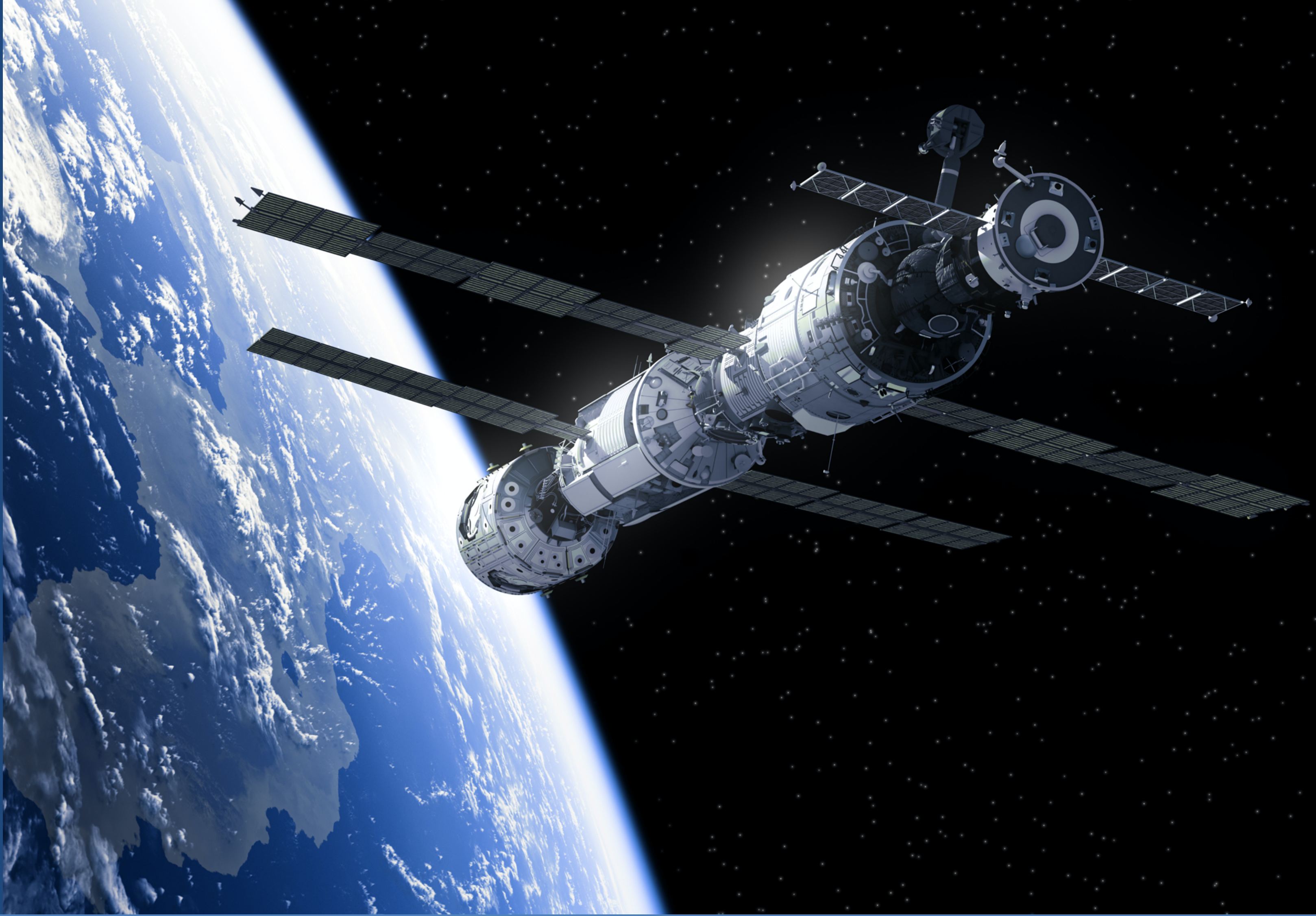

Special Political and Decolonization Committee (SPECPOL)

MUNUC 34

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CHAIR LETTER

Welcome to the SPECPOL!

My name is Alexander Vinarov and alongside Dan Qi, I'll be one of your Chairs for this committee at MUNUC 34! I'm a fourth-year in the College, majoring in Environmental Science and minoring in French. On campus, I am also a Chair of a committee for our college conference, ChoMUN, the co-President of the Club Tennis Team, and a Class Representative on College Council. I am excited to be here with you all to discover such interesting topics!

With respect to topic A, the exploration of outer space has captivated humanity for generations, and especially in the twenty-first century, it is important to provide structure to preserve outer space as a domain for all, since both private companies and government agencies are involved in developing new technologies and exploring our solar system and beyond. Delegates will have the opportunity to come up with innovative and comprehensive solutions to the problems that are arising in this topic area. On topic B, the rare earth mineral trade is one of vital importance to the functioning of the entire world economy. Yet, while rare earth minerals are universally used, they are currently only found in economically extractable quantities in a few countries and are often extracted in ways that negatively impact the environment and human rights. In this committee, delegates will be tasked with ensuring that there will be an affordable, reliable, and sustainable use of these finite resources for years to come.

I sincerely look forward to addressing these topics with all of you at conference. If you have any questions at all, whether they be about procedural matters on the committee and the expectations for it or substantive questions about the content of this background guide and committee, please email me at avinarov@uchicago.edu. Once again, I can't wait to meet you all and simulate the Special Political and Decolonization Committee.

Yours truly,

Alexander Vinarov

Dear Delegates,

My name is Dan Qi and I am a fourth-year undergraduate student at the University of Chicago, studying Economics and Data Science. I will be serving as one of your Chairs during this conference and am beyond excited to work with you. I have been participating in Model United Nations since middle school, and previously served as the Chief Financial Officer of MUNUC 33. Outside of MUNUC, I am involved with a finance club on campus and help lead the UChicago Men's Volleyball Club Team.

When I'm not involved on campus at UChicago, I love to bake with my upstairs neighbor. Just recently, I lent him a cup of brown sugar and we baked cookies together. They were delicious!

I'm thrilled about the topics that Alex and I have in store for you. Space travel fascinates me, as I've thought about starting a new life on Mars for many years. Furthermore, my love of chemistry has made the rare earth mineral trade incredibly exciting—its importance to our economy compounds that interest (remember I also study economics)!

If you have any questions, feel free to email me at any time at danqi@uchicago.edu. Good luck and looking forward to seeing you all at the conference!

Sincerely,

Dan Qi

TOPIC A: EXPLORATION OF OUTER SPACE

Statement of the Problem

Introduction

Since the beginning of time, humans have turned toward the sky in awe of its beauty and vastness. The first space adventure launched on October 4th, 1957, when the Union of Soviet Socialist Republics (U.S.S.R.) first launched Sputnik, the first artificial satellite to orbit Earth.[1] These first moments of space exploration occurred during the Cold War, a period of heightened political hostility between the Soviet Union and the United States. Since then, there has been a burgeoning of space exploration as humanity has been able to walk on the moon, conduct research in outer space, and push the confines of our solar system. The capability for space exploration has never been more present than today, as countless countries can explore space.

Space exploration is currently being approached in two main ways: through national and international space agencies, such as NASA, and through collective international efforts such as the International Space Station and privately funded space programs. Collective international efforts are the largest players in space exploration as they represent prominent state actors with large amounts of military and scientific funding. However, in every new frontier, there are commercial partnerships that seek to create innovation and move industries forward. For example, World War I spurred the modern age of powered flight by a combination of private companies and government-funding.[2] Recently, privately funded space exploration companies like SpaceX have seen success in launching private, crewed missions to space.[3] Inspiration4, SpaceX's mission, marks the latest private venture into space as SpaceX is looking to normalize space travel for all individuals, not just for government-funded scientists. Another key space venture is Blue Origin, which is looking to team up with Sierra Space, Boeing, and a few other companies to launch a commercial space station that could help to

[1] Wilkinson, Freddie. 2020. "The History of Space Exploration." National Geographic Society. https://www.nationalgeographic.org/article/history-space-exploration/.
[2] "A Brief History of the FAA | Federal Aviation Administration." n.d. FAA. Accessed 2021. https://www.faa.gov/about/history/brief_history/.
[3] Roulette, Joey. 2021. "SpaceX launches its first private crewed mission to space." The Verge. https://www.theverge.com/2021/9/15/22675793/spacex-inspiration4-launch-first-all-civilian-private-crew.

replace the International Space Station.[4] Simply put, the private space exploration industry is less constrained by politics and can take on risks where national space programs are unwilling. For example, Virgin Galactic has been able to overcome extensive delays, testing setbacks, and a fatal test flight accident in 2014, to deliver a suborbital vehicle that makes space travel viable on a regular basis.[5] Given the tremendous opportunity that space exploration provides, the committee must consider both the present climate of space exploration and the future of space governance. Currently, the United Nations recognizes that space activities can be beneficial to all nations and thus any country is free to explore space.[6] A critical issue that this body must address is the ability of the United Nations to maintain equal opportunity in space for all countries.

Existing Space Law

Space law can be described as the set of rules, principles, and standards of international law that appear in the five international treaties and five sets of principles governing outer space as developed by the United Nations. The framework of space law focuses on a variety of issues ranging from the preservation of space, liability for damages caused by space debris, rescue of astronauts, and the use of space-related technologies. The current legal framework was established in 1967, and it is primarily concerned with prohibiting the placement of nuclear weapons or any other kinds of weapons of mass destruction in outer space as well as establishing the principles related to the peaceful use of outer space.[7] At the core of all existing UN frameworks for space law is the ability to "conduct space activities, including the notion of space as the province of all humankind, the freedom of exploration and use of outer space by all states without discrimination, and the principle of non-appropriation of outer space."[8] As such, the existing framework for outer space as designed by the UN ensures that outer space remains a resource for every human and every country.

