medicine to these remote areas. Every year NASA has a magazine that it publishes and it's now an online publication called Spinoffs, where we talk about all the technology that NASA had developed and we can give to the world. We put it out there. Usually, there's a U.S. company that wants to commercialize it and even if it's not done for profit, we put it out there and we say hey this is a great technology. People should be using it and we make it available to the world community. Please yes?

Audience Member [1:21:07] *Inaudible*

Steven Mirmina [1:31:18] Integrated circuits raw materials different kinds of metal and tinsel strength. Yeah.

Mark Sundahl [1:31:23] *Inaudible*

Chris Johnson [1:31:44] I would also point out planetary defense. So, if the Earth is threatened by a near earth asteroid or near-earth object, a "NEO," first space agencies coordinate and cooperate in tracking and characterization of near earth asteroids, which may threaten the Earth that's the international asteroid warning network. Space agencies also cooperate in the same page space mission planning and analysis group. which would be the mission with the coordination for a mission to launch and to deflect an asteroid which threatens the Earth. So, both the characterization and the potential missions are, at this point, we hope still theoretical whether an asteroid is going to hit the Earth. The good news is that the planet killers that are larger than a kilometer have all been spotted. None of them threaten the Earth, but they're still tracking and have only found around thirty (30) percent of the NEO's that would be a hundred and fifty (150) meters or larger, which would cause regional disruption. So, it is not just the benefits that we have right now but if we are to defend our planet, it's the space agencies that are doing the work now.

Steven Mirmina [1:32:56] And then, just some other applications of course would be for agriculture or aquaculture or hydrology or even fish populations or pestilence. Dust storms in Africa that blow across the ocean and come into the western hemisphere. Even the ability to predict the weather. Right? I mean, this is something that certainly everybody benefits from.

Jeff Murphy [1:33:19] Right. Thank you. Still sticking with the kind of broad and going back to the Outer Space Treaty. Is sovereign immunity waved under the various treaties so that countries can be held liable. So, would sovereign immunity apply generally except where they gave it away. For instance, in the liability convention in the Outer Space Treaty.

Steven Mirmina [1:33:47] Yes, you answered it perfectly. Alright so sovereign immunity, states generally are sovereign so they can't be sued unless they agree to be sued and they did that specifically in the liability convention where they mention where they say "we agree to be absolutely liable for anything launched from our territory or facility or anything we procure."

Jeff Murphy [1:34:04] Thank you.

Steven Mirmina [1:34:04] Absolutely. Good job.

Jeff Murphy [1:34:06] And then this one is an old favorite. What is the definition of outer space relevant to the space treaty? Is it the Van Karman line? Is Virgin Galactic who flies below the Van Karman line an activity in outer space?

Chris Johnson [1:34:22] Certainly. Let's pass that to a Professor. [hanging microphone to Michelle Hanlon]

Michelle Hanlon [1:34:26] [Laughing to Chris Johnson as she reaches for the microphone] Depends on where you live. Yeah, there is no internationally agreed demarcation line between the air space and outer space. There are different and varying ways of making that determination. Some countries like Australia have decided that they're just going to send another hundred (100) kilometers. Countries like the United States, we look at it in terms of functionality what is what is the craft going to do and we do it that way. But the COPUOS has been discussing the demarcation line since its inception. So your guess is as good as ours on that one.

Chris Johnson [1:35:05] But look up a paper by Jonathan McDowell and M-C-D-O-W-E-L-L arguing for and his argument has gotten recognition from the IAF international astronomical federation saying that the hundred-kilometer demarcation doesn't make sense and that he argues that the lowest altitudes, the perogy of the operating satellite could be as low as eighty-four or eighty-five (84–85) kilometers. So, it is possible to have a stable orbit even at that low altitude.

Jeff Murphy [1:35:39] Thank you. So how does the U.S. decide which international partners to work with and how can new space faring nations receive a place at that table?

Steven Mirmina [1:35:55] Alright.

