

RUSIN THATHSARA

Rusin Thathsara

•

•

Space Construction



Rusi E BOOKS

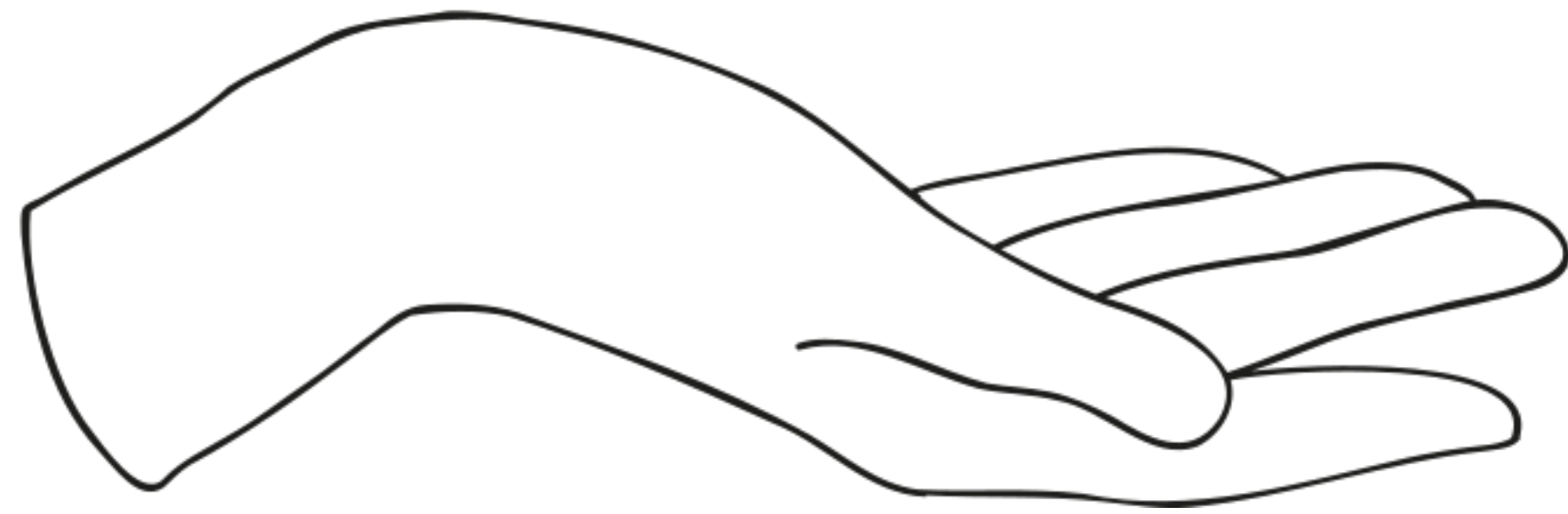
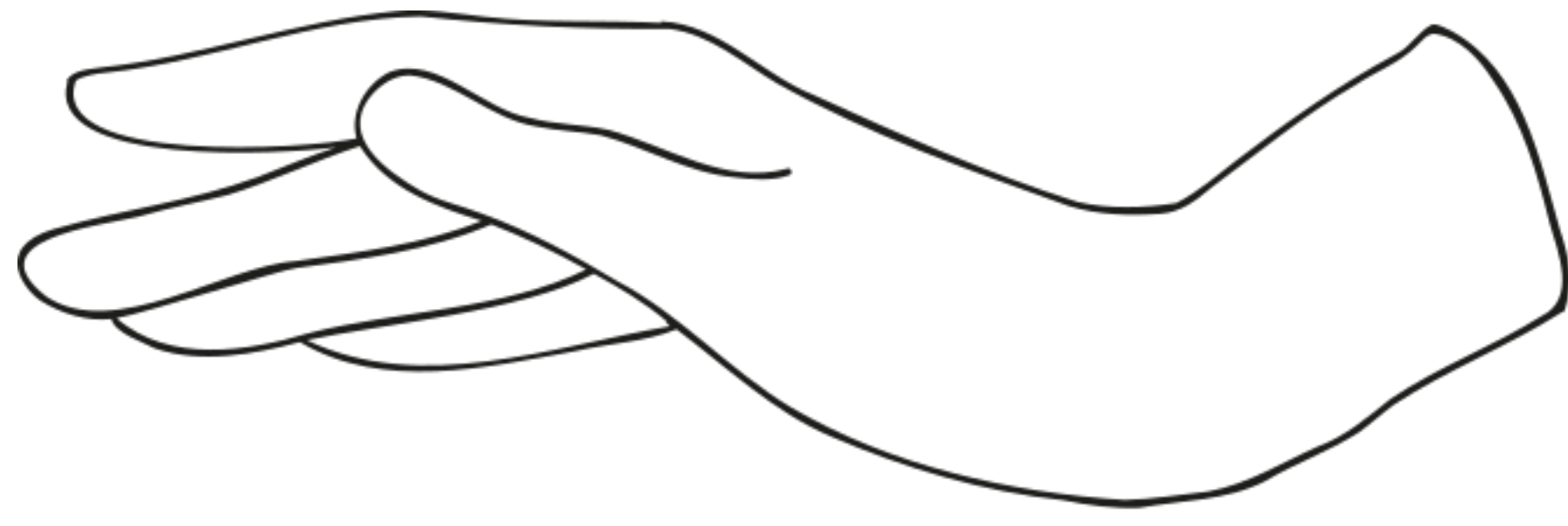
Rusin Thathsara + + + + + + + + +

SPACE CONSTRUCTION

Enthusiasm For
Future
Architectures

First Edition





All rights reserved.
No part of this book may be used
or reproduced in any manner
Whatsoever without the written permission of
the publisher.

This is the E-Book version of the
Sri Lankan First Book About Space Construction
| Limited edition |

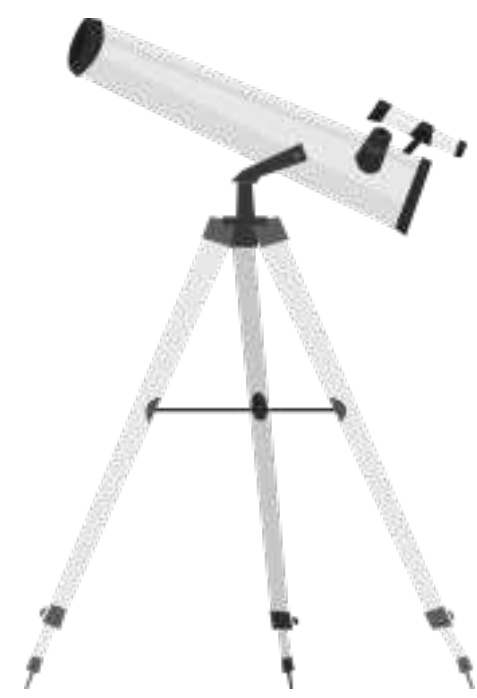
Copyright © Rusin Thathsara
First Edition | 2022

I S B N -9 786 249 920910

contact

Email - rusinthathsaraofficial@gmail.com





Prologue From Author

Giving, making a difference in people's lives, enlarging the sphere of our concern to include others, being true to ourselves, and constantly remaining open to receiving as well as giving. This is not a fairy tale; rather, it is a description of some of the most incredible fresh Subject approach in the Future construction industryI have ever come across.

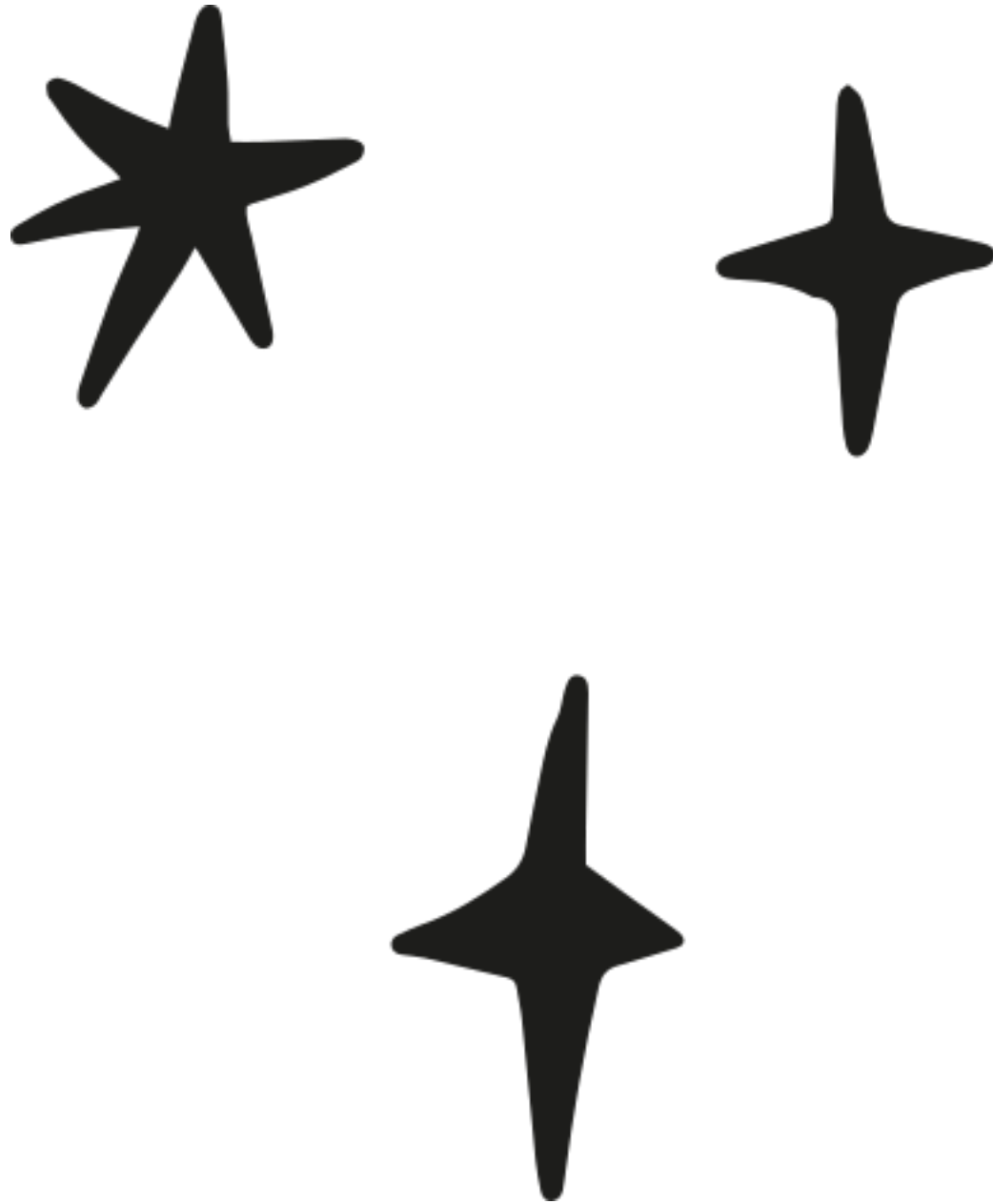
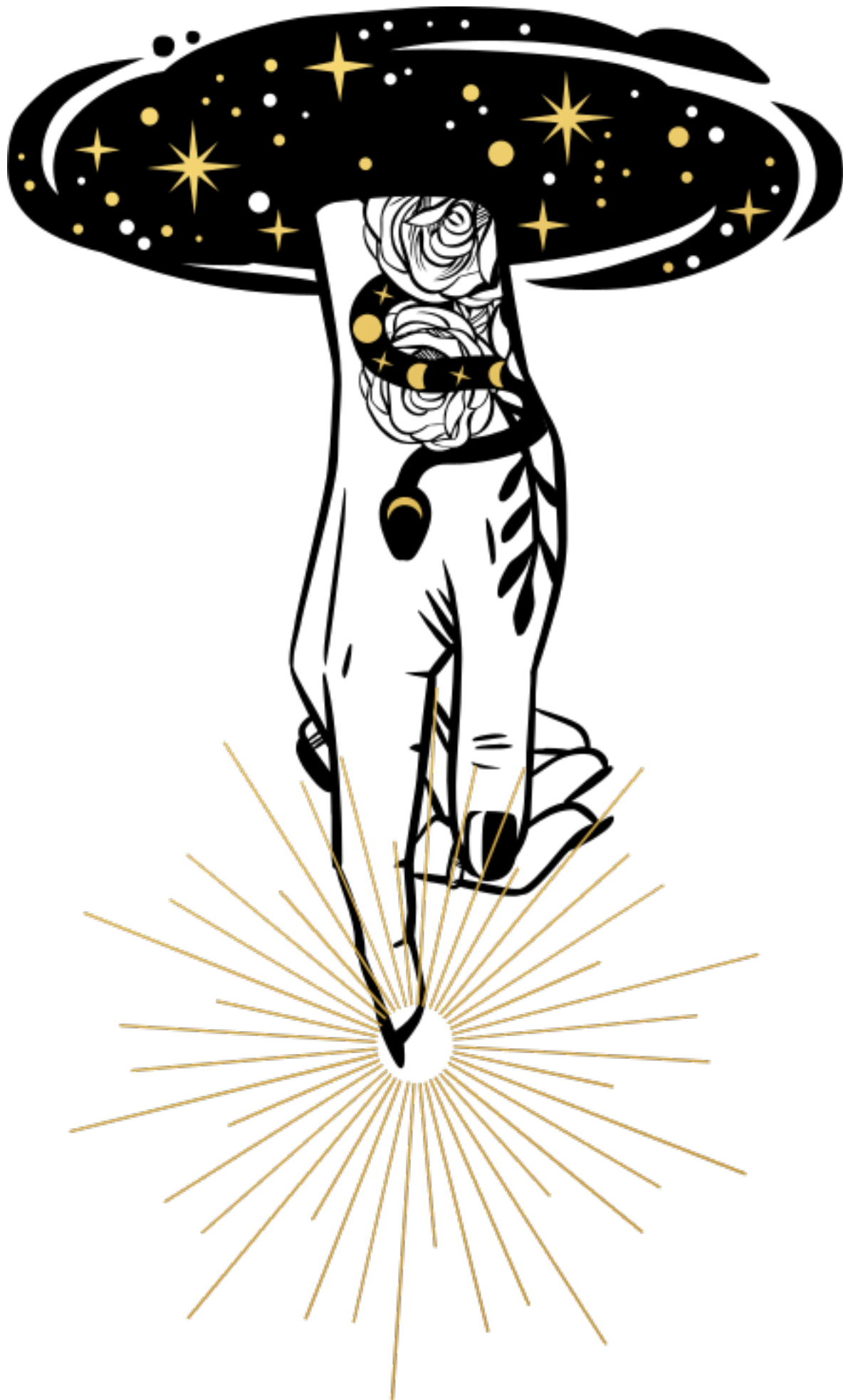
Astronomers tell tales that are perhaps weirder and more interesting than those from any other field of study. However, astronomy and space science are not just about amazing things and outlandish speculations. The classical principles of physics, chemistry, and earth science serve as the foundation upon which astronomy and space science are based. Students' keen interest in astronomy can serve as incentive for learning these essential scientific principles.