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[4] "Blue Origin: Jeff Bezos unveils plans for 'space business park.'" 2021. BBC. https://www.bbc.com/news/world-us-canada-59046076.
[5] Foust, Jeff. 2020. "Virgin Galactic, still awaiting liftoff, spreads its wings." The Space Review. https://www.thespacereview.com/article/4004/1.
[6] "International Space Law." n.d. Space Foundation. https://www.spacefoundation.org/space_brief/international-space-law/.
[7] "Outer Space – UNODA." n.d. the United Nations. Accessed 2021. https://www.un.org/disarmament/topics/outerspace/.
[8] "Our Work Space Law." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html.

Moreover, this policy framework prevents any country from claiming property in outer space as its own sovereign territory.

In addition to the international frameworks of space law, nations have developed national regulatory frameworks to govern space-related activities as the privatization of space has rapidly increased. States have enacted national space legislation that ranges from covering the launch of objects into and their return from space, operation, and control of space objects in orbit, and the application of space science and technology. National space law is critical toward regulating the increasing participation of non-governmental or private entities in space exploration.[9] However, one important factor that this committee must consider is that these national laws do not always align well with international laws, despite the supremacy of international space law over national legislation. Ensuring that international agreements work in conjunction with national policies and frameworks will be a critical responsibility for this committee.

Space Objects and Space Debris

When the initial framework for space law was formed, national government bodies were the key players in the exploration of outer space, with the United States National Aeronautics and Space Administration (NASA) and the U.S.S.R Soviet space program as the two major players. As both space exploration programs had a heavy focus on the military application of space, the initial framework developed by the UN served to address any military or political issues relating to space. However, the existing legal framework developed by the UN is far too rigid; it cannot evolve in its current state to dictate how things like the increasing privatization of space should be handled. For example, one of the adopted UN treaties, the Registration Convention on Objects Launched into Outer Space, was adopted in 1976 and requires all parties that abide by the Convention "to establish their own national registries and provide information on their space objects."[10] As such, there is no singular definition for these "space objects," leading to a variety of interpretations.

[9] "Space Law: National Space Law Database." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw.html.
[10] "United Nations Register of Objects Launched into Outer Space." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/spaceobjectregister/index.html.

Furthermore, this legal framework was intended to focus on satellites that were launched by national governments. However, due to the continued growth of the private space industry, we have seen significant development in commercial satellites that can be sold to individuals and companies. From this current legal framework, though, there is no way to transfer the registration of the space object at a commercial level. As a result, the new owners of these commercial satellites bear no responsibility for any damages or harm that the satellites may cause, as there is no way to transfer the registration of the object. Determining liability in the private sector for space-related injuries is a critical question with which this committee must grapple. The key component task from the question is finding ways to streamline reporting of information to the UN about various space launches and exploration.

Having the location and origin of every object launched into space is an important tool for the UN as it allows for various space programs to avoid accidents and to identify potentially dangerous objects in space. As a result of the previously mentioned Convention on Registration of Objects Launched into Outer Space, 88% of all satellites, probes, landers, crewed spacecraft, and space station flight elements launched into orbit or beyond have been registered with the UN.[11] However, one of the problems with this registry is that it does not account for the many other objects in space such as space debris. Space debris, or "space junk," can be defined as "both meteoroid and artificial (human-made) orbital debris."[12] There are currently more than 27,000 pieces of space debris that orbit at extremely high speeds (approximately 15,700 mph), and even a tiny collision between a piece of space debris and a spacecraft could create catastrophic problems. Space debris poses a rising danger to all space vehicles that must be dealt with.

Space debris has already posed significant threats. Toward the end of the twentieth century, a French spy satellite called Cerise crashed and became the first confirmed case of accidental collision between two objects in space. The satellite collided with debris from a French rocket that was launched a decade earlier.[13] Furthermore, in 2009, an inactive Russian communications satellite collided with a functioning U.S. Iridium commercial spacecraft. The collision produced almost 2,000

[11] Ibid.
[12] "Space Station Space Debris and Human Spacecraft." 2021. NASA. https://www.nasa.gov/mission_pages/station/news/orbital_debris.html.
[13] Ward, Mark. 1996. "Satellite injured in space wreck." New Scientist. https://www.newscientist.com/article/mg15120440-400-satellite-injured-in-space-wreck/.

pieces of debris and was the first-ever collision between two satellites in orbit.[14] Furthermore, the creation of space debris is an ever-growing problem as seen by China's 2007 anti-satellite test, in which a missile was used to destroy an old weather satellite, creating more than 3,500 pieces of space debris.[15] A critical determination this committee must make is what defines a space object. Until that is done, no other actions concerning space debris can have effect, since there would still be loopholes around what is a space object.[16] These loopholes allow countries and companies to abandon space objects, but it is unclear whether or not these space objects can be abandoned or considered abandoned, as a result of their functional status.

There have been studies on active debris removal to try to reverse the growth of space debris, but this solution is both costly and inefficient, as new debris would be created by the spacecraft that launch to collect other debris. Once again, a main issue is the permanent ownership of objects launched into outer space.[17] This committee should look to address the framework surrounding the concept of "space object" and address the growing issue of space debris through a combination of tracking, preventing, and removing space debris to ensure that space remains accessible for all of humanity.

Militarization of Outer Space

Under current provisions, the UN has prohibited both the placement of nuclear weapons (or any other weapons of mass destruction) in outer space and the stationing of potential weapons on celestial bodies.[18] The first instances of weaponized space were astronauts bringing firearms into space as a form of protection.[19] The militarization of outer space can be defined as the placement of any military weapons or military infrastructure into space. Therefore, while bringing these firearms

[14] Weeden, Brian. n.d. "2009 Iridium-Cosmos Collision Fact Sheet." Secure World Foundation. Accessed 2021. https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf.
[15] "Space Station Space Debris and Human Spacecraft." 2021. NASA. https://www.nasa.gov/mission_pages/station/news/orbital_debris.html.
[16] "Space debris conundrum for international law makers - Room: The Space Journal." n.d. Room, The Space Journal. Accessed 2021. https://room.eu.com/article/space-debris-conundrum-for-international-law-makers.
[17] Robinson, Tim. 2014. Space debris: The legal issues. https://www.aerosociety.com/news/space-debris-the-legal-issues/.
[18] "Outer Space – UNODA." n.d. the United Nations. Accessed 2021. https://www.un.org/disarmament/topics/outerspace/.
[19] Janelle, Chantelle. 2008. "International Space Station astronauts have access to a gun." WIS-TV. https://www.wistv.com/story/7875955/international-space-station-astronauts-have-access-to-a-gun/.

into space clearly weaponizes space, does any technology that helps military operations on the ground constitute militarization? It is also important to note that many nations do not separate their civilian and military space programs.[20] As such, it is difficult to determine the differences between civilian and military space capabilities as many space exploration programs remain intertwined with military operations. For example, Global Positioning System (GPS) is a space-based radionavigation system that is operated by a network of satellites developed as a military technology to help the military in combat.[21] Should this type of technology constitute militarization of space? Currently, as seen under the Outer Space Treaty, such satellites do not constitute militarization, nor do they violate the treaty that governs outer space.

As more nations develop the ability to place humans into orbit and to carry heavy payloads into space, there are more opportunities to militarize and dominate space. A key part of the problem that lies within the current framework is the legal understanding of what a space weapon is. For example, the aforementioned collision between the Iridum satellite and the Russian satellite demonstrates that even non-functioning space junk can act as a weapon, as it has the capability to destroy another satellite. A further complication arose in 2007 when China gained the ability to destroy satellites in low Earth orbits (LEOs), a region of space that contains military and communication satellites. This shouldn't be possible since under the Outer Space Treaty, the placement of weapons of mass destruction is banned in outer space. However, since ballistic missiles, or anti-satellite (ASAT) weapons, which are used to destroy satellites, are not weapons of mass destruction, they are technically allowed under the treaty. Satellite-destroying missiles are a clear technological development that has not only weaponized space, but in many ways has confirmed that space is already a militarized zone. There are currently no international restrictions on the testing or use of military systems intended to destroy satellites.[22] ASAT weapons could therefore significantly increase the cost of using space and could hinder the use of regions of space as more space debris is created because of ASAT weapons.

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[20] Erwin, Sandra. 2021. "Analysts: China's space programs are a security concern to the US but not all are nefarious." SpaceNews. https://spacenews.com/analysts-chinas-space-programs-are-a-security-concern-to-the-u-s-but-not-all-are-nefarious/.
[21] "What is GPS?" 2019. NASA. https://www.nasa.gov/directorates/heo/scan/communications/policy/what_is_gps.
[22] "Space Debris from Anti-Satellite Weapons." n.d. Union of Concerned Scientists. Accessed 2021. https://www.ucsusa.org/sites/default/files/2019-09/debris-in-brief-factsheet.pdf.