Jeff Murphy [1:35:56] You got the hot seat. [looking at and laughing with Steven Mirmina].

Steven Mirmina [1:35:56] This is what I do. There are lots of factors that go into it. So, for example, the U.S., sorry, NASA is an agency of the U.S. government and the U.S. government uses NASA sometimes to build alliances. We've done cooperative agreements with countries because it made political sense to do that. We wanted to become closer allies with particular countries and some countries have expertise that NASA or the U.S. don't have.

So, for example, the Ukraine has a lot of experience with radiation. Canada has fabulous experience with robotics and

outer space. So that's why they built the Canada arm. In fact, they're building their third. They put one on the space shuttle. They put one on the space station, and they're going to donate one to the gateway program. So, we're gonna take the Canada arm put it up in space and use that arm to put all the other components together.

And sometimes we have relationships with countries just because of their geographic position on Earth. So, for example, I talked about the deep space network. There are three systems of dishes around the globe. There are some in California, some in Spain, and some in Australia. And the reason is of course the Earth rotates and if you have a probe that's way out, say by Saturn or Pluto and you want to be constantly in contact with it, then the dish in California has got essentially like eyes and ears on the satellite and then the Earth turns and then it's picked up by the dish in Spain and the Earth turns some more and then it's picked up by Australia and then they pass it back to California.

In fact, if it weren't for the Spain and Australian dishes and our cooperation with Spain and Australia, we would not have video of Neil Armstrong coming down the ladder because that came from our foreign stations because of the time a day that we came down the earth had rotated so the dishes in California wouldn't have picked up his first steps. So, we're very grateful for our cooperation Spain and Australia on that. And those are just a few examples.

Jeff Murphy [1:38:03] Thank you. Very nicely answered. So, this is kind of a two-part question. How do you maintain the peaceful use of outer space in the face of increased militarization and then going to the more decentralization part of that, what can be done about avoiding terrorism launch from outer space?

Chris Johnson [1:38:24] I don't know what can be done about avoiding terrorism, except for we have in Article VI and that we hope that states actually authorize, supervise, and ensure continued compliance with the provisions of the present treaty.

Now, dealing with the space as military domain or preventing weaponization or militarization or conflict in space. You know, I've mentioned, well first, we don't know what constitutes an act of war, an act of aggression, or use of force in space. We've been talking today about international space law. There's another entire regime international humanitarian law which defines and regulates international armed conflict. So, we put it to our class. you know under space law if you cause damage

to another states space object, the duty of liability rises to pay compensation. So, it is not illegal to destroy another states' space assets, but it mainly gives obligation to pay compensation.

However, in international armed conflict no such duty arises if you destroy another states assets. So, what governs if we do see conflict in space? This is something my organization is concerned with. You can look at the Secure World Counter Space Report to see a counter space capability from the U.S., Russia, China, and Iran. There's also the "CSIS" Center for Strategic and International Studies aerospace projects open source counter space report - looking at all the ways that conflict can break out in space and the capabilities of particular countries. Essentially, there is on orbit Kinetic, on orbit kinetic, dazzling and cyber. And essentially nefarious activities, as I mentioned before, are happening in space. It is permissible to take countermeasures against those activities. But we don't know what triggers reprisals and actually going into an international armed conflict.

The U.S. relies on its space assets as a national technical means verification and in other words, we have assets in space that are looking at the rest of the world to see launches to detect testing of nuclear weapons and explosives. It's the American policy that if you blind those satellites, if you disable those satellites, that's the first act of war. We're now in a state of war if you disable or disrupt our national technical means of verification. So, there are hard lines in space that may trigger a conflict and the U.S., certainly, Russia, and China, but the U.S. is also doing undisclosed activities in outer space. I'll leave it at that.

Jeff Murphy [1:41:13] Thanks. Anybody else have a thought?