Science fiction typically has a device to meet any need, from food to a whole house. If only everything was that simple. Building for space presents a particularly challenging challenge. The necessary equipment and materials must all be both compact enough to go on a rocket and sturdy enough to last. Similarly, the large equipment we commonly utilize for building projects, such as carry deck cranes and scissor lifts, isn't designed to function anywhere else than Earth. However, more space expansion is now possible than ever thanks to improvements in technology and building techniques. The future of the building industry may be largely in space if things continue to go as they are.As Undergraduate who seeks new frontiers in Astronomy And Construction field i have encountered these knowledge via bless of nature



Rusin Thathsara
Undergraduate of University Of Moratuwa(facilities Management)|Astronomer|Author|Concept & Research Writer

What steps must be taken to make it possible to live in space? What might a Mars habitat look like? And how does the architecture of the Moon compare to that of Earth? We will hear from space industry professionals in this article and uncover all the mysteries of space exploration!



From the Vision Of an
Astronomer

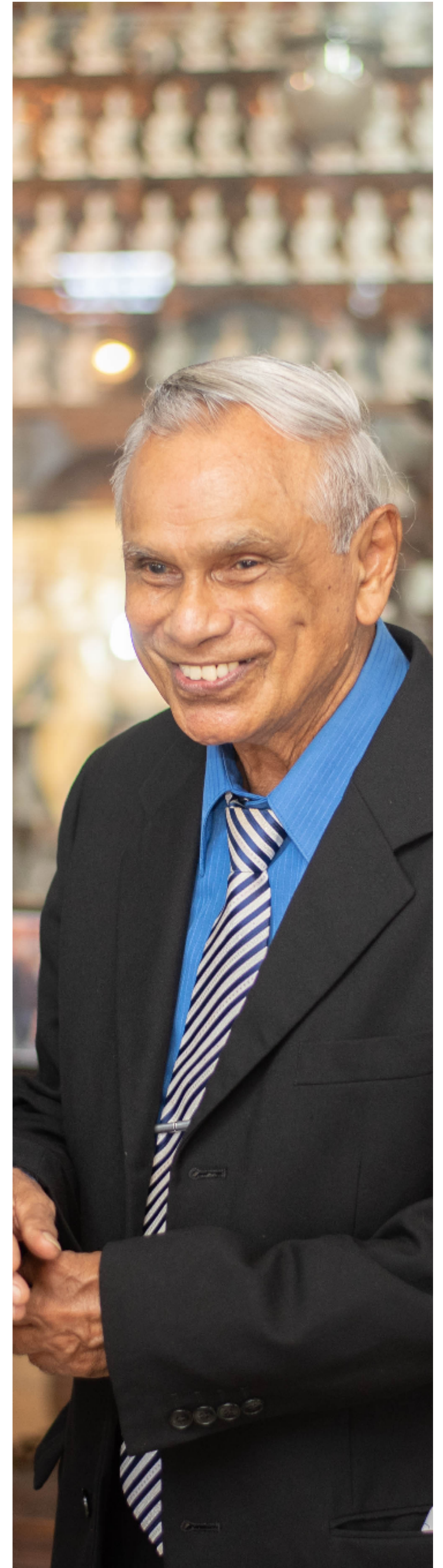
Preface

As humanity continues to explore the depths of space, the need for construction in outer space becomes increasingly critical. The ability to build structures, habitats, and even entire stations in space is a key component in our journey towards establishing a permanent presence beyond our planet. It is with great pleasure that I introduce the first book in South Asia about space construction, written by Rusin Thathsara, an Undergraduate at the University of Moratuwa. This groundbreaking book delves into the intricacies of space construction, exploring the technical and logistical challenges of building in a zero-gravity environment. From the materials and tools required to the innovative techniques used to overcome the unique obstacles of space construction, this book is a comprehensive guide to the future of human settlement beyond Earth.

Rusin Thathsara has done an excellent job in compiling and presenting the information in an easily digestible format. As an astronomer, I am pleased to see young minds like Rusin Thathsara taking an interest in this critical aspect of space exploration. The book's insights and knowledge are sure to inspire a new generation of space engineers, architects, and builders.

I highly recommend this book to anyone interested in the future of space exploration and construction. Rusin Thathsara has provided an invaluable contribution to the field, and I am honored to have the opportunity to write this preface for his groundbreaking work.

Astronomer **Anura C. Perera**
Royal Astronomical society



TABLE

OF CONTENTS

IV	COPYRIGHT
V	PROLOGUE FROM AUTHOR
VI	PREFACE
VII	COSMONAUTICAL DAY
4	WHAT IS SPACE CONSTRUCTION?
6	HOW TO BUILD IN SPACE?
8	MATERIALS FOR SPACE CONSTRUCTION
13	CONSTRUCT SPACE HABITATS
18	FUTURE CONSTRUCTION MATERIALS RECYCLING & REPURPOSING
27	IMPORTANCE OF SPACE CONSTRUCTION
31	SPACE VS EARTHS ARCHITECTURE
33	COMPETITION BETWEEN GREEN BUILDINGS AND SPACE CONSTRUCTION



TABLE

OF CONTENTS

36	SCIENTIFIC EXPERIMENTS ON SPACE CONSTRUCTION?
37	SECRETS OF SPACE CONSTRUCTION
38	RUSSIAN ASTRONOMY IN SPACE CONSTRUCTION
42	COSMONAUTS IN FUTURE SPACE
43	PREDICTIONS MADE BY SCIENTISTS ABOUT FUTURE SPACE CONSTRUCTION.
44	NEW TRENDS IN FUTURE SPACE CONSTRUCTIONS
45	INTERPLANETARY COMMUNICATION SYSTEM





COSMONAUTICAL DAY



Russian Space Day, also known as Cosmonautics Day, is a significant event celebrated on April 12th in Russia. This day commemorates the historic achievement of Yuri Gagarin, the first human to journey into space. It was on April 12th, 1961, that Yuri Gagarin embarked on his journey, which lasted 108 minutes, and forever changed the course of human history.