Everything from small pieces of space debris, to satellites, to spacecraft could be considered a projectile weapon in space. It is extremely difficult to think about the militarization of space as nearly every object launched into space could become a weapon, and thus enacting a blanket ban on any object that could be a projectile from space is unrealistic. The committee should focus instead on what can be used to militarize space or the potential infrastructure that is needed for these space weapons to operate. It is critically important that this committee discuss the definitions and contexts that precisely constitute the militarization of space. Moreover, it is critical that any resolution works to prevent the further militarization of space, demilitarize it if possible, and search to create a singular definition for the militarization of space.

History of the Problem

Introduction

At the end of World War II, the two clear political superpowers were the United States and the Soviet Union. These two hegemonies had an ideological rivalry of communism versus capitalism, but feared direct conflict with each other.[23] This resulted in the Cold War, which featured a variety of proxy wars and advances in technology. For example, the United States first used atomic weapons in 1945, in an attempt to expedite the end of World War II. In response, the Soviet Union tested its first atomic weapon in 1949, far earlier than many experts had expected. With this, the nuclear arms race between the United States and the Soviet Union had begun.[24] Both countries adopted a policy of nuclear deterrence, in which the threat of a massive retaliation prevented a nuclear attack by an enemy. The missile-based nuclear arms race between the United States and the Soviet Union foreshadowed the start of the space race, another rivalry driven by displays of technological strength.

Space Race

On October 4th, 1957 the Soviet Union launched Sputnik – the first artificial satellite to orbit Earth.[25] Realizing that the Soviet Union had capabilities that exceeded the U.S., this further fueled tensions between the world's two greatest powers. In response to the launch of Sputnik, the U.S. quickly added additional resources and funding into a national space program in the hopes of catching up to and eventually exceeding the Soviet Union space program. However, the U.S. would not be able to launch its first satellite into orbit until January 31st, 1958.[26] Soon thereafter, the first human in space was the Soviet cosmonaut Yuri Gagarin, who made one orbit around Earth on April 12th, 1961. A little more than three weeks later, the U.S space agency otherwise known as NASA launched astronaut Alan Shepard into a suborbital flight. Despite lagging in the initial milestones, in 1969 the United

[23] "The Soviet-American Arms Race." n.d. History Today. Accessed 2021. https://www.historytoday.com/archive/soviet-american-arms-race.
[24] Ibid.
[25] Wilkinson, Freddie. 2020. "The History of Space Exploration." National Geographic Society. https://www.nationalgeographic.org/article/history-space-exploration/.
[26] ibid

States claimed victory in the space race, when NASA had successfully sent humans to the moon and back with Project Apollo.[27]

Many of the technologies that were used to launch humans into space were previously developed by the military. For example, the chief designer of the satellite used by the Soviet Union to launch Yuri Gagarian into space was developed with intercontinental missile and spy satellite technology.[28] Satellites in space could give an espionage advantage, and weapons situated in space could theoretically attack any area of the world. As such, a primary driver of the early space race had been gaining a military advantage.

Following the end of the space race, there were several other achievements that furthered the exploration of space. In 1971, the Soviet Union launched into orbit Salyut, the world's first space station.[29] The Voyager mission was launched in 1977 to study the planets of the solar system. Around this time, the Apollo-Soyuz Test Project was created as the first international partnership in space. On July 15th, 1975, an Apollo spacecraft was launched carrying three Americans and two Soviets, in a test for the compatibility of rendezvous and docking systems. The success of this project paved the way for future international partnerships, such as the Shuttle–Mir program in 1993.[30] After the collapse of the Soviet Union, cooperation in space persevered over national rivalries. Dozens of countries have sent satellites and citizens to space, often utilizing the resources of many nations. National space agencies often collaborate with each other, resulting in projects such as the International Space Station.

Development of Space Law

Space law is based upon a series of international treaties, agreements, and UN resolutions that govern the use and exploration of outer space. In 1958, shortly after the launching of the first artificial satellite, the United Nations General Assembly established the Committee on Peaceful Uses

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[27] ibid
[28] McKie, Robin. 2011. "Sergei Korolev: the rocket genius behind Yuri Gagarin." The Guardian. https://www.theguardian.com/science/2011/mar/13/yuri-gagarin-first-space-korolev.
[29] "50 Years Ago: Launch of Salyut, the World's First Space Station." 2021. NASA. https://www.nasa.gov/feature/50-years-ago-launch-of-salyut-the-world-s-first-space-station/.
[30] "Apollo-Soyuz Test Project Overview." 2017. NASA. https://www.nasa.gov/apollo-soyuz/overview.

of Outer Space (COPOUS) to "consider the activities and resources of the United Nations, the specialized agencies and other international bodies relating to the peaceful uses of outer space."[31] Since 1959, COPOUS has maintained close contacts with governmental and non-governmental organizations concerned with the exploration of outer space.

In 1960, President Eisenhower gave a speech at the UN which formally launched efforts to create an international space treaty. Seven years later, the international community adopted the Space Treaty of 1967 also known as the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies."[32] Although the United Nations has produced many resolutions involving space law, few of these resolutions had a sizable effect, as some critical resolutions were not actually ratified by countries capable of reaching space.

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[31] "COPUOS History." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/copuos/history.html.
[32] "Space Law Bibliography." 2020. NASA. https://www.nasa.gov/centers/hq/library/find/bibliographies/space_law.

Past Actions

Developments in the United Nations

Efforts in the United Nations to maintain space for the peaceful use and exploration began in 1957, months prior to the launch of Sputnik. As the Cold War progressed, early proposals on regulating the exploration of outer space were focused on prohibiting the use of space for military purposes. By the late 1950s the United Nations was focused on regulating the placement of weapons of mass destruction in outer space.[33] Shortly after the launch of Sputnik, the General Assembly of the United Nations adopted resolution 1348, which established an ad hoc Committee on the Peaceful Uses of Outer Space (COPOUS), composed of 18 members. In 1959, the General Assembly established COPOUS as a permanent body with 24 members. COPOUS is a unique body in that there is no voting, instead, decisions are taken by unanimous consensus.[34] Since the establishment of COPOUS it has become one of the larger committees in the UN and has been serving as a focal point for international cooperation in the peaceful exploration and use of outer space.

The United Nations Office for Outer Space Affairs (UNOOSA) was initially created as an expert unit within COPOUS. Currently, it is a part of the UN Secretariat, implementing the decisions of the General Assembly and COPOUS.[35] The Office has also assumed responsibility for supporting intergovernmental discussions in the Legal Subcommittee, as well as continuing to assist developing nations in improving their space exploration programs. The bulk of the past action of space law is contained within the five treaties and the adoption of a set of principles that govern the exploration of outer space.

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[33] "Outer Space – UNODA." n.d. the United Nations. Accessed 2021. https://www.un.org/disarmament/topics/outerspace/.
[34] "COPUOS." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/copuos/index.html.
[35] "History." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/aboutus/history/index.html.

The Five Treaties

There are five treaties of the United Nations that combine to form a comprehensive set of treaties:

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty)

2. Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space (Rescue Agreement)

3. Convention on International Liability for Damage Caused by Space Objects (Liability Convention)

4. Convention on Registration of Objects Launched into Outer Space (Registration Convention)

5. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)[36]

The Outer Space Treaty was passed in 1967 to ensure that the competitiveness of the space race did not affect the militarization or peaceful use of outer space. The treaty was largely based upon the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, which was a slightly less comprehensive version of the document adopted in 1963. The Outer Space Treaty provides the basic framework on international space law, including a strong focus on the peaceful use of outer space by all nations. Furthermore, under the Outer Space Treaty, no State can lay claim to space or equip space with any weapons of mass destruction. The Outer Space Treaty also governs that "States shall be responsible for national space activities whether carried out by governmental or non-governmental entities"[37] In other words, even if a corporation or private entity travels into space, its host nation would be responsible or liable for any detrimental actions. With the ever-growing presence of private corporations venturing into space exploration, this committee should explore whether this statement should be adjusted to address the new space age of private

[36]"Space Law Treaties and Principles." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.
[37] Ibid.

space travel. The agreement also states that no state should contribute to the harmful contamination of space.[38] Clearly, this provision needs greater enforcement, as seen by the continued growth of space debris containing outer space and threatening the peaceful use and exploration of outer space.

After the Outer Space Treaty was created, the UN adopted the Rescue Agreement, which focuses specifically on the international cooperation of rescuing astronauts in space. The agreement ensures that all "States should take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State". As more and more nations enter space, the provisions of this agreement will become even more important as more and more individuals will be traveling into space.[39] In regard to the provision stating that States shall return space objects back to the original launch state, there could be discussions surrounding violations of sovereignty particularly if such objects were being used in a clandestine or malicious manner.

The Liability Convention was reached in 1971 and ensured that States are liable to pay compensation for damage caused by its space objects on the surface of the Earth and liable for damage due to its faults in space.[40] Once again, with the recent developments of private space exploration, delegates should reconsider how to hold all entities accountable for their actions in space.

The Registration Convention was established in 1974 and ensured that a registry of space objects was to be maintained by the Secretary General. This is an international list that is intended to be composed of all objects sent into space. It further allows for all states to access information on where objects are so that countries can enter space safely.[41] However, many states do not report all space objects, and therefore this list is not holistic.

[38] "The Outer Space Treaty." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html.
[39] "Rescue Agreement." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html.
[40] "Liability Convention." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html.
[41] "Registration Convention." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html.