Jessy Kate Schingler [1:41:17] So, the example you were just giving [looking at Steven Mirmina] Can everybody hear me? Am I on? Yes, so in the extreme sort of exaggerated example of let's say the one we've all been using, China goes and claims the south pole and says what are you gonna do about it because you know you're ten years behind us because you don't have an authoritarian government so it takes you a lot longer to make decisions than we do. Then, you know, I think there is a scenario where you could see the conflict bleed back to Earth. As a way of enforcing it to the question of how do you enforce peace or how do you do one of the carrots and sticks at our disposal and at some point when you run out of carrots and you don't

have sticks that you can deploy remotely you might bring them back home.

Jeff Murphy [1:42:14] Thank you guys. Alright, the next two are kinda hypotheticals. So, if a baby is born on the moon village what would govern the jurisdiction of family or juvenile law of the child and are there any proposed rules that protect the child from improper use of his or her image as a moon baby?

Chris Johnson [1:42:41] I love a good hypothetical. Essentially that individual born would be born in a habit, let's say it's born, you know, habitat which is also a space object which was launched from a country on Earth. It would be inside the space object and under the jurisdiction of whoever registers that space objects. However, what if that individual was born in the habitat was which was constructed purely out of lunar material. Where's the jurisdictional links by a state back here on Earth? Would they inherit the citizenship of their parents? What if those parents go to the Moon? This is fifty to sixty years from now. Individuals go to the Moon and renounce citizenship and there are less . . .

Jeff Murphy [1:43:26] That was actually the next question.

Chris Johnson [1:43:29] Yeah, there are a possibility for lesson links to jurisdictions here on Earth. There's a lot of science fiction aspects of it but as I tell students that want to write papers about the creation of new states in space, there's plenty of international law scholarship on the creation and recognition of new states. There's plenty of international scholarship about stateless persons and you merely have to find where it is elsewhere in international law and make a convincing argument for the analysis of those of those general principles transposed into the space domain.

Steven Mirmina [1:44:12] I think that if you came back to the U.S. and he was encountered by ice immigration and customs enforcement that they would consider him an illegal alien.

>>>>>>>>>>>>>>>>>>>> Audience Laughing <<<<<<<<<<<<<<<<<<<<

Jeff Murphy [1:44:27] Okay, will the law on Mars need any sort of transformation or deviation from what you guys would perceive to be the foundation of law for the Moon?

Chris Johnson [1:44:43] I mean, I'd say something what we've seen. If you look at the Outer Space Treaty, which we got through almost all of it today - Looking at it as a treaty of general principles applicable to

space activities. When I look to the answer, or when I asked the question is removal space debris legal or illegal? Show me the provision that makes it legal. There's all these activities in space that are coming online. Removal of space debris, manufacturing in space, satellite servicing, use of resources in space, commercial space stations that the law is simply not clear. So, we'll have these general principles that are generally applicable, and you've also seen that the Outer Space Treaty was followed by some additional treaties. The Astronaut Agreement expands on Article V of the Outer Space Treaty. The Liability Convention expands on Article VI and VII. The Registration expands on Article VIII. There's nothing that expands on Article IX and what we'll need new instruments for this because it is so speculative, some of these things

Michelle Hanlon [1:45:51] I was just going to add that Mars is really far away and so you know on the Moon we do have a nominal sense of enforcement. We have the lunar reconnaissance orbit, and we can get to the Moon in a matter of days. A lot of things can happen on Mars that we won't even know about with the twenty (20) minute lag and then to be able to do something about it is years. So, it's vitally important that we get these laws in place now. This customary law so hopefully it will carry over because we're not going to be able to do anything to enforce anything on Mars.