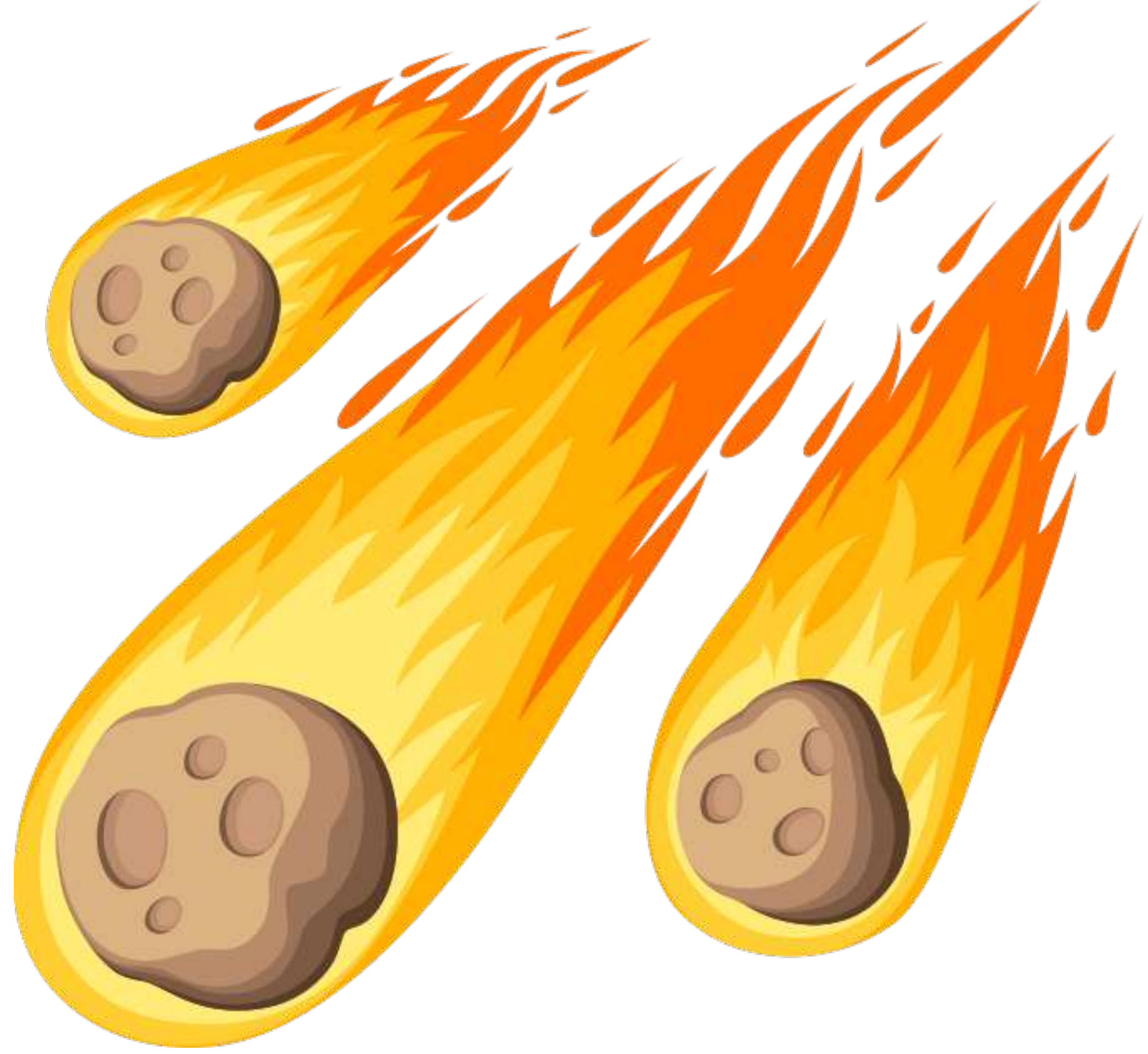
The accomplishments of the Russian space program have been significant over the years. From launching the first satellite, Sputnik, to sending the first man into space, Russia has consistently been at the forefront of space exploration. This has led to many scientific discoveries, including the discovery of new planets, stars, and galaxies.

The Russian space program has also played a significant role in advancing technology. The innovations developed for space exploration have been adapted for various applications on Earth, from medical technologies to communication systems.

Moreover, the Russian space program has been a source of national pride for the Russian people. The country's achievements in space have been a symbol of its scientific and technological prowess, and the successes have fostered a sense of unity and purpose among its citizens.

In recent years, Russia has continued to push the boundaries of space exploration, with a strong focus on human spaceflight. The country is currently collaborating with other nations, including the United States, in the development of the International Space Station. Additionally, Russia has ambitious plans to establish a permanent lunar base in the coming years.

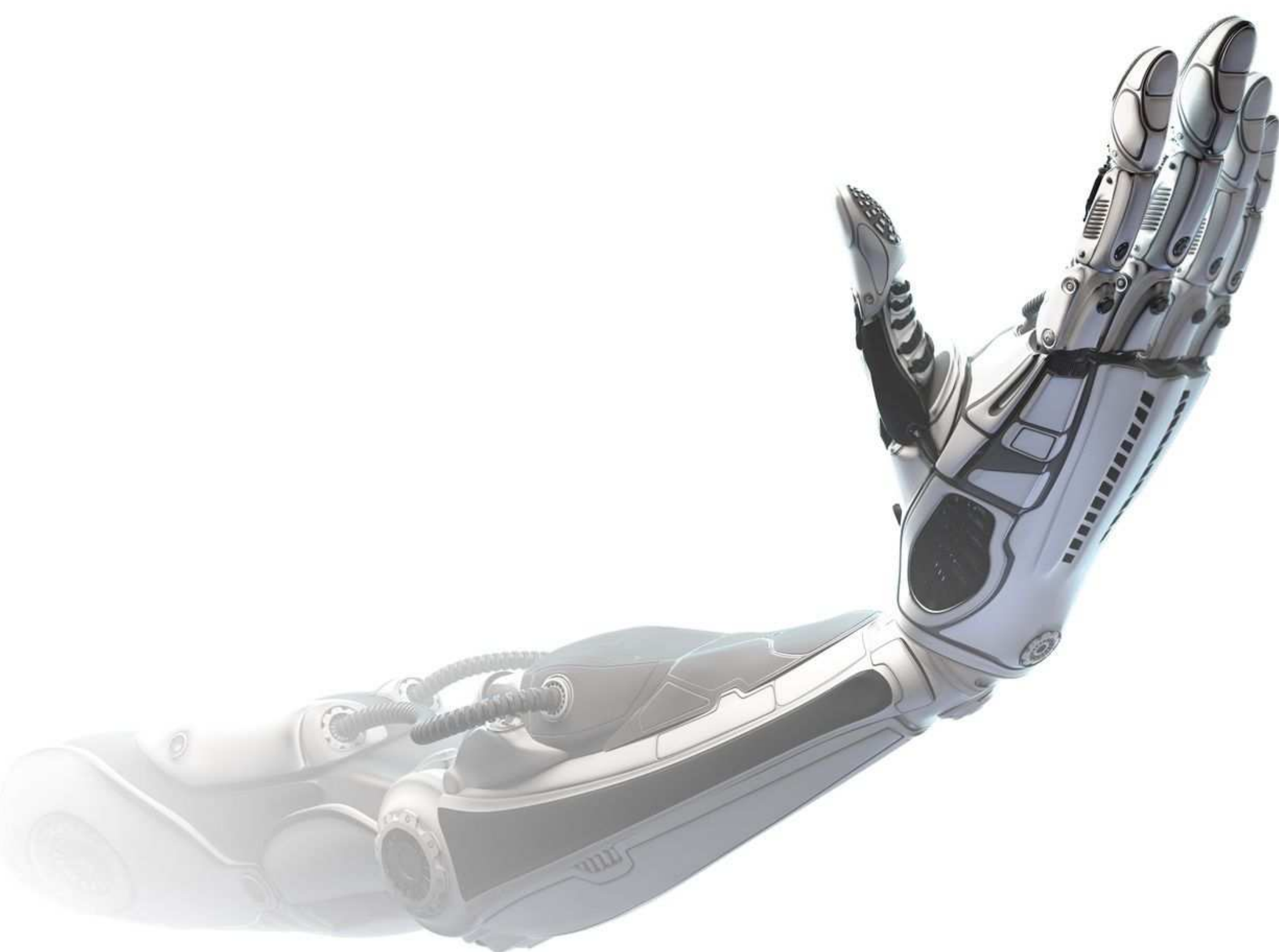
In conclusion, Russian Space Day is an occasion to celebrate the achievements of the Russian space program, which has played a significant role in advancing scientific knowledge and technology. It is also a time to recognize the dedication and hard work of the many people involved in space exploration, including cosmonauts, scientists, and engineers. As we look to the future, we can only imagine the incredible discoveries and achievements that await us in space, thanks to the efforts of those who continue to push the boundaries of human knowledge and exploration.



**Life isn't about
finding yourself.
Life is about
creating yourself.**

•

George Bernard Shaw



What is space construction?



The concept of building in space as opposed to on Earth is known as space construction. The design of objects in space can alternatively be referred to as in-space manufacturing or off-Earth manufacturing.

For a variety of reasons, it may be important to build things in space. Space construction can be a practical alternative when the structure in question is too large to be carried by spacecraft or when the components are too delicate to survive a launch.

Space Construction



Although building in space has benefits, it also presents a variety of special challenges. Without gravity, conventional design principles and architectural conventions are no longer applicable. Additionally, even if carrying structures in spacecraft is no longer a problem thanks to space construction, materials and other equipment still need to be shipped from Earth. Engineers and scientists have already learnt a lot about the best ways to build in space, despite the fact that there are still many challenges to overcome.

How to build in Space ?



Building in space differs greatly from building on Earth. For starters, the absence of gravity entirely nullifies the rules of physics and design that normally govern Earth's structure. Even though an architectural concept may be expanded in space, construction in space still has its own set of challenges.

Making anything that can resist the harsh elements of space is one unique building task. The demand for materials that can tolerate radiation exposure is one such challenge. The need to be strong enough to leave the Earth's atmosphere while remaining light enough to not impede takeoff must be addressed, among other things.

Build in Space



New building materials might have found a solution to such issues, despite it seeming like wishful thinking to think of these materials as solutions. These modern materials are more durable, more cost-effective, and radiation-resistant. They can also be recycled. To deal with the effects of microgravity and move massive constructions, specialized tools have also been developed.



Chapter 2 ++++++

MATERIALS FOR SPACE CONSTRUCTION

According to NASA, they are developing methods and tools to use "in-situ" or on-site resources to construct buildings on the surfaces of other planets. Understanding how to employ these resources will help overcome many significant obstacles to building in space, particularly when it comes to transferring building supplies.

Old or worn-out goods that have been repurposed have been a significant source of construction materials. Acrylonitrile butadiene styrene (ABS), a unique polymer that can be used to create bolts, wrenches, and other objects is one of the materials NASA commonly employs aboard the International Space Station (ISS). When these things wear out or break, they can be recycled and the ABS used again. It can be difficult to really disassemble these tools and other goods so that they can be recycled. The In-Situ Fabrication and Repair project, in fact, was started explicitly with the aim of figuring out new ways to make, fix, and recycle "tools, components, and habitats and other structures" out of garbage, recycled spaceship parts, trash, human waste, and a number of other things.

New technology is now available to increase the efficiency of recovering space materials, thanks to experts like those at the In-Situ Project. The International Space Station's 3-D printer uses the Recycler, a system that recycles polymer ingredients like ABS (ISS).

The Recycler can be used by crews to recycle spent tools and materials, turning them back into the polymer base from which they were originally made. Then, workers can recycle the polymer to 3-D print additional tools and equipment for building and maintenance.