Lastly, the Moon Agreement, adopted in 1979, reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies. The Moon and other celestial bodies should be used exclusively for peaceful purposes and require the registration of any base of object placed on one of these bodies. In addition, this agreement also serves to protect the natural resources from outer space, stating that an international regime should be established to govern the use of such resources.[42]

The Five Principles

In addition to the treaties adopted by the United Nations, five additional declarations and legal principles have been adopted since 1980:

1. Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (Declaration of Legal Principles)

2. The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (Broadcasting Principles)

3. The Principles Relating to Remote Sensing of the Earth from Outer Space (Remote Sensing Principles)

4. The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (Nuclear Power Sources)

5. Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries[43]

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[42]"Moon Agreement - Space Law." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html.
[43]"Space Law Treaties and Principles." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.

All these UN principles work together to form the framework for international space law. Rather than focusing on bilateral agreements, nations have been turning to the UN to solve disputes in outer space. The UN will continue to be the most important legitimate institution governing space, especially as space exploration increases. However, this committee must revisit some of these outdated documents and decide how to best move forward into this new age of space exploration.

Possible Solutions

The exploration of outer space is constantly innovating and evolving, and the role of most nations in the future of space exploration is still uncertain. The United Nations can play a critical role in shaping the peaceful exploration of outer space through international agreements that must both govern and create opportunities for space exploration. Delegates should not just advocate for their nation's interests, but also for the future interests of humanity.

Updates to Existing Framework

The first step towards establishing an ideal draft resolution is to thoroughly define the role of private, national, and international actors in space. As mentioned in previous sections, some sections of the current legal framework were established during a time when national space programs were the main drivers of space travel versus the current innovation that we see from private space travel. For example, a private bearer of a space object through the current legal framework has no responsibility for the space object. This gets further complicated as space objects are unable to be transferred to other companies or nations through registration. Therefore, new owners of space objects would not be able to claim responsibility or liability in the case of an accident. This committee must discuss and think through solutions to update and ensure that the treaties and principles are updated to include commercial objects in this age of new space exploration. The current UN legal framework for space should be used as a starting point for delegates. Delegates should comb through all relevant UN documents to decide whether additional UN legislation is needed to create brand new legislation, expand existing laws, or scrap existing treaties.

Enforcement and Future Legislation

The UN is limited in its enforcement abilities as outer space is a relatively new field. Because of this constraint, the committee might want to consider creating a new measure of possible enforcement for its policies. For example, sanctions and reduced funding are both aggressive penalties that could be recommended to the United Nations Security Council to ensure that nations adhere to UN space policies.

This committee should focus on how to maintain the peaceful use of outer space by addressing potential military threats in space, the increase of space debris, the lack of accountability for private actors, the scarcity of viable orbit paths, and the acquisition of space resources for commercial use. Pursuing agreements that uphold the fundamental ideas will be a good starting point. But it's also important to decide how these principles will impact the future for outer space travel. A good resolution will point to new treaties or principles that need to be established as well as manners of enforcement.

Bloc Positions

Obviously, the exploration of outer space is still a relatively new field and as such many nations around the world have yet to venture into this field. It is important to understand that as we are gathered here in SPECPOL, we are here to collaborate, so do not feel constrained if your country has not had much to say historically about space exploration.

Established Space Programs and Developed Nations

Some UN member states have already experienced significant space exploration. In particular, the US and Russia have led the way in terms of innovating for the continued exploration of outer space. Other countries such as the European Space Agency members, China, India, Iran, Israel, North Korea, South Korea, Canada, South Africa, Japan to just name a few have well-funded large space programs that are involved with the International Space Station. Some of the key questions that these developed nations must answer surround the weaponization of space, particularly if one of these countries were to put weapons into outer space. Claiming property in outer space is also a major issue due to the rise of private space exploration. While nations are unable to claim land in outer space due to the current international treaties and principles, it is unclear what the regulations are for private companies.[44] Therefore, the ability to regulate space militarization, debris, and property rights are all very important issues for these developed countries.

Developing Nations

While not every nation may have a well-established national space program, it is only a matter of time when every nation joins this new age of space exploration. There are currently more than 70 nations that are involved in operating satellites which is a good benchmark of having a minimally successful space program.[45] Nations in this bloc will generally have enough presence in the modern space race as either developing a space program or plans to in the near future. As such, the focus for this bloc should be on the accessibility of space for smaller nations and an emphasis on UN aid for

[44] Mann, Adam. 2012. "Loophole Could Allow Private Land Claims on Other Worlds." WIRED. https://www.wired.com/2012/04/moon-mars-property/.
[45] Birukov, Vladimir. 2019. "How Many Countries Have Space Programs?" History and Headlines. https://www.historyandheadlines.com/how-many-countries-have-space-programs/.

space programs. Furthermore, until the gap is bridged in terms of being able to access space, this bloc tends to focus strict, enforceable regulation on countries staking claims to outer space.

Glossary

International Space Station: A space station operated by scientists from all around the globe, which is also an international resource for scientific advancement.

Satellite: Any object that has been intentionally placed into orbit

Space debris: Objects that have been discarded, lost, or sent into space and remain in orbit around the Earth. These can be as small as paint chips or as large as old satellites.

Sovereignty: The ability of a country or other entity to exercise jurisdiction over itself, or in other words to rule over itself as the ultimate authority in its territory

TOPIC B: REGULATING THE RARE EARTH MINERAL TRADE

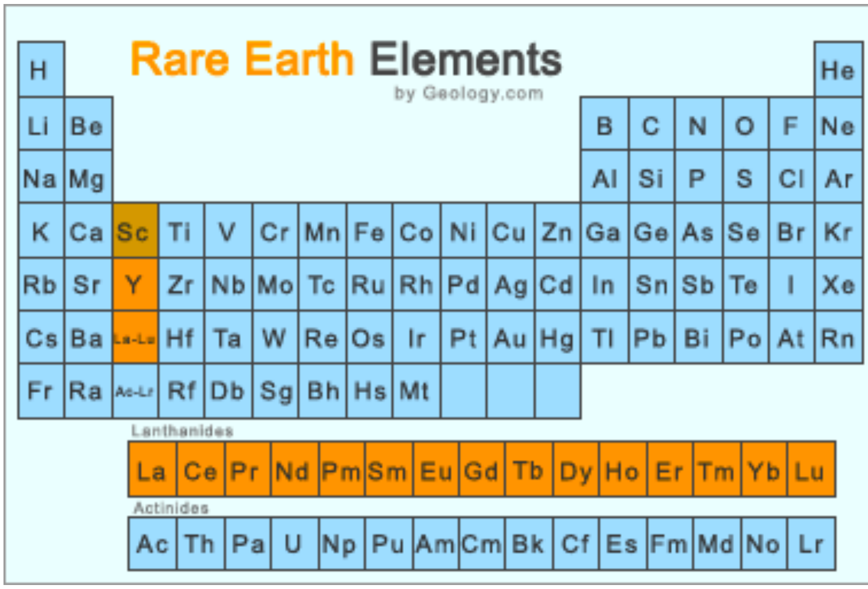
Statement of the Problem

Introduction to the Problem

Worldwide, it is impossible to overstate the importance of technology. From the largest airplane to the smallest computer chip, all technology is built upon decades of discovery and innovation. Critical to the performance of such technology are components, specifically the base materials that are extracted from the environment. Nearly everything humans interact with on a daily basis are derived from such base materials, such as wood, metal, or even water. What is often overlooked by consumers of these products is that for every device made, a resource extraction had to take place: workers had to assemble the products and they had to be disposed of in some manner after a certain period of time. Some of the parts of a product's journey over its life cycle and its components may be obvious, but some are not. One such type of resource that needs to be extracted for the creation of everyday products are rare earth minerals. Their importance is underappreciated yet paramount to the workings of modern life. Thus, it is important to first understand the role of rare earth minerals in contemporary life, recognize the machinations involved with their extraction, and realize their geopolitical significance for the near future. Only then can truly comprehensive solutions be developed to regulate rare earth mineral trade going forward.

What are Rare Earth Minerals?

To begin to understand the importance of rare earth minerals for the global economy, they need to be defined in a clear way, which will require some scientific and technical explanation. Beginning with the basics, rare earth minerals are a group of seventeen metallic elements (also known as rare earth elements/metals), found together on the periodic table. They are the fifteen lanthanide elements (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium), in addition to scandium and yttrium.[46] For easy identification they are numbers 57-71, 21, and 39 on the periodic table, respectively. All the above elements are metals and are grouped together because they have similar properties. Additionally, they are often found grouped together in **geologic deposits**. All can be found as free elements in nature except for yttrium, which can only be found in deposits combined with other rare earth elements.[47]



[48]

When thinking about rare earth minerals, it is natural to assume that they are not commonly found given the name, however this is not the case. Large quantities exist all over the world. They are typically found fairly dispersed throughout most rock types. The real reason they are deemed rare is because they are not often found grouped together in geologic deposits that contain **minable concentrations**.[49] So, often, it is not economically feasible to extract and process the rare earth minerals when they are found in nature.

This creates a question: where are rare earth minerals found? This will be delineated in terms of production and **reserves**. According to 2020 estimates, the top five producers in the world of rare

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[46] King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.

[47] "Wyoming State Geological Survey." n.d. Wyoming State Geological Survey. Accessed 2021. https://www.wsgs.wyo.gov/minerals/rare-earths.

[48] Geology.com. Rare Earth Elements. n.d. https://geology.com/articles/rare-earth-elements/#:~:text=The%20group%20consists%20of%20yttrium,%2C%20ytterbium%2C%20and%20lutetium).