Dennis O'Brien [1:46:27] A couple things. One, this falls into the category of adaptive governance that we talked about before that we really don't make the rules until the rules are needed because at that point we'll know more about technology, our own morality, all those types of things, how business works in space. So, one of those questions about how Mars is going to be put off, however, there is one that may actually be right now, and that is terraforming because a lot of people are making their business decision or even personal life decision on whether or not they can terraform Mars when they get there. Now, I believe the Outer Space Treaty has a provision in it that says we shouldn't alter the natural environment of another planetary body and certainly terraforming is altering the natural environment of Mars. I mean maybe to a human's benefit, but it is altering and so we come up to the questions who gets to decide that? Should all of humanity? Should all of humanities through some process make that decision? Should the settlers who go there who let's say far enough in the future become autonomous or independent should say make those decisions? I've heard it argued very strongly on both sides. How dare you Earth tell us what to do, or vice versa, how dare you rebels tear up this

planet. Let's preserve it. So, it's a very difficult one but on that particular issue it is right. We should pay attention to it.

Jessy Kate Schingler [1:48:03] I was gonna add . . .

Chris Johnson [1:48:07] Just to say we talk about this earlier the use of I would say science fiction to flush out some of these scenarios. What springs to mind is both the Moon is a harsh mistress and then red moon by Kim Stanley Robinson both have use of semi-autonomous lunar installations.

Jessy Kate Schingler [1:48:26] Right and The Dispossessed.

Chris Johnson [1:48:27] What is that? Dispossessed?

Jessy Kate Schingler [1:48:27] The Dispossessed, the Ursula Laguin. It's another book. Just one last thing on the laws for Mars and thinking about the time delay. I find an interesting question to be how if we want to have institutions that are shared between Earth-Moon system and Earth-Moon- Mars system, when you have a time delay, is however many minutes twenty (20) minutes, you know, if a law is passed in one of these plants and it takes some time for that information to propagate to the other location and so there's an ambiguity I mean it sounds sort of an extreme case but maybe not if you have automated robots that are undertaking actions before they know that the law has changed in one area of the jurisdiction and it hasn't propagated to the others. So, how do you ensure you have sort of consistent institutions? Presumably will eventually be a relevant question.

Jeff Murphy [1:49:32] Thank you. I'm gonna do two more and then we'll close out with the editors of Global Business Law Review. So what can states, like Ohio, do to promote the space industry? Is there something on the state level that would clear a path. I don't know that we have any of our . . .

Michelle Hanlon [1:49:55] So we're actually working in Mississippi in creating a space sector or using the economic development council and so there are all sorts of, you know you can think about tax breaks you can think about other sort of monetary incentives to bring space here. One thing I'll share is that we are thinking of creating a clinic for space startups and so they would get advice for free. So, they would come to us in Oxford. We would give them free advice and they would stay in Mississippi because once you stay there you don't leave. Obviously, you know, we have Stennis in Mississippi, but there's so many resources here in Ohio. The key is to draw the people here away from the

money in Silicon Valley or whatsoever and one way to do that is with excellent legal advice, especially if it's pro bono.

Chris Johnson [1:50:49] I especially like that idea of clinics and helping people start their businesses because so I work at an NGO people come to me for free legal advice and how to make their startup take like to be successful all the time. And it is a process of education to say like okay you're gonna need a lawyer. You actually going to need many lawyers. No single lawyer can solve all those problems for you. Sorry for the bad news but that's the reality if you don't have a regulatory compliance plan as part of your business plan, then you don't have a good business plan. So, you know, there are many engineers who are coming up with amazing ideas. Some of them have a business, but all of them need guidance and counseling about the legal context and consequences of their actions. So, the clinic idea is great.

Jeff Murphy [1:51:44] If I could follow up Michelle, is there any kind of state money that goes towards that clinic? Are you soliciting the legislature for something like that?

Michelle Hanlon [1:51:44] We are, yeah.

Jeff Murphy [1:51:57] Okay, and then the last question: how difficult is it to obtain financing for private or commercial activity on the Moon?