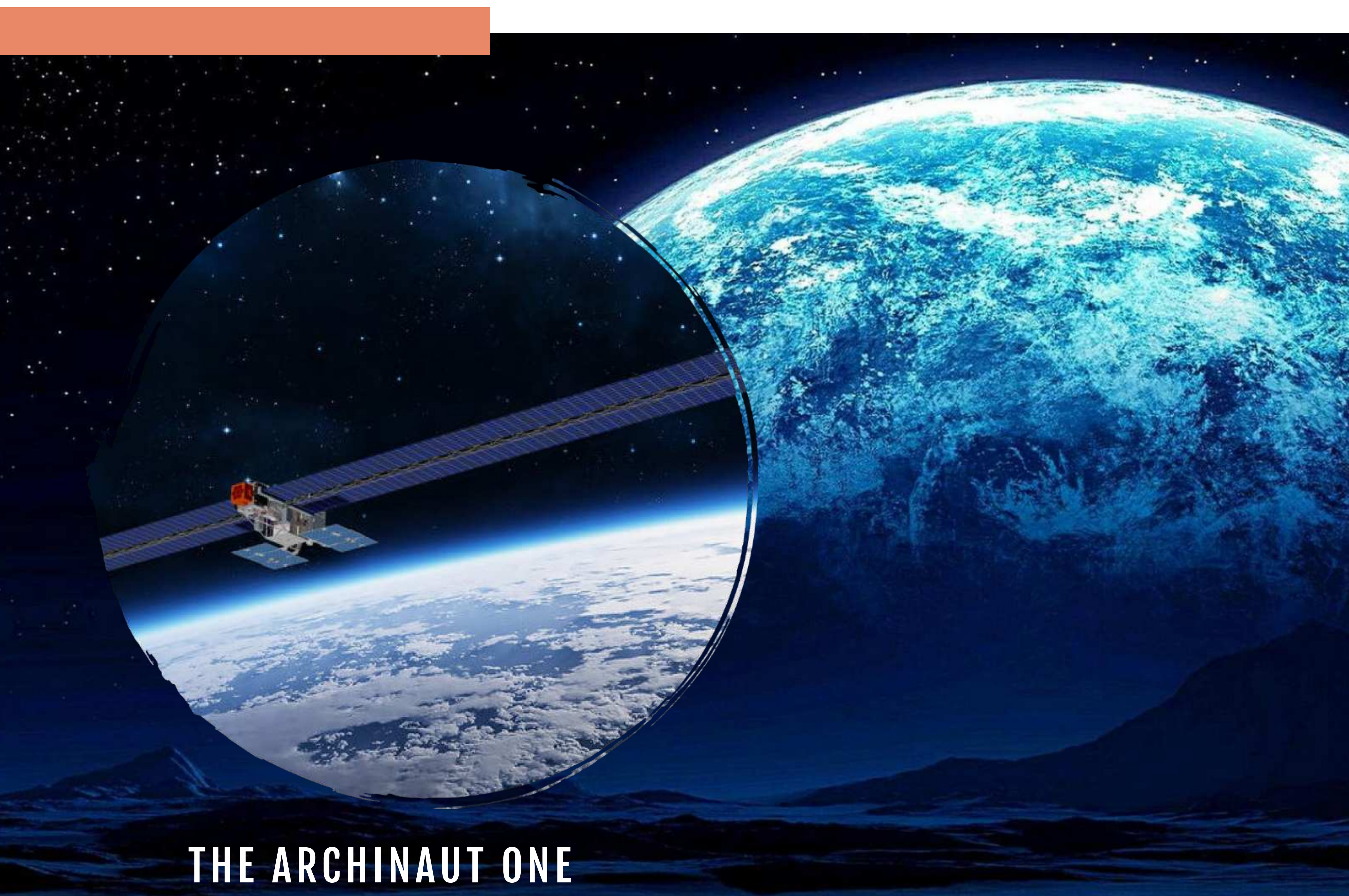
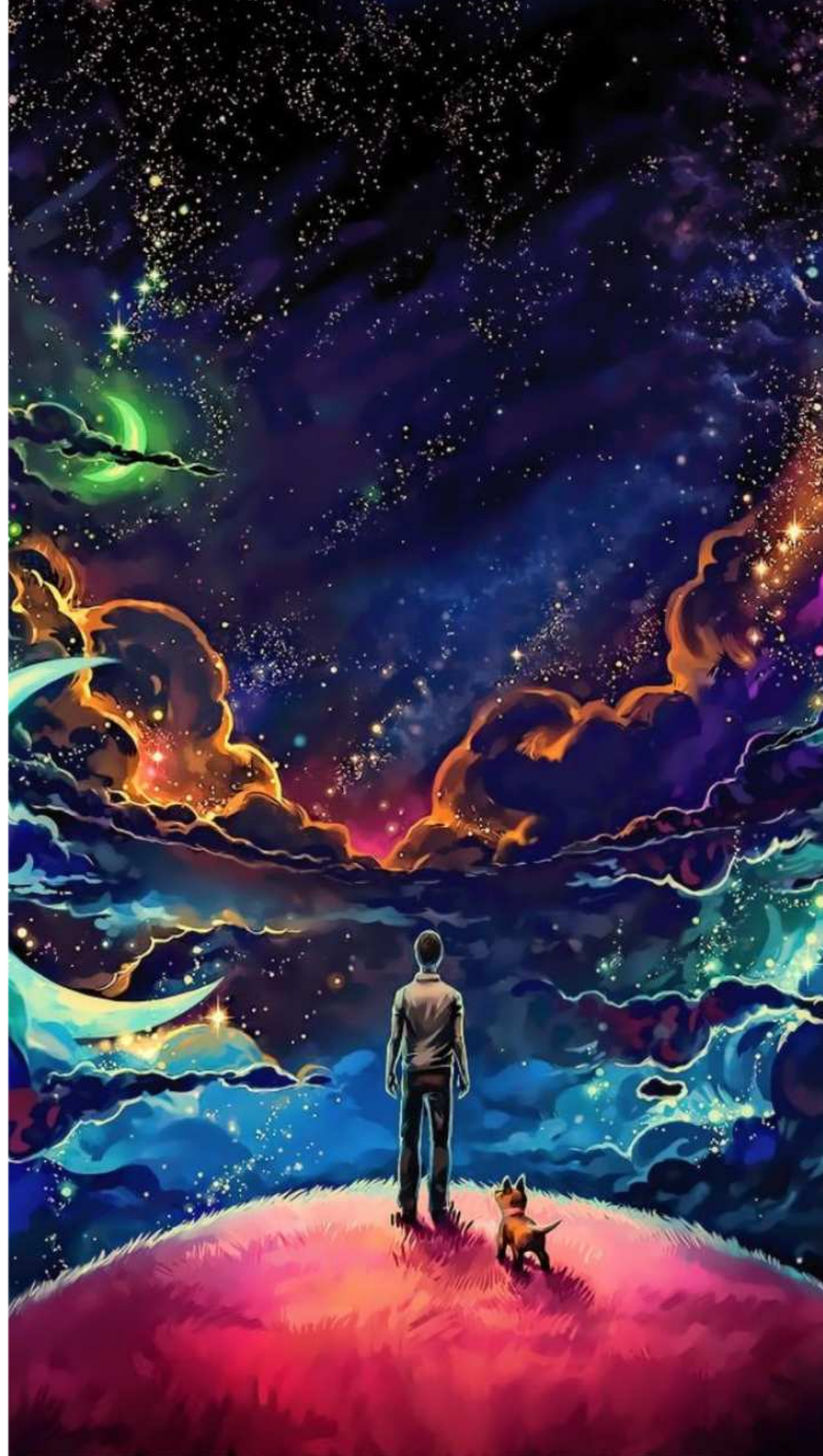
The In-Space Re-fabricator, a similar device that combines the functions of the Recycler with a 3-D printer, serves as a sort of "one-stop shop" for recycling used tools. Even materials like plastic packaging and foam that conventional 3-D printers cannot use can be used by the In-Space Re-fabricator.

THE ARCHINAUT ONE

A 3-D printer and robotic arms are combined to produce the Archinaut One, a Made in Space project that can construct and assemble huge structures in space.

Crews on Earth will be able to transmit the Archinaut the raw materials and digital design files required to construct a specific edifice once it is finished. The components of the construction can then be printed by the Archinaut and put together to form the finished product.

According to NASA, this device will be able to construct enormous telescopes as well as repair satellites. No later than 2022, the Archinaut One is expected to launch for a test flight.



SPACE TOOLS

01

Pistol Grip tool

02

The candarms

"

Even simple building operations require specialized equipment for the crews in space. These instruments must be simple to use even when wearing thick gloves and tough enough to resist the harsh conditions of space. "





source: <https://nasa3d.arc.nasa.gov/detail/pgt-3ds>

PISTOL GRIP TOOL

A cordless drill with a pistol handle was created specifically for usage in space. As liquid lubricants can cause a tool to seize up, it is lubricated using dry film and is made to prevent hand fatigue.

The operator can change the drill's torque and speed using the computer screen that is attached to it. It is one of the essential items in NASA's space toolkit due to its extensive use in repairs on both the ISS and the Hubble Space Telescope.

THE CANDARMS



Without a space crane, what would construction in space be like? The Canadian Space Crane, also known as the Candarm, was developed in Canada, and is supported by the Canadian Space Agency. It is a little more advanced than the cranes seen on Earth. It can reach, handle, and attach goods far more easily than a person can, just like a standard crane.

In fact, the Canadarm was so effective that the CSA created the Canadarm2, which was much larger. The Canadarm2 can move more freely and has an arm span that spans the whole length of the ISS thanks to its attachment to the ISS. It can move like an inchworm. Canada has promised to construct another of these tools, appropriately designated Canadarm3, to assist with large-scale construction, repairs, and spacewalks in conjunction with the development of the Lunar Gateway.



Source: https://www.nasa.gov/audience/foreducators/robotics/imagegallery/r_candarm2.jpg.html#.Y6QHI9VBy3A

construct

SPACE HABITATS

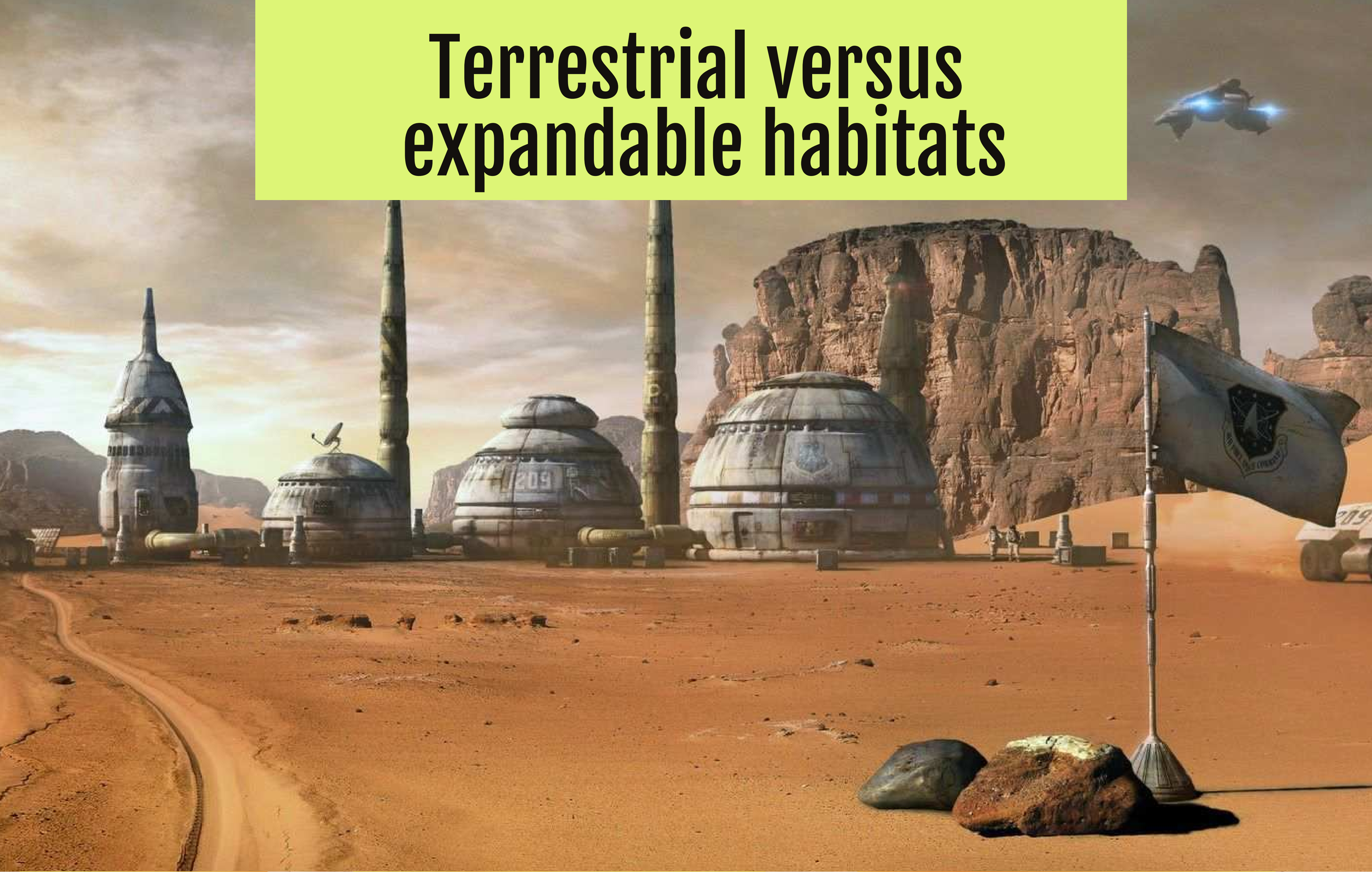
Living on another planet is a notion that has pervaded discussions about social, political, and environmental advancement as well as the field of science fiction. Scientists, media, and the general public have been debating whether or not it is feasible for humans to live anywhere other than Earth for decades