[49] "Rare Earths Statistics and Information | US Geological Survey." n.d. USGS.gov. Accessed 2021. https://www.usgs.gov/centers/nmic/rare-earths-statistics-and-information.

earth minerals are China, the United States, Burma, Australia, and Madagascar. The countries with the largest estimated reserves are China, Vietnam, Brazil, Russia, and India. Furthermore, it is estimated that global rare earth mineral mine production increased by 20,000 tons from 2019 to 2020.[50] It is also important to note that some rare earth elements (REEs) are categorized as either 'light' or 'heavy' which impacts their market availability. Light REEs are generally globally available with abundant supply. These include lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium and scandium. Heavy REEs are predominantly produced solely in China and are not as abundantly available on the global market. These include terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium.[51] This distinction is key to demonstrate the differences among the rare earth minerals as well as their global trade importance.

Uses for Rare Earth Minerals

As previously mentioned, rare earth minerals are used in everyday life for the vast majority of people around the world. They play crucial roles in many industries vital to people and governments alike, including computing, clean technologies, defense, communications, and healthcare. Some of the largest uses of these minerals are permanent magnets, catalysts, and glass polishing powder.[52] As a more basic example, consider a smartphone. Permanent magnets are one of the essential factors that have allowed for the miniaturization of the smartphone. The world already relies heavily on rare earth minerals, and that dependence will only continue to grow.

Additionally, their inclusion in clean technologies and green innovations are going to be critical for the next century as the world grapples with the increasing effects of climate change. Wind turbines need rare earth minerals to be reliable and more efficient. High performance batteries need them as well, and they are in turn needed for electric cars. Light bulbs are more energy efficient when they

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[50] Gambogi, Joseph. n.d. Rare Earths. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf.
[51] Rare earth elements facts. https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/minerals-metals-facts/rare-earth-elements-facts/20522.
[52] Ibid

have rare earth minerals.[53] It is evident that in order to stave off the worst effects of climate change, rare earth minerals are essential.

Rare Earth Mineral Extraction

Given their clear importance, the method in which rare earth minerals are extracted globally must be carefully examined, as the production of these minerals will continue to increase. Often, the mines that have extracted and continue to extract these minerals suffer from human rights violations, cause deforestation, and contaminate the environment.[54] The more contemporary aspects of this will be discussed in this section, while the historical side of this subject will be explored in greater detail in the *History of the Problem* section.

From any type of mineral extraction via mining, there will be environmental impacts inherent to the process. The extraction of rare earth minerals is no different. Because they are found in geologic deposits with other elements, there is significant processing that the deposit must undergo to extract the desired minerals. This often involves purification and chemical treatments, which lead to toxic and radioactive byproducts which need to be dealt with properly.[55] To deal with these byproducts safely, there must be significant investment in these steps and the necessary environmental controls, which is not always the case. If this is not the case, or in the case of accidents (which are not completely preventable), rare earth minerals (which generally only exist in limited quantities in a given location), toxic chemicals, and radioactive waste have the potential to leak into the environment, contaminating the soil and groundwater, leading to irreparable harm to both the environment and the people that depend on it.[56]

There can also be human rights issues in the mines where rare earth minerals are extracted. Not all countries around the world have the same levels of regulation and oversight when it comes to mining practices. Additionally, many mining operations in countries with weaker government

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[53] Jones, Nicola. 2013. "A Scarcity of Rare Metals Is Hindering Green Technologies." Yale E360. https://e360.yale.edu/features/a_scarcity_of_rare_metals_is_hindering_green_technologies.
[54] Standaert, Michael. 2019. "China Wrestles with the Toxic Aftermath of Rare Earth Mining." Yale E360. https://e360.yale.edu/features/china-wrestles-with-the-toxic-aftermath-of-rare-earth-mining.
[55] "Rare Earth Elements." n.d. Massachusetts Institute of Technology. Accessed 2021. http://web.mit.edu/12.000/www/m2016/finalwebsite/elements/ree.html.
[56] n.d. MIT Technology Review. Accessed 2021. http://www.technologyreview.com.

regulations are more under the control of non-state actors (those resorting to coercion), where workers can be forced to work in unsafe conditions that violate the United Nations Declaration of Human Rights (UDHR).[57] Practices such as these harm both the environment and human lives, and do not lead to sustainable growth for this industry as a whole.

The Trade of Rare Earth Minerals

One of the remaining parts of the rare earth mineral trade that has not yet been discussed is their actual global trade. Currently, China dominates the rare earth mineral trade. However, many other countries are actively attempting to increase their domestic supply of the minerals in order to reduce their dependence on foreign countries in general. This has led to widespread geological exploration projects in countries around the world to determine their potential REE reserves. In addition, countries have begun to use the trade of rare earth minerals as a geopolitical tool to wield power and influence over other countries, by offering favorable access in some cases and cutting off access in others (this will be more thoroughly examined in the *History of the Problem* section).[58]

Current Situation

The current situation regarding rare earth minerals is fluid. They have demonstrated importance for nearly all aspects of modern life. They will grow increasingly more important with new technological advances in industry and with the growing global spectre of climate change. With the predicted increase in production, it is critical that the methods of extraction of rare earth minerals are closely examined in order to ensure that extractions can occur sustainably for the people involved and the local environment. Furthermore, because of their uses, in conjunction with their relative abundances around the world, rare earth minerals have been and will most likely continue to be used as bargaining chips for countries in trade. With the geopolitical significance of rare earth minerals in mind, there is clearly a wide swath of current and potential issues revolving around this topic. Therefore, there are exigencies that exist that call for potential solutions. This is where the delegates

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[57] "Human Rights." n.d. Massachusetts Institute of Technology. Accessed 2021. https://web.mit.edu/12.000/www/m2016/finalwebsite/problems/humanrights.html.
[58] Nobel, Carmen, Clark Merrefield, Naseem S. Miller, and Denise Ordway. n.d. The Journalist's Resource - Informing the news with research. Accessed 2021. http://journalistsresource.org/.

of this SPECPOL committee are needed. Comprehensive solutions are needed for the multifaceted issue that is the regulation of the rare earth mineral trade.

Questions to consider:

- How can the public be better educated about the growing importance of rare earth minerals?
- In what ways can countries collaborate to ensure sustainable extraction practices for rare earth minerals?
- What sorts of safeguards can be put in place to protect the human rights of those involved in the rare earth mineral trade?
- What are some best practices in other domains that could be applied to the regulation of the rare earth mineral trade?

History of the Problem

Introduction

When interacting with this topic, it is important to understand the situation from a historical perspective to both understand how it was shaped and the lessons that can be learned from it for future applications. The history of this topic is complex and there are countries that appear more frequently than others in this section. This is not to say that other countries have not and will not play a large role. Historical context regarding rare earth minerals has the potential to impact the future growth or decline of this industry for the planet and is thus must be examined closely.

History of Rare Earth Minerals

Rare earth elements were first discovered during the tail end of the scientific revolution. In 1787, Carl Axel Arrhenius discovered the element which is now called gadolinite.[59] This sparked research into the field which led to the discovery of six REEs by 1842.[60] There was then a gap of time in which none more were identified. Eventually, the technology and scientific understanding caught up and new uses were discovered for the elements. Up until the 1950s and 1960s, there was very limited commercial demand for REEs, as they were not commonly incorporated into products. That changed with the advent of the color television, which incorporated the REE europium. Before this innovation, India, Brazil, and South Africa were some of the largest producers of rare earth minerals in the world. Afterwards, the United States became the largest producer with a europium mine in Nevada.[61]

The next big shift in the production of rare earth minerals occurred in the 1980s. In the early part of that decade, China began ramping up production of REEs and became the world's leading producer by the 90s.[62] This was accomplished in two main ways. First, extraction and output was drastically increased during this period. Second, China flooded the international market with large volumes of

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[59] HOLDEN, N E. Fri . "HISTORY OF THE ORIGIN OF THE CHEMICAL ELEMENTS AND THEIR DISCOVERIES.". United States. https://www.osti.gov/servlets/purl/789650.
[60] Ibid.
[61] King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.
[62] Ibid.

REEs at low prices. This had the effect of causing mining operations in other parts of the world to close down due to the inability for them to compete economically, further cementing China's market dominance.[63] So, in the latter half of the twentieth century, the world went from rather varied production sources for rare earth minerals to relying on a very small subset of countries for their supply. Thus, in addition to what was covered in the *Statement of the Problem* regarding the growing importance of rare earth minerals, it is hopefully becoming apparent that a growing importance combined with growing monopolies on supply has the potential to lead to geopolitical tensions.