Michelle Hanlon [1:51:08] So that's what that's one of the reasons we are here talking right because one of the things investors are looking for is our answers and they take away as much of the risk as possible, and so one of the biggest risks we're dealing with with respect to mining the Moon or creating a community on the Moon is what are the laws and regulations that are gonna apply? And so again, it's to the point that we've been making all day. We want regulations. We don't want to burdensome regulations, but we wanna know what's gonna happen when we get there. So I think that is a fundamental need for anybody going to space, is that you want transparent and clear laws so that you can go to your investors and say I know this is what's gonna happen and I know this is how I'm gonna make the money off of it and we don't have that yet.

Jessy-Kate Schingler [1:52:57] I might just add that as you would expect, it's a lot harder to raise money for a lunar venture then building an app. And so, it's not that the regulatory regime and the legal regime that we have certainly brings us you know the confidence that it brings can improve one's chances, but the other element that I think is really important is that there's just kinda nothing there right now and so it's hard to go and have a customer or you know

offer a service to someone or even know how to do something together. If you want to say, invest in a power infrastructure. You know, all of that requires some amount of coordination and it doesn't have to be an international treaty but it does require understanding norms of physical interaction, technical standards, and all of these things can also accelerate activity and it's not just about the confidence for external investors but it's also about the confidence of having something to do there and cooperating and working together on the lunar surface, I think, will really help that but this goes to that as well.

Jeff Murphy [1:54:09] Thank you panelists. You guys were awesome. I guess you can take your leave and we'll invite our final speakers.

Mark Sundahl [1:54:40] Yes, we reached a final part of the program. Thank you again to all the fine panelists. At this point, I would like to introduce Mr. Joseph Nelson, who is the Editor-in-Chief of the Global Business Law Review, which was a co-sponsor of this event and we work hard to help make it the success that I feel it was. So, Joseph thank you very much. Would you like to say a few words?

Joseph Nelson [1:55:12] So I would just like to thank everybody who came here and supported us and showed up here. It's been a long day been here since nine a.m. Thank you for sticking around and this is one of the most novel areas of the law and it has been a pleasure to work with Professor Sundahl and Kristina Schiavone. She is one of our editors and a member of the Global Space Law Center. So thank you, especially thank you guys and thank you for our sponsors SpaceX and Open Lunar for making this possible. So thank you I hope that you stick around for the cocktail hour after this so Kristina if you want to say something?

Mark Sundahl [1:55:58] Now I'd like to shine a spotlight on Kristina Schiavone. She made all of this possible. She did more work than I did. I felt like she really carried the heavy load in putting this together and I just want to thank you for that. You did an excellent job, and you did it all with the grace that really inspires me. So, good work. Please everyone join me in giving Kristina a hand! (hearty applause follows)

Kristina Schiavone [1:56:53] Thank you again. I apologize for the chill in the air today it's not normally like this. So, if you think about coming back to Cleveland-Marshall for another symposium don't let the cold scare you off.

Thank you again and I want to reiterate what Joseph side about our sponsors. This wouldn't have been possible without you, so thank you very much. Thank you to our speakers for traveling in. I'm so glad we made it possible. I hope you enjoyed Cleveland while you were here, and I hope [our discussions] today shed a little bit more light on various topics of space law and that you walk away having learned something new. [A special thank you to Professor Sundahl for his endless guidance to the Global Space Law Research Council in navigating this new field of law and for his tireless efforts in putting this symposium together].

Mark Sundahl [1:57:50]

Thank you, Kristina, and to show my appreciation in the Global Space Law Center 's appreciation to Kristina for her work and to J.J. as well, I'm going to have a flyer signed by all of the speakers and framed for you guys. I should have that delivered to you guys during the reception. I really have nothing more to add. That was beautifully said, both of you. So just thank you Open Lunar and thank you (in absentia) SpaceX. But really a big thank you for the speakers that came out here, who braved the big bad world that we have to contend with right now. So, I really do appreciate you guys. I couldn't blame you if you'd all had canceled, but you didn't. You came and we did this. Thank you especially to everyone in the audience who came and stuck it out for the entire day. It would not have been the same without you. So, thank you all for coming and please join me for the reception!