We are now more prepared than ever to establish sustainable life outside of Earth's atmosphere because to the quick development of space construction technologies.



Terrestrial versus expandable habitats



Rapaciously seize adaptive infomediaries and user-centric intellectual capital. Collaboratively unleash market-driven "outside the box" thinking for long-term high-impact solutions. Enthusiastically engage fully tested process improvements before top-line platforms.

Lightweight, inflatable expandable habitats can be built for usage on the ground or as free-floating habitations hung in space. Terrestrial habitats, on the other hand, are erected on the ground using locally available materials or those that have been transferred. Expandable habitats are a good place to start when building terrestrial habitats.

Increased Habitats

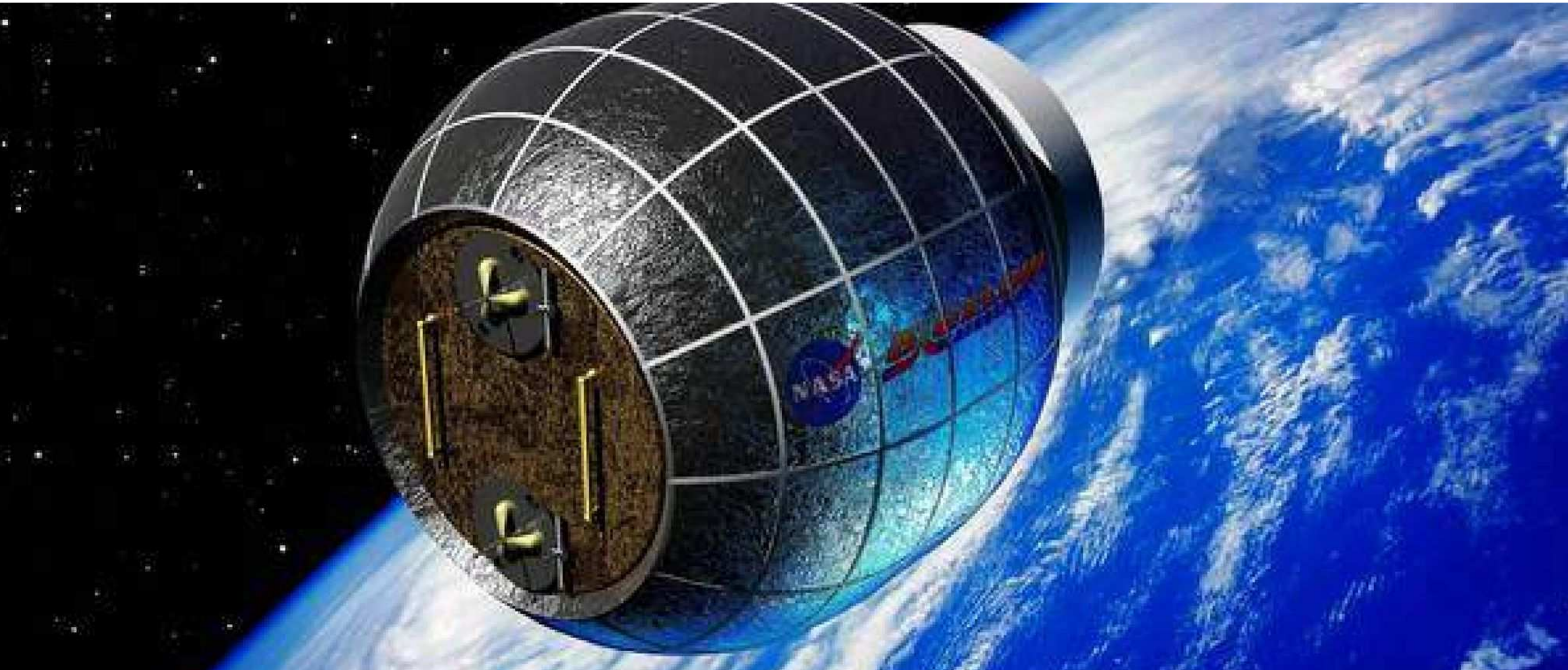
Expandable habitats have several benefits. Because they are lighter and take up less space before being inflated, their most obvious benefit may be that they are less expensive to transport into orbit.

Although testing is still being done to determine their level of protection, expandable shelters are also expected to shield from space radiation much more efficiently than their terrestrial counterparts.

The TransHab and the Bigelow Expandable Activity Module are two of the most renowned expandable habitats (BEAM).