Contemporary Context

To address this topic comprehensively, recent history surrounding rare earth minerals must be discussed. So far in the twenty-first century, China is both the world's leading producer and consumer of rare earth minerals, while Japan and the United States are the next two largest consumers.[64] Clearly, there are implications for the countries who have different types of relationships with those countries previously mentioned. In 2010, China produced 97% of the world's REE supply.[65] This number decreased to 63% by 2019 for a variety of reasons, including skyrocketing prices, spurring other countries to begin their own domestic REE exploration and extraction.[66] Because of the nature of the global entanglement of alliances, it is important to note that the United States imported 80% of its rare earth minerals from China between 2016 and 2019, demonstrating the geopolitical interests involved in this trade.[67] The takeaway from this is that production and consumption of rare earth minerals are heavily skewed toward certain actors on the world stage. This can create certain predetermined impacts on the global market for these minerals. Due to its perch on the top for decades, China has amassed a monopoly complete with an economy of scale and vertical integration, making it very difficult for new entrants to break in.[68] Yet, the needle is

[63] Lu, Christina, and Kishore Mahbubani. 2021. "What Are Rare Earths, and Why Are They So Important to Geopolitics?" Foreign Policy. https://foreignpolicy.com/2021/04/22/rare-earths-china-us-greenland-geopolitics/.
[64] King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.
[65] "Rare Earth Elements." n.d. Massachusetts Institute of Technology. Accessed 2021. http://web.mit.edu/12.000/www/m2016/finalwebsite/elements/ree.html.
[66] Gambogi, Joseph. n.d. Rare Earths Data Sheet - Mineral Commodity Summaries 2020. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-rare-earths.pdf.
[67] Ibid.
[68] Lu, Christina, and Kishore Mahbubani. 2021. "What Are Rare Earths, and Why Are They So Important to Geopolitics?" Foreign Policy. https://foreignpolicy.com/2021/04/22/rare-earths-china-us-greenland-geopolitics/.

moving - in the past decade, production has been increasing in Australia, Malaysia, Russia, Thailand, and Vietnam, slowly but steadily.[69]

However, that was all in terms of production and consumption. As mentioned in the *Statement of the Problem*, rare earth mineral deposits are spread across the world, with many other countries having sizable reserves that are beginning to expand extraction. Due to the recent increase in prices, combined with the growing demand for products containing REEs, countries with proven yet relatively untapped reserves will need to have a seat at the table in order for this topic to be addressed successfully.

Historical Problems

Any type of resource extraction presents environmental issues that can have negative consequences if not handled in a responsible manner. The extraction and processing of rare earth minerals is no different. Byproducts often include heavy metal toxins and radioactive waste.[70] In countries that deal heavily in the extraction of REEs, this is evident. As the largest producer of these minerals, China presents several examples of the negative effects that are inherent to resource extraction. In the Jiangxi province of China, in Inner Mongolia, the vast majority of the country's REE extraction takes place. The Chinese government estimates that the cleanup bill for the province due to pollution from rare earth mineral production is estimated at $5.5 billion and could potentially take 50-100 years for full **remediation** to occur.[71] This is the case despite repeated efforts by the Chinese government to impose regulations on the operations in the region and clamp down on those that are illegal.

Any environmental issue can easily become a health one as well. REEs have a tendency to **bioaccumulate** in the body and can lead to negative health outcomes, such as cancer, neurological issues in children, and death.[72] These poor healthcare outcomes are acutely felt by those who live in

[69] King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.
[70] "TENORM: Rare Earths Mining Wastes | US EPA." 2021. US Environmental Protection Agency. https://www.epa.gov/radiation/tenorm-rare-earths-mining-wastes.
[71] Standaert, Michael. 2019. "China Wrestles with the Toxic Aftermath of Rare Earth Mining." Yale E360. https://e360.yale.edu/features/china-wrestles-with-the-toxic-aftermath-of-rare-earth-mining.
[72] "Health risk assessment of rare earth elements in cereals from mining area in Shandong, China." 2017. NCBI. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5575011.

an environment with chronic exposure to rare earth minerals in their surrounding environment. As an example, in Bukit Merah, Malaysia, it is suspected that a rare earth refinery in the community has led to a disproportionate increase in birth defects and leukemia, otherwise rare illnesses in the region.[73]

There are also human rights issues historically associated with rare earth mineral production. Many geologic deposits exist in remote locations, often without proper infrastructure and regulatory oversight to ensure safe production conditions for those involved in the process. Geopolitics also adds on a layer of complexity. As an example, many mining operations in the Democratic Republic of the Congo are run by violent militias, which use oppressive methods to control its production enterprise.[74] While an extreme example, many other developing countries have similar human rights problems regarding their rare earth mineral trade. Thus, it is critical to recognize the negative legacy that is oftentimes associated with the rare earth mineral trade, in order to strive for better outcomes in the future.

Rising Geopolitical Tensions

It should now be apparent that rare earth minerals are of importance to countries around the world. With the current production and consumption trends the way that they are, there are inherently countries that hold more sway over the global market for these minerals. A byproduct of this is rising geopolitical tensions. This is exacerbated by the unregulated nature of the rare earth mineral trade. A set of examples of this stem from China, which conducts a lot of trade given its position in the rare earth mineral economy. First is an example of trade **tariffs**: in 2019, China placed a 25% tariff on rare earth minerals from the US, whereas the US exempted all rare earth imports from tariffs.[75] Any sort of tariff sends out a signal to the rest of the players in the global economy that a given country is trying to protect an industry at the expense of that same industry in another country—in this case, rare earth mineral production. Second is an example of the rare earth mineral trade being used as a geopolitical weapon: in 2010, during a heightening of tensions between China and Japan, the former

[73]n.d. Bloomberg.com. Accessed 2021. https://www.bloomberg.com/news/.
[74]"Human Rights." n.d. Massachusetts Institute of Technology. Accessed 2021. https://web.mit.edu/12.000/www/m2016/finalwebsite/problems/humanrights.html.
[75]Su, Alice. 2019. "The hidden costs of China's rare-earth trade." Los Angeles Times. https://www.latimes.com/world-nation/story/2019-07-28/china-rare-earth-tech-pollution-supply-chain-trade.

blocked the exports of rare earth minerals to the latter.[76] As mentioned previously, Japan is one of the top consumers of rare earth minerals due to their domestic technology industry. Actions such as these can cripple economic sectors that rely on rare earth minerals and can cause cascading effects throughout the world economy.

Conclusion

Rare earth minerals have not had a very lively history for most of human history. But this is rapidly changing. With the rapid growth of innovation in technology, the importance of these types of minerals has grown and will continue to grow. Regardless of the historical ties countries have or do not have with them, all countries are tied to the future of rare earth minerals, as they become ever more prevalent in society. That is exactly why the delegates of SPECPOL must examine this issue. Order and regulation must be brought to the rare earth mineral trade to reduce mounting geopolitical tensions and the risk of ruinous environmental and human rights issues. In order for comprehensive solutions to be formed, historical context must be understood and heeded in order to incorporate the lessons previously learned into lasting results.

[76]Bradsher, Keith. 2010. "Amid Tension, China Blocks Vital Exports to Japan (Published 2010)." The New York Times. https://www.nytimes.com/2010/09/23/business/global/23rare.html.

Past Actions

Introduction

As this background guide has shown, the rare earth mineral trade is complex and growing in importance. For progress to occur, any regulations regarding the trade will need to be inclusive of all countries and comprehensive enough to cover diverse local environments of differing state actors. This *Past Actions and Possible Solutions* section should be used to craft such inclusive and comprehensive solutions. Using the former section, previous actions taken across the international community should be scrutinized to learn from past successes and failures. Using the latter section, potential areas for solutions should be understood and utilized as the foundations for initial debate and ideas for resolution writing. These sections will not be exhaustive, but will allow delegates to conduct their own research and build upon the ideas presented here.

International Organizations

While attention to the rare earth mineral trade is relatively new, there have not been many international past actions that have made significant impacts. However, there have been several individual cases that deserve to be highlighted, that illustrate the potential of what international cooperation can accomplish at that level.

In 2012, the United States, joined by the European Union and Japan, brought a case to the World Trade Organization (WTO)'s Dispute Settlement body against China.[77] This was in response to a drastic decrease in China's export quota of rare earth minerals. In 2010, China reduced their exports by 40%, leading to a price surge for the minerals outside of the country.[78] The U.S. argued that Chinese restrictions enacted in 2010 violated the treaty China signed when it joined the WTO in 2001. In response, China argued that its export reduction was legal as the WTO allowed countries to impose quotas for conservation as well as environmental and human safety purposes.[79] Ultimately,

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[77]"dispute settlement - the disputes - DS431." 2015. World Trade Organization. https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.
[78]n.d. CBS News - Breaking news, 24/7 live streaming news & top stories. Accessed 2021. http://www.cbsnews.com.
[79]Gavin, B. China's growing conflict with the WTO. Intereconomics 48, 254–261 (2013). https://doi.org/10.1007/s10272-013-0467-6

in 2014, the WTO ruled in favor of the United States, arguing that while the reasons China put forth were valid, the restrictions did not necessarily serve those purposes. This led to China dropping the export quotas in 2015.[80]

While this is an example of the international community coming together to use multilateral institutions to address grievances, it is important to note the timeframe of this dispute. It took five years for the entire process to become resolved, during which time much was changed in the rare earth mineral market because of the rising prices. This case should be viewed as a partial success but also as an opportunity for improvement.

Regional Organizations

Many countries have banded together on a regional basis to begin understanding and addressing issues that arise in the rare earth mineral trade. A prominent example of this is the European Rare Earths Competency Network (ERECON) created by the European Union. Its primary goal was to secure the supply of rare earth minerals into the region. Due to lack of reserves internally, the EU imports over 90% of its REEs, mostly from China.[81] Before issuing its final report in 2014, it had three working groups that focused on rare earth supply chains, resource efficiency and recycling, and European end-user industries.[82]

This is a clear example of countries with common goals coming together to address a growing problem that affects them all. While this was a regional solution to a very specific issue (supply chains), the framework of ERECON has the potential to be applied to other regions and other issues within this topic.

[80] "dispute settlement - the disputes - DS431." 2015. World Trade Organization. https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.
[81] "Rare earth elements, permanent magnets, and motors." n.d. European Commission. Accessed 2021. https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/erecon_en.
[82] "European Rare Earths Competency Network." n.d. University of Birmingham. Accessed 2021. https://www.birmingham.ac.uk/research/activity/metallurgy-materials/magnets/research/ERECON-EU-Network.aspx.

Individual Countries

Countries are also unilaterally taking action to address rare earth mineral issues as they arise. A prime example of this is Russia, which seeks to become a major play on the global rare earth market. Starting in 2020, it plans on investing $1.5 billion dollars in rare earth mineral ventures, eyeing its internal reserves of 12 million tons, or 10% of the global reserves. The goal is to be self-sufficient in REEs by 2025 and begin exporting in 2026. The country is trying a combination of ideas to accomplish this monumental task. This includes reducing mining taxes, cheaper loans to investors, and a willingness to support foreign investment.[83] While these plans are specific to a country and as of yet, unproven, they offer an outline for other countries that may wish to increase their rare earth mineral production.

[83]"Russia has $1.5 billion plan to dent China's rare earth dominance." 2020. Reuters. https://www.reuters.com/article/russia-rareearths/russia-has-1-5-billion-plan-to-dent-chinas-rare-earth-dominance-idUSL8N2F73F4.

Possible Solutions

International Community

In order to come to a regulatory resolution regarding rare earth minerals, there must be buy-in from the global community. To foster such international dialogue, institutions and organizations need to either be created or refocused to address the growing global demand for rare earth minerals in a timely manner. This could take the form of working within existing supranational organizations such as the WTO or the UN, or creating new ones such as ERECON that are meant to specifically address issues relating to rare earth minerals. Venues for such dialogue need to both place an emphasis on the growing economic importance of the minerals as well as potential externalities that go along with increasing production. The main goal of places for countries to come together to discuss issues is for these issues to be addressed satisfactorily, which can only occur if countries feel that they are heard and respected.

Trade Agreements

In the global economy, it is inherent that there will be countries that are net producers of REEs and that there are countries that are net consumers of REEs. The variable that has the potential to change is how these groups of countries interact with each other. This is where trade agreements come into play, as a form of market regulation. Trade agreements have the potential to be between any number of countries, as long as the terms are agreed to by all parties involved. They have the potential to resolve issues such as environmental malpractices, human rights abuses, and restrictive tariffs or quotas, all leading to more open and accessible markets. Thus, trade agreements may be considered as part of a comprehensive solution on the topic, but not as the sole answer to the problem.[84]

[84]Kuhn, Janne, and Hein Gevers. 2014. "Rare Earth Elements; from Mineral to Magnet." Sustainable Development Goals. https://sustainabledevelopment.un.org/content/documents/5749Rare%20earth%20elements,%20from%20mineral%20to%20magnet.pdf.

Best Practices

There must also be solutions on a micro level that address real-time concerns of the rare earth mineral trade. A large area of concern is the environment. The lifecycle of rare earth minerals, which includes mining, refining, and disposing of them, will inherently create pollution and other kinds of environmental degradation. These sorts of issues must be addressed on a global scale in order for there to be any real progress, as many countries have proven REE reserves. All three processes mentioned above have the potential to contaminate the soil, water, and air of nearby communities, necessitating costly remediation. It is important to ensure adequate environmental protections on the front-end in order to limit environmental and health issues on the back-end. This may necessitate the transfer or sharing of best practices when it comes to knowledge and technology regarding rare earth mineral production and consumption, in order for all countries to be able to address these concerns completely.

Another area of concern is the vast potential for human rights abuses. There are going to be occupational hazards in the mining extraction of any mineral. The name of the game is to limit them to ensure that workers that provide such a vital resource for the global economy also are safe enough to benefit from their actions. This may be possible through the strengthening of regulations relating to working conditions as well as reducing the amount of illegal mining that occurs outside of governmental oversight. One part of a solution to this issue may be establishing more transparent supply chains for rare earth minerals. Transparent supply chains would allow consumers of REEs to know where they come from and make smarter choices, which in turn would pressure producers to abide by more stringent regulations and encourage actors throughout the supply chain to source their materials appropriately.[85]

Furthermore, because ultimately there is a finite supply of rare earth minerals on the planet, any comprehensive solution should factor in recycling of REEs to promote sustainable practices. Advances in technology have made it possible for rare earth minerals to be somewhat more economically recycled.[86] Much of the potential for recycled minerals comes in the form of electronic

[85]"Transparent Supply Chains." n.d. Massachusetts Institute of Technology. Accessed 2021. https://web.mit.edu/12.000/www/m2016/finalwebsite/solutions/conflictmining.html.
[86]n.d. Recycling International • For the global recycling industry. Accessed 2021. http://www.recyclinginternational.com.

waste.[87] Any such recycling ventures would require significant investment in safe practices and in the necessary advanced technology to accomplish such a task. Yet, such an effort may be worth it for countries that wish to reduce their dependence on rare earth imports.

Conclusion

The topic of regulating the rare earth mineral trade is complex and nuanced. It must be addressed appropriately from multiple approaches in order to truly make a meaningful difference. These sections should provide the foundation for delegates to innovate and create their own comprehensive solutions on this topic. Ultimately, countries in this committee should work together on this topic using all resources available to them in order to draft a resolution that promotes SPECPOLs goals of international peace and security.

[87]Um, Namil. (2017). Hydrometallurgical Recovery Process of Rare Earth Elements from Waste: Main Application of Acid Leaching with Devised τ-T Diagram. 10.5772/intechopen.68302.

Bloc Positions

Rare Earth Mineral Producers

A key group of countries relating to the rare earth mineral trade are the countries that currently produce most of the world's current supply of rare earth minerals. As detailed in the *Statement of the Problem*, as of 2020 these countries include the United States, China, Australia, Myanmar, and Madagascar.[88] Large producers of rare earth minerals have a large amount of sway on the international marketplace for these resources, given that they produce and sell sizable quantities already. It is also important to note that countries that produce large amounts of REEs may have more exposure to the kinds of issues relating to the mining process described in previous sections of this background guide. Furthermore, not all countries in this grouping are on the same technological playing field when it comes to these minerals. Thus, while countries that currently produce rare earth minerals have issues in common, there are still many issues that add diversity to this group.

Rare Earth Mineral Consumers

Another group that affects the rare earth mineral trade are the countries that are the leading consumers of REEs in their economies. These countries include China, the United States, Japan, the European Union, and other developed economies that produce modern technology, from electronics to computers.[89] It should now be evident that countries can both produce and consume large quantities of rare earth minerals simultaneously. This group has less to do with rare earth minerals themselves, but rather the type of economy a country has. It is therefore important to factor in consumer demand when considering regulations on the rare earth mineral trade, as producers produce for consumers to consume, leaving both groups playing an integral role in the global REE market.

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[88]Gambogi, Joseph. n.d. Rare Earths. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf.

[89]King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.

Rare Earth Mineral Developing Economies

A further group of countries that impacts the rare earth mineral trade are countries with future growth potential. They can come in two forms. The first is sizable reserves that can turn a country into a large producer of rare earth minerals. These countries include Brazil, Vietnam, Russia, and India, among others.[90] The second is the potential to have greater REE consumption in a country as it grows its economy. These sorts of countries may have developing economies currently, but have growing population bases that suggest future demand will increase. These groups of countries represent the future of the rare earth mineral trade and thus must be taken into consideration when regulations are being drafted.

[90]Gambogi, Joseph. n.d. Rare Earths. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf.

Glossary

Bioaccumulation: The gradual accumulation of a substance in an organism

Environmental remediation: The removal of pollution or contaminants from water (both groundwater and surface water) and soil[91]

Geologic/mineral deposit: Natural accumulations of minerals in the earth crust, in form of one or several mineral bodies which can be extracted at the present time or in an immediate future[92]

Minable concentrations: Concentrations of minerals in the ground that can be feasibly extracted under contemporary technological and economic constraints

Mineral reserves: The economically mineable part of a known mineral resource[93]

Tariff: A tax imposed by one country on the goods and services imported from another country[94]

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[91] Hamilton, James. n.d. "Careers in Environmental Remediation : US Bureau of Labor Statistics." Bureau of Labor Statistics. Accessed 2021. https://www.bls.gov/green/environmental_remediation/remediation.htm.

[92] n.d. Mineral Deposits • GeoLearning • Department of Earth Sciences. Accessed 2021. https://www.geo.fu-berlin.de/en/v/geolearning/gondwana/special_topics/mineraldeposits/index.html.

[93] "mineral reserve defined." n.d. INSPIRE. Accessed 2021. https://inspire.ec.europa.eu/codelist/ExplorationResultValue/mineralReserveDefined.

[94] Kelly, Robert C. n.d. "Tariff Definition." Investopedia. Accessed 2021. https://www.investopedia.com/terms/t/tariff.asp.

Bibliography

2021. Rare earth elements facts. https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/minerals-metals-facts/rare-earth-elements-facts/20522.

n.d. MIT Technology Review. Accessed 2021. http://www.technologyreview.com.

n.d. Bloomberg.com. Accessed 2021. https://www.bloomberg.com/news/.

n.d. CBS News - Breaking news, 24/7 live streaming news & top stories. Accessed 2021. http://www.cbsnews.com.

n.d. Recycling International • For the global recycling industry. Accessed 2021. http://www.recyclinginternational.com.

n.d. Mineral Deposits • GeoLearning • Department of Earth Sciences. Accessed 2021. https://www.geo.fu-berlin.de/en/v/geolearning/gondwana/special_topics/mineraldeposits/index.html.