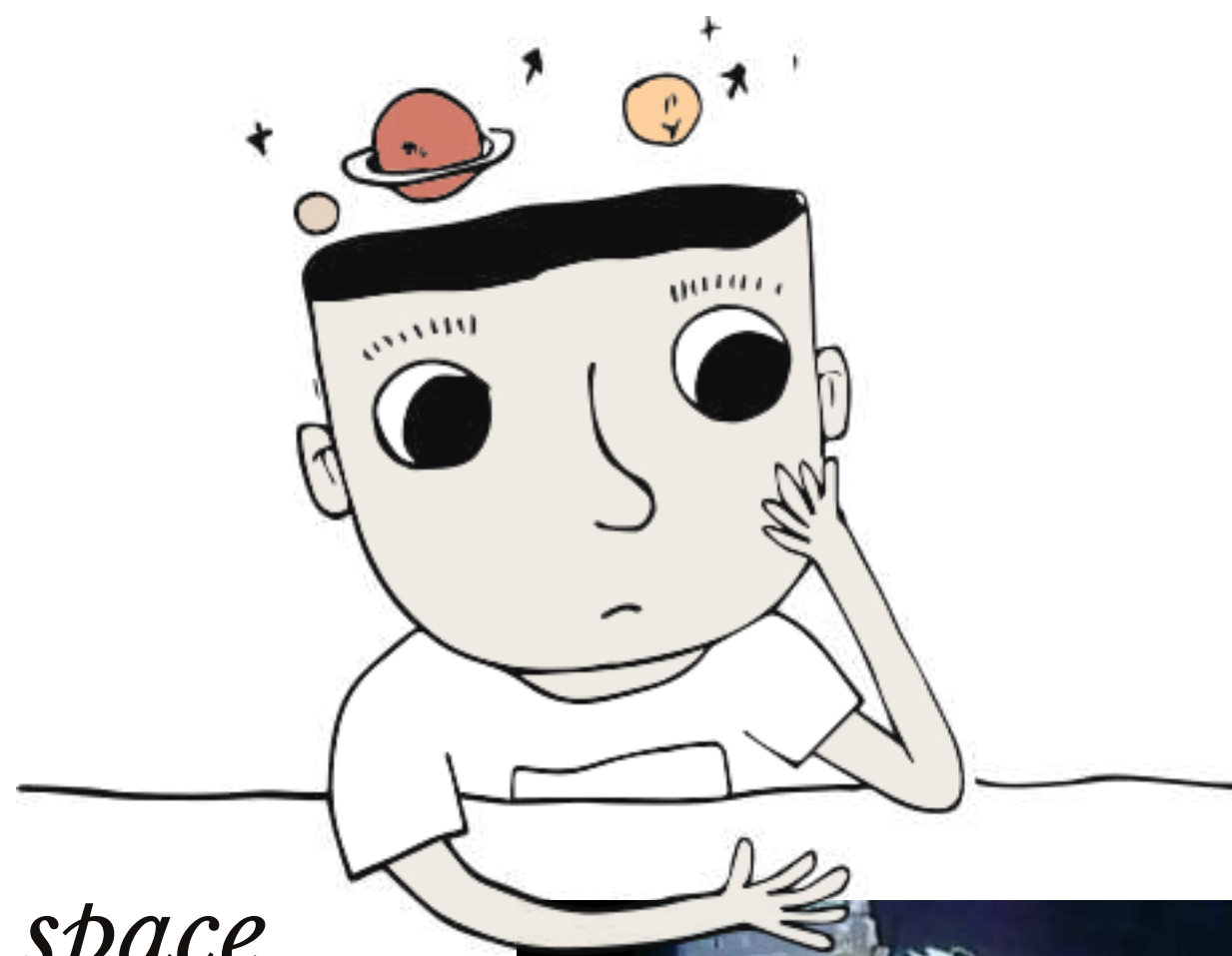
TransHab



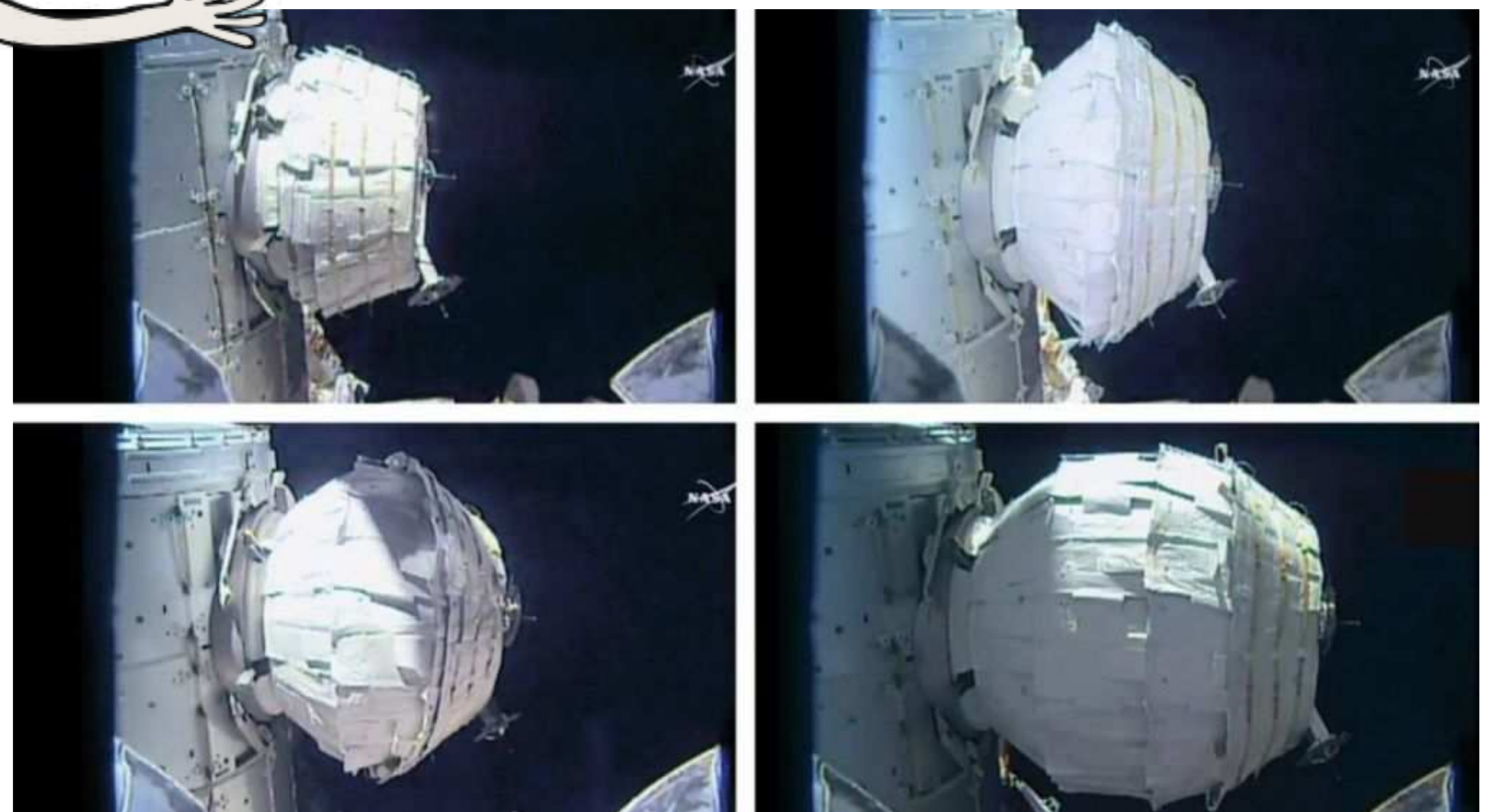
Inflatable habitats were first proposed by NASA in the early 1960s, and in the late 1990s, they created an experimental module known as the TransHab. The TransHab was created as a potential replacement for the astronauts' current living arrangements.

The commercial business Bigelow later acquired the patents for the TransHab's design and quickly created their own inflatable module.

BEAM



The BEAM, an extensible space station module, is currently connected to the International Space Station (ISS), where it was first set up in May 2016.

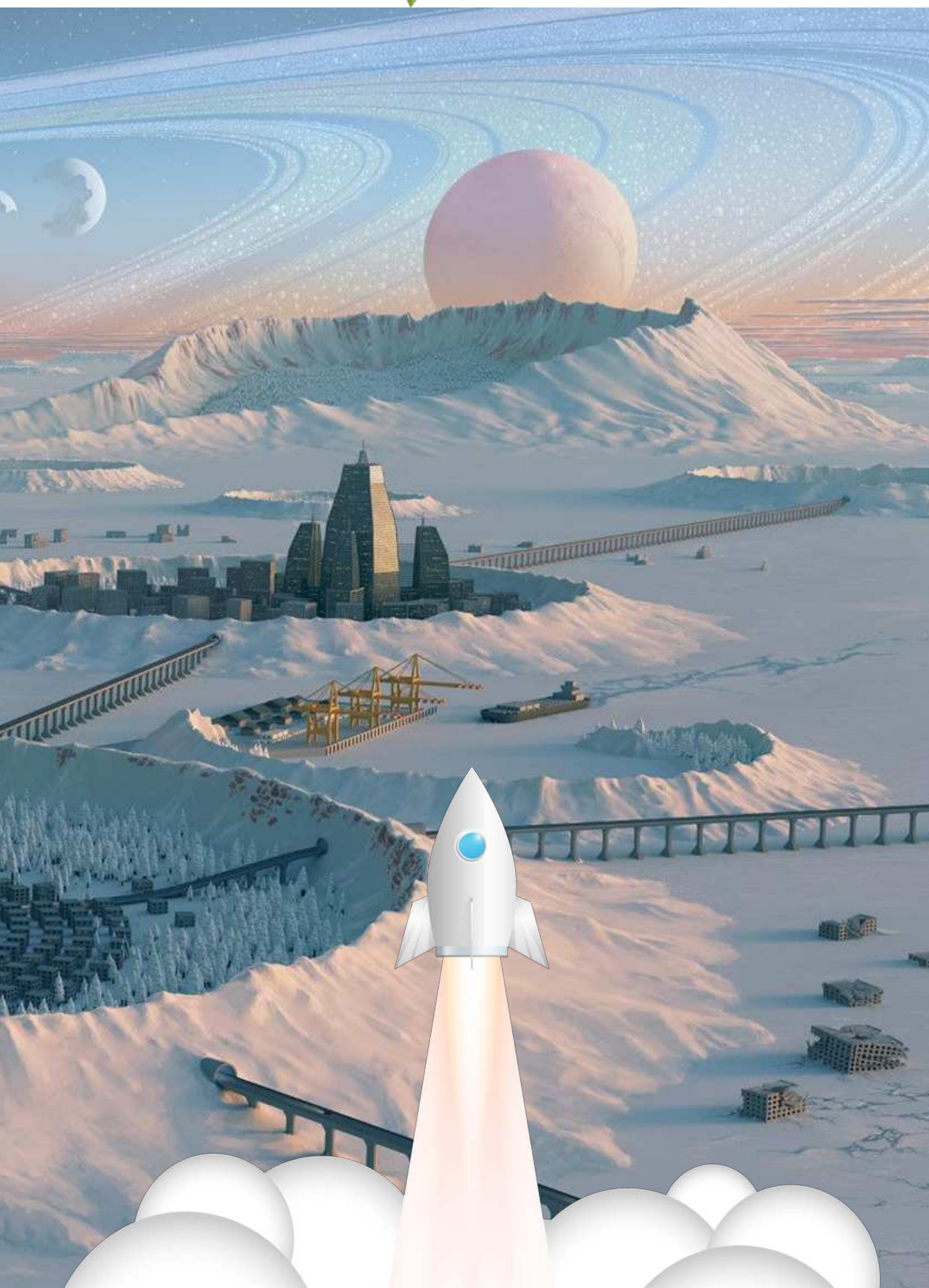


The BEAM's presence in the ISS has now been extended through 2028 from its planned deadline of late 2020. The BEAM's achievement is encouraging for expandable habitats as a key component of upcoming space exploration and living.



Regionally
supplied

TERRESTRIAL ECOSYSTEMS



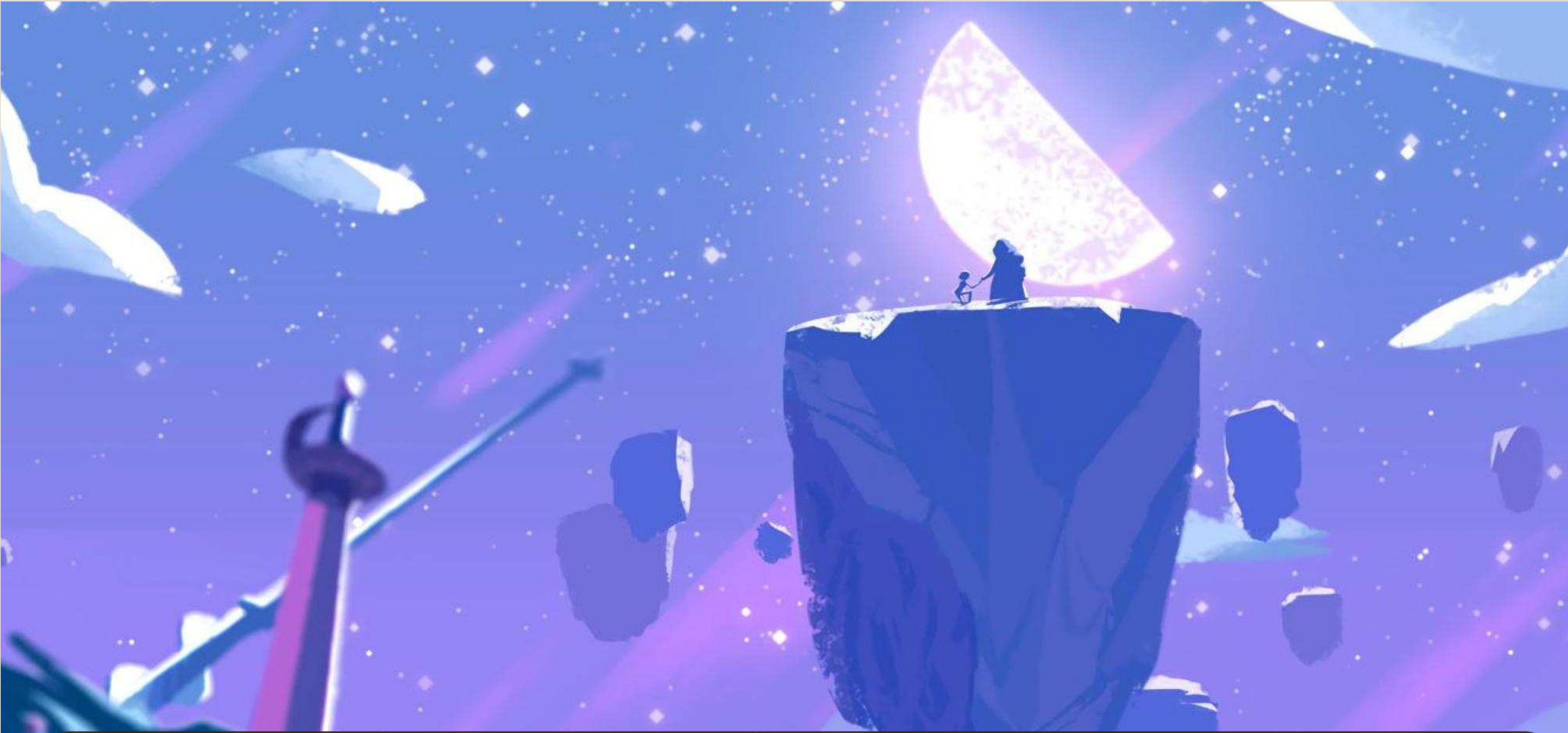
Terrestrial homes are built to be permanently affixed to a planet's surface, so they more closely mimic Earth structures. Although materials supplied from Earth can be used to build terrestrial homes, engineers are working hard to find a means to convert planetary resources into building materials.