“Apollo-Soyuz Test Project Overview.” 2017. NASA. https://www.nasa.gov/apollo-soyuz/overview.

Birukov, Vladimir. 2019. “How Many Countries Have Space Programs?” History and Headlines. https://www.historyandheadlines.com/how-many-countries-have-space-programs/.

“Blue Origin: Jeff Bezos unveils plans for 'space business park.'” 2021. BBC. https://www.bbc.com/news/world-us-canada-59046076.

Bradsher, Keith. 2010. “Amid Tension, China Blocks Vital Exports to Japan (Published 2010).” The New York Times. https://www.nytimes.com/2010/09/23/business/global/23rare.html.

“A Brief History of the FAA | Federal Aviation Administration.” n.d. FAA. Accessed 2021. https://www.faa.gov/about/history/brief_history/.

“COPUOS.” n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/copuos/index.html.

“COPUOS History.” n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/copuos/history.html.

“dispute settlement - the disputes - DS431.” 2015. World Trade Organization. https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.

Erwin, Sandra. 2021. "Analysts: China's space programs are a security concern to the US but not all are nefarious." SpaceNews. https://spacenews.com/analysts-chinas-space-programs-are-a-security-concern-to-the-u-s-but-not-all-are-nefarious/.

"European Rare Earths Competency Network." n.d. University of Birmingham. Accessed 2021. https://www.birmingham.ac.uk/research/activity/metallurgy-materials/magnets/research/ERECON-EU-Network.aspx.

"50 Years Ago: Launch of Salyut, the World's First Space Station." 2021. NASA. https://www.nasa.gov/feature/50-years-ago-launch-of-salyut-the-world-s-first-space-station/.

Foust, Jeff. 2020. "Virgin Galactic, still awaiting liftoff, spreads its wings." The Space Review. https://www.thespacereview.com/article/4004/1.

Gambogi, Joseph. n.d. Rare Earths. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf.

Gambogi, Joseph. n.d. Rare Earths Data Sheet - Mineral Commodity Summaries 2020. Accessed 2021. https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-rare-earths.pdf.

Geology.com. Rare Earth Elements. n.d. https://geology.com/articles/rare-earth-elements/#:~:text=The%20group%20consists%20of%20yttrium,%2C%20ytterbium%2C%20and%20lutetium).

Hamilton, James. n.d. "Careers in Environmental Remediation : US Bureau of Labor Statistics." Bureau of Labor Statistics. Accessed 2021. https://www.bls.gov/green/environmental_remediation/remediation.htm.

"Health risk assessment of rare earth elements in cereals from mining area in Shandong, China." 2017. NCBI. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5575011.

"History." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/aboutus/history/index.html.

"Human Rights." n.d. Massachusetts Institute of Technology. Accessed 2021. https://web.mit.edu/12.000/www/m2016/finalwebsite/problems/humanrights.html.

"International Space Law." n.d. Space Foundation. https://www.spacefoundation.org/space_brief/international-space-law/.

Janelle, Chantelle. 2008. "International Space Station astronauts have access to a gun." WIS-TV. https://www.wistv.com/story/7875955/international-space-station-astronauts-have-access-to-a-gun/.

Jones, Nicola. 2013. "A Scarcity of Rare Metals Is Hindering Green Technologies." Yale E360. https://e360.yale.edu/features/a_scarcity_of_rare_metals_is_hindering_green_technologies.

Kelly, Robert C. n.d. "Tariff Definition." Investopedia. Accessed 2021. https://www.investopedia.com/terms/t/tariff.asp.

King, Hobart M., and Peggy Greb. n.d. "REE - Rare Earth Elements - Metals, Minerals, Mining, Uses." Geology.com. Accessed 2021. https://geology.com/articles/rare-earth-elements/.

Kuhn, Janne, and Hein Gevers. 2014. "Rare Earth Elements; from Mineral to Magnet." Sustainable Development Goals. https://sustainabledevelopment.un.org/content/documents/5749Rare%20earth%20elements,%20from%20mineral%20to%20magnet.pdf.

"Liability Convention." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introliability-convention.html.

Lu, Christina, and Kishore Mahbubani. 2021. "What Are Rare Earths, and Why Are They So Important to Geopolitics?" Foreign Policy. https://foreignpolicy.com/2021/04/22/rare-earths-china-us-greenland-geopolitics/.

Mann, Adam. 2012. "Loophole Could Allow Private Land Claims on Other Worlds." WIRED. https://www.wired.com/2012/04/moon-mars-property/.

McKie, Robin. 2011. "Sergei Korolev: the rocket genius behind Yuri Gagarin." The Guardian. https://www.theguardian.com/science/2011/mar/13/yuri-gagarin-first-space-korolev.

"mineral reserve defined." n.d. INSPIRE. Accessed 2021. https://inspire.ec.europa.eu/codelist/ExplorationResultValue/mineralReserveDefined.

"Moon Agreement - Space Law." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html.

Nobel, Carmen, Clark Merrefield, Naseem S. Miller, and Denise Ordway. n.d. The Journalist's Resource - Informing the news with research. Accessed 2021. http://journalistsresource.org/.

"Our Work Space Law." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html.

"The Outer Space Treaty." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html.

"Outer Space – UNODA." n.d. the United Nations. Accessed 2021. https://www.un.org/disarmament/topics/outerspace/.

"Rare Earth Elements." n.d. Massachusetts Institute of Technology. Accessed 2021. http://web.mit.edu/12.000/www/m2016/finalwebsite/elements/ree.html.

"Rare earth elements, permanent magnets, and motors." n.d. European Commission. Accessed 2021. https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/erecon_en.

"Rare Earths Statistics and Information | US Geological Survey." n.d. USGS.gov. Accessed 2021. https://www.usgs.gov/centers/nmic/rare-earths-statistics-and-information.

"Registration Convention." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introregistration-convention.html.

"Rescue Agreement." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introrescueagreement.html.

Robinson, Tim. 2014. Space debris: The legal issues. https://www.aerosociety.com/news/space-debris-the-legal-issues/.

Roulette, Joey. 2021. "SpaceX launches its first private crewed mission to space." The Verge. https://www.theverge.com/2021/9/15/22675793/spacex-inspiration4-launch-first-all-civilian-private-crew.

"Russia has $1.5 billion plan to dent China's rare earth dominance." 2020. Reuters. https://www.reuters.com/article/russia-rareearths/russia-has-1-5-billion-plan-to-dent-chinas-rare-earth-dominance-idUSL8N2F73F4.

"The Soviet-American Arms Race." n.d. History Today. Accessed 2021. https://www.historytoday.com/archive/soviet-american-arms-race.

"Space debris conundrum for international law makers - Room: The Space Journal." n.d. Room, The Space Journal. Accessed 2021. https://room.eu.com/article/space-debris-conundrum-for-international-law-makers.

"Space Debris from Anti-Satellite Weapons." n.d. Union of Concerned Scientists. Accessed 2021. https://www.ucsusa.org/sites/default/files/2019-09/debris-in-brief-factsheet.pdf.

"Space Law Bibliography." 2020. NASA. https://www.nasa.gov/centers/hq/library/find/bibliographies/space_law.

"Space Law: National Space Law Database." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw.html.

"Space Law Treaties and Principles." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html.

"Space Station Space Debris and Human Spacecraft." 2021. NASA. https://www.nasa.gov/mission_pages/station/news/orbital_debris.html.

Standaert, Michael. 2019. "China Wrestles with the Toxic Aftermath of Rare Earth Mining." Yale E360. https://e360.yale.edu/features/china-wrestles-with-the-toxic-aftermath-of-rare-earth-mining.

Su, Alice. 2019. "The hidden costs of China's rare-earth trade." Los Angeles Times. https://www.latimes.com/world-nation/story/2019-07-28/china-rare-earth-tech-pollution-supply-chain-trade.

"TENORM: Rare Earths Mining Wastes | US EPA." 2021. US Environmental Protection Agency. https://www.epa.gov/radiation/tenorm-rare-earths-mining-wastes.

"Transparent Supply Chains." n.d. Massachusetts Institute of Technology. Accessed 2021. https://web.mit.edu/12.000/www/m2016/finalwebsite/solutions/conflictmining.html.

"United Nations Register of Objects Launched into Outer Space." n.d. UNOOSA. Accessed 2021. https://www.unoosa.org/oosa/en/spaceobjectregister/index.html.

Ward, Mark. 1996. "Satellite injured in space wreck." New Scientist. https://www.newscientist.com/article/mg15120440-400-satellite-injured-in-space-wreck/.

Weeden, Brian. n.d. "2009 Iridium-Cosmos Collision Fact Sheet." Secure World Foundation. Accessed 2021. https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf.

"What is GPS?" 2019. NASA. https://www.nasa.gov/directorates/heo/scan/communications/policy/what_is_gps.

Wilkinson, Freddie. 2020. "The History of Space Exploration." National Geographic Society. https://www.nationalgeographic.org/article/history-space-exploration/.

"Wyoming State Geological Survey." n.d. Wyoming State Geological Survey. Accessed 2021. https://www.wsgs.wyo.gov/minerals/rare-earths.