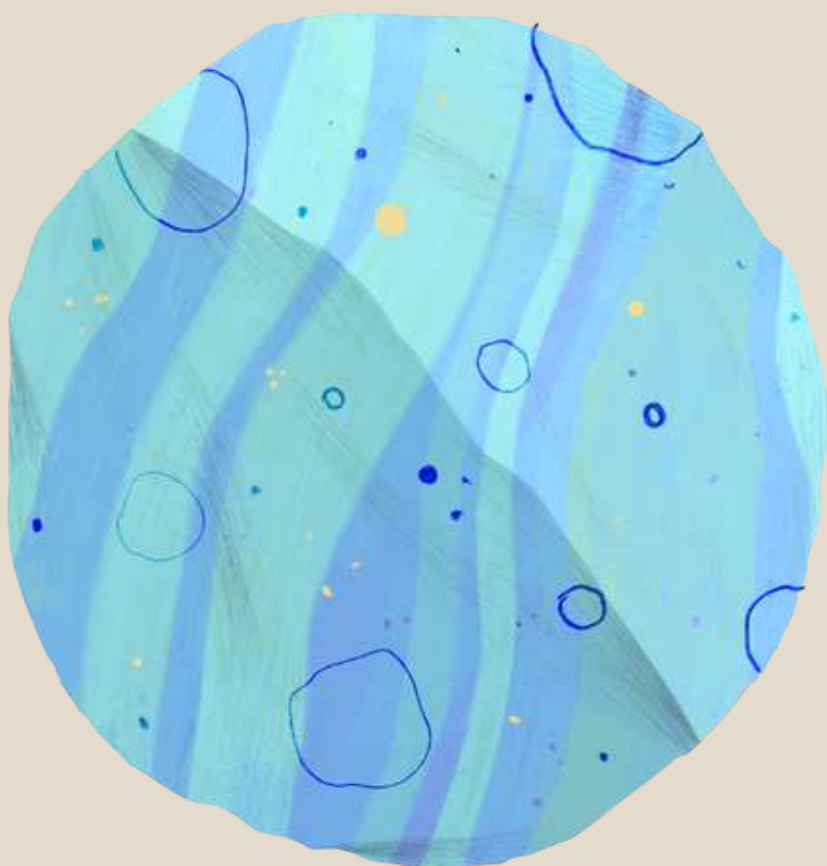
Locally sourced habitats might be challenging because many of the materials aren't safe for human exposure.

For instance, the dust on Mars is poisonous to people, and other minerals on other planets might not be as suitable for use in construction as those on Earth.

Engineers are experimenting with ways to print structures using materials from Earth on other planets. Even while no techniques have yet been perfected, preliminary results from a competition to duplicate 3-D printing on Mars are encouraging.



The Lunar Base and the Mars Ice House are two envisioned terrestrial dwellings.



The Moon Base

NASA has disclosed intentions to visit the moon once more and establish a lunar base. They made their base's design plans public, but it is still unclear how to assemble it.

The usage of a 3-D printer with lunar materials may be the most effective and appear to be the simplest technique. All of this is to argue that a lunar base created from moon rocks and produced using 3-D technology



The Ice House at Mars

The Mars Ice House won one of NASA's Centennial Challenges, which involved designing a 3D-printed housing for deep space exploration. As they phrased it, their designers used a "follow the water method," with water serving as the main 3D printing ingredient.



It permits a natural, above-ground living environment that uses the capacity of water and ice to filter solar radiation and create natural light, much to how earth-sheltered homes make use of natural light.



CHAPTER 3

FUTURE CONSTRUCTION MATERIALS RECYCLING AND REPURPOSING MATERIALS

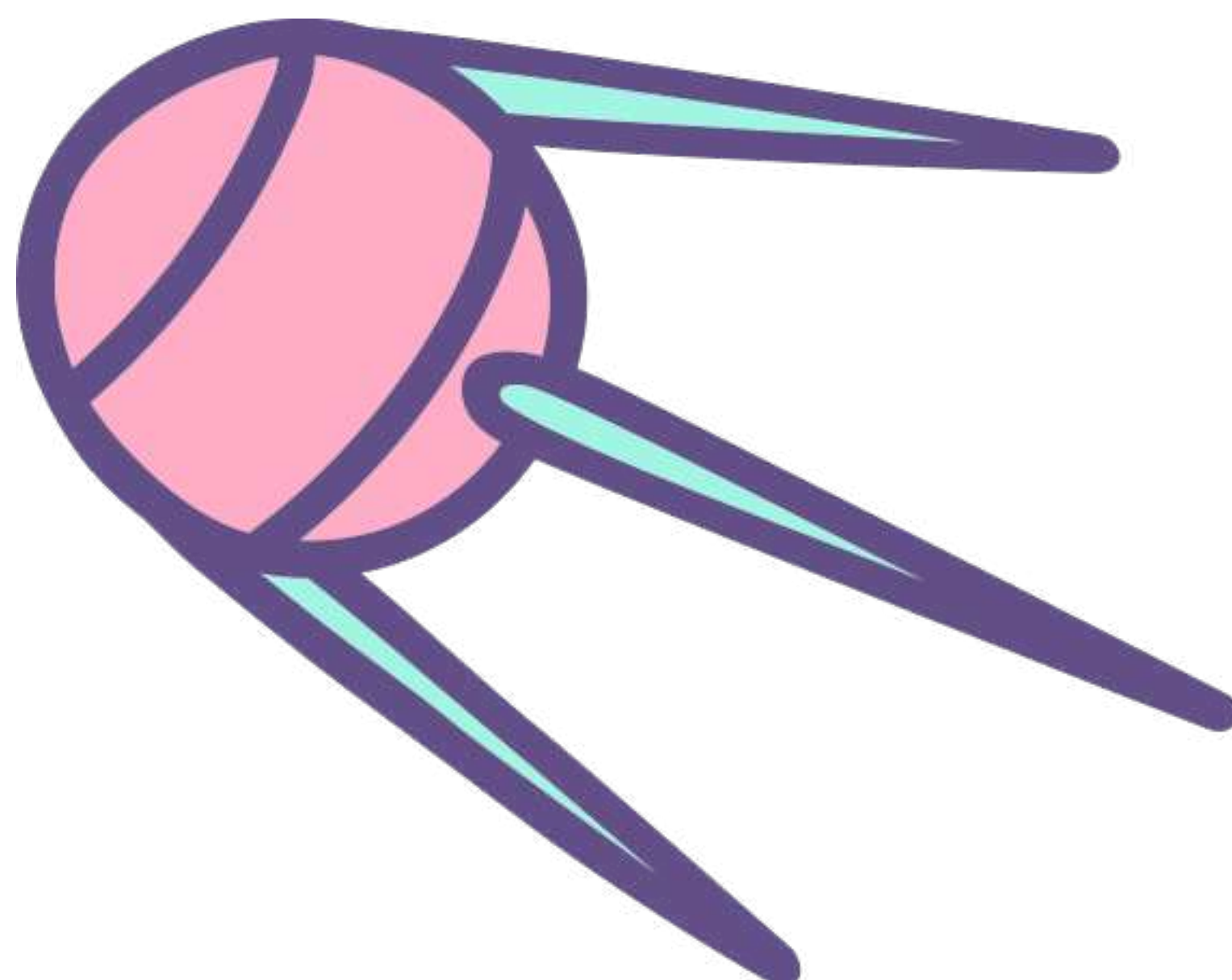


Recycling and repurposing materials found on-site have gone a long way, but there is still plenty to be done. Many of the issues that can arise when building in space will be resolved by futuristic building materials. Here are some of the more intriguing ones:

1) Construction of concrete spaces

2) Graphene is used in space construction materials.

3) Space Construction Projects



SPACE





[1] CONSTRUCTION OF CONCRETE SPACES

A National Space Society study suggests that concrete might be a suitable material for manufacturing in space. A lot may be accomplished with reinforced concrete, especially since moon dust can be used in place of one of the two constituents in concrete (aggregate), making the final product stronger.

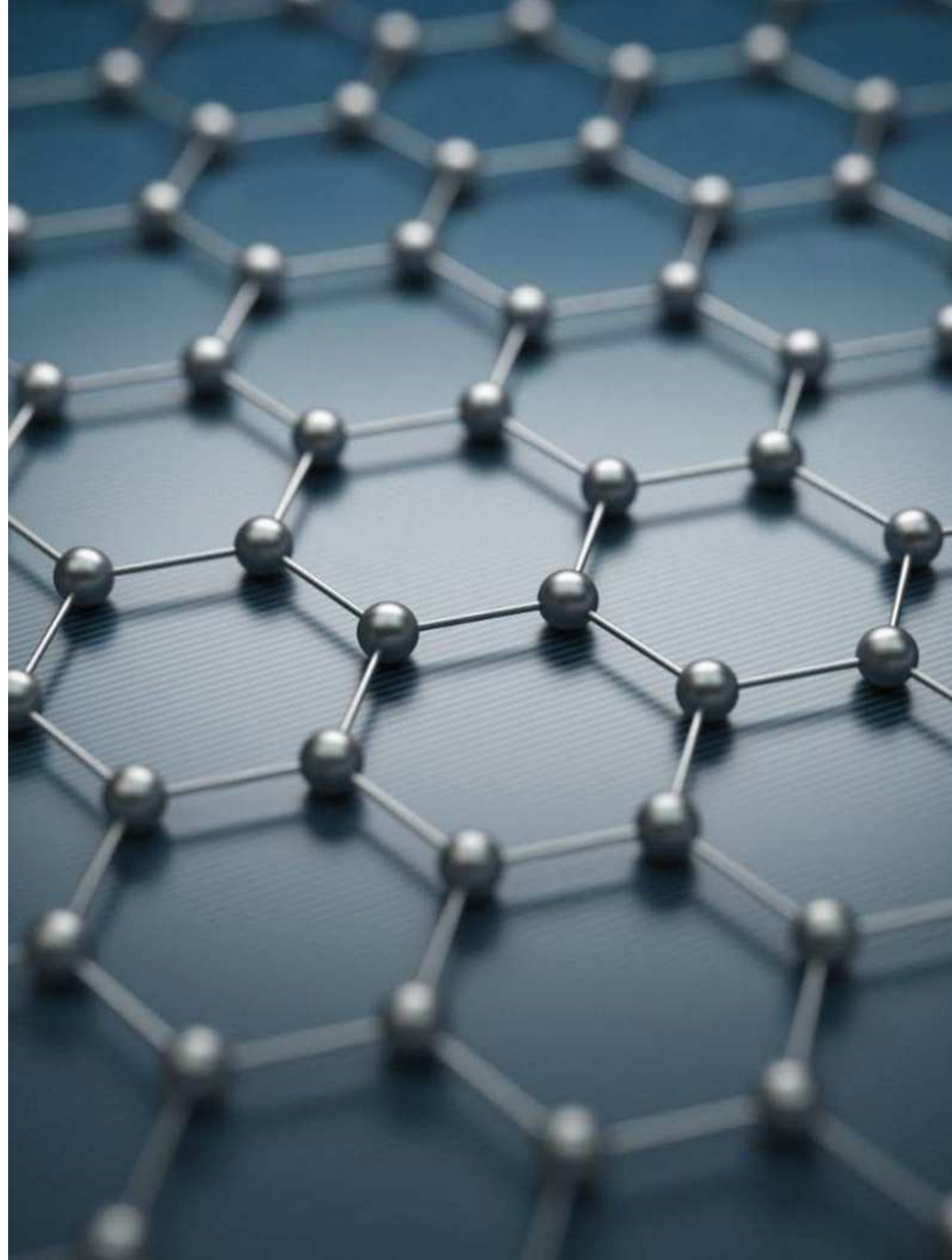
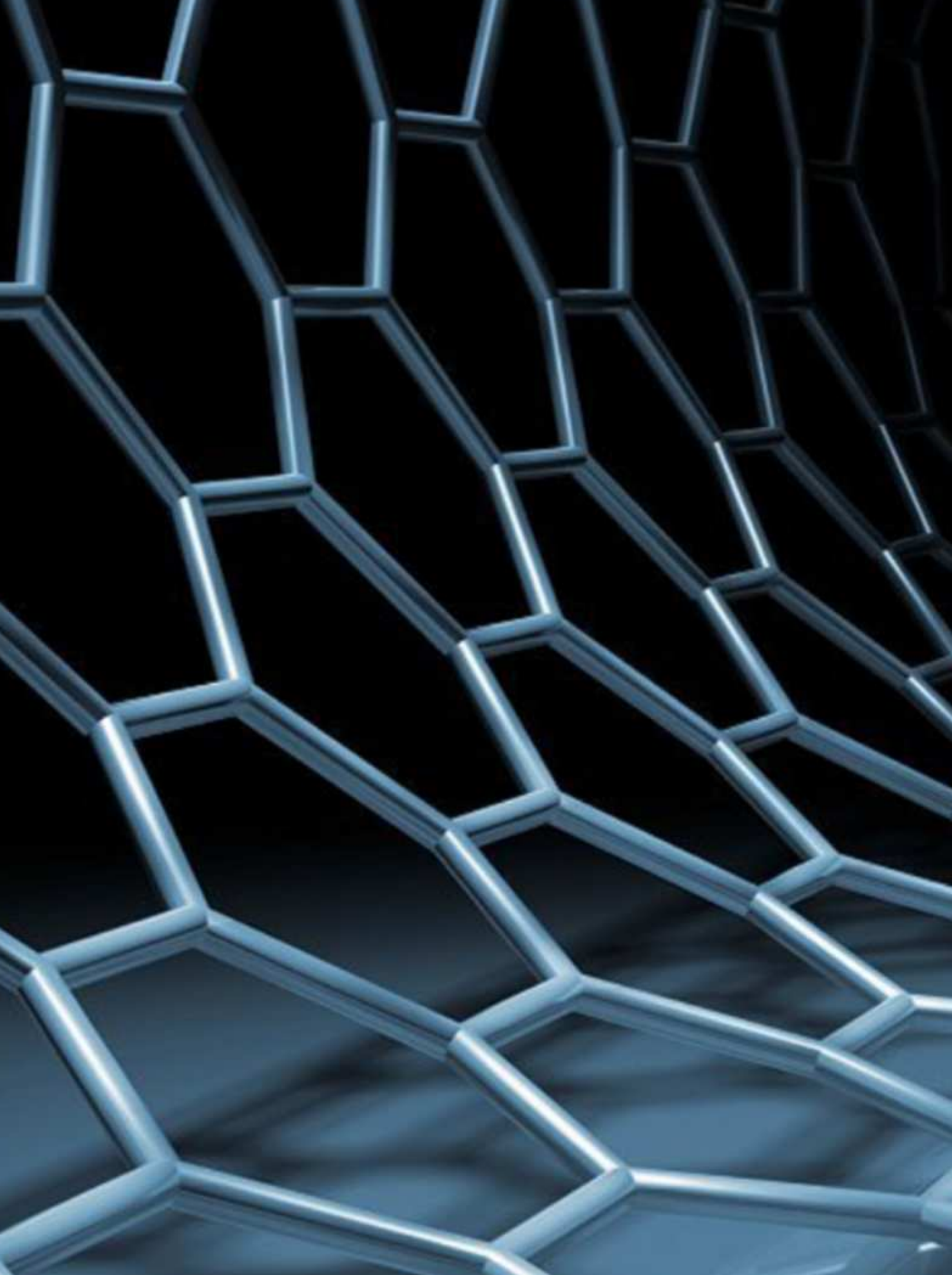
Concrete starts to seem like an affordable and very practical material for space development when innovations like self-healing concrete and light-generating concrete are becoming practical.

Materials for building spacecraft out of transparent aluminum that's clear

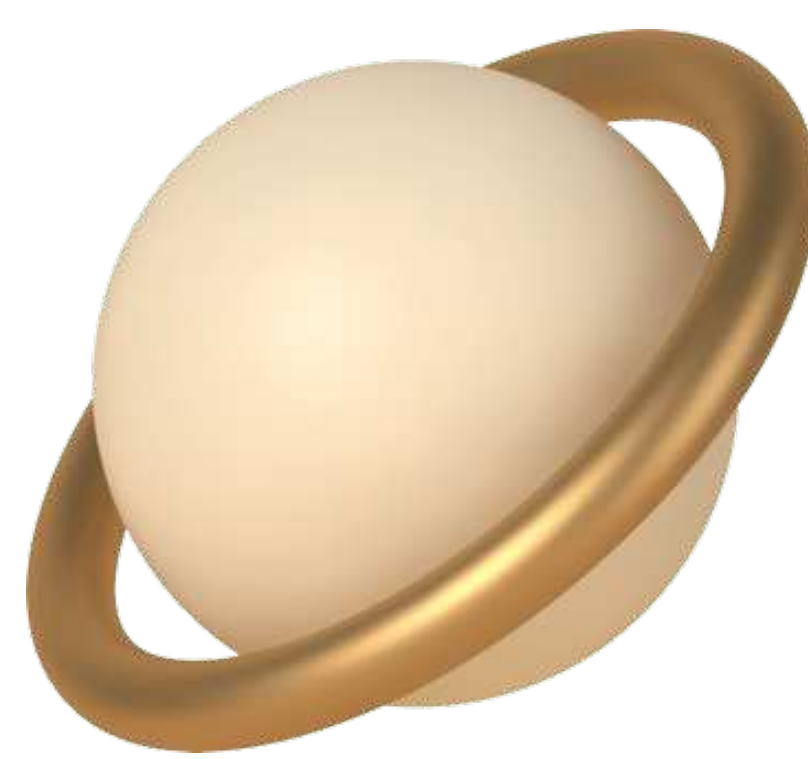
One of the most promising materials for use in space manufacturing is transparent aluminum. It is an oxidation, corrosion, and radiation-resistant ceramic alloy that is 85% tougher than sapphire.

Astronauts may experience issues with space radiation, although transparent metal can offer significant radiation shielding.





GRAPHENE IS USED IN **space construction materials.**



Amazing substance graphene has great use in a variety of projects. It is a carbon that was 3D printed and has 200 times the strength of steel while still being substantially lighter. It would be simpler to take it to space and use it to construct a range of tools, vehicles, and structures due to its small weight

Space Construction Project

Numerous initiatives have already started using the various techniques and resources described above. It's a testament to how far everything has gone even though some of them may simply be in pre-production.

Three of the most important projects are as follows:

1]Space Station International (ISS)

2]The Mars colony

3]The Lunar Gateway

According to NASA, the station's components were built on Earth and then sent into space to be initially put together by astronauts using:



INTERNATIONAL SPACE STATION

[ISS]



The construction of the ISS required a significant investment in space architecture. The main part of the International Space Station was built for nearly 20 years, and it was finished in 2011.



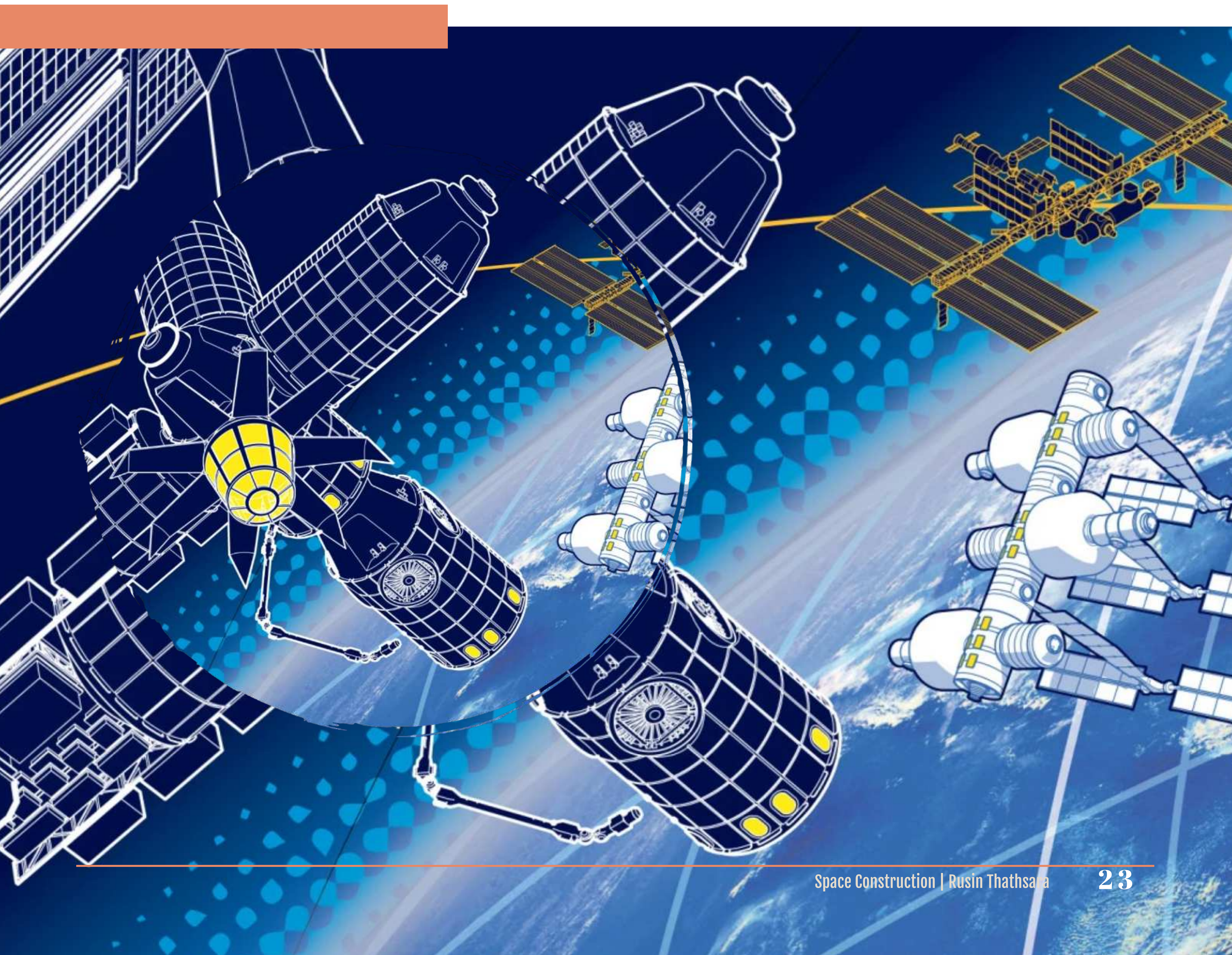
I S S

The construction of the ISS required a significant investment in space architecture. The main part of the International Space Station was built for nearly 20 years, and it was finished in 2011.

According to NASA, the station's components were built on Earth and then sent into space to be initially put together by astronauts using:

The Gun Grip Instrument

The European Robotic Arm from the ESA is among the upgrades and additions currently being made to the BEAM's Canadarms Attachment. The Russian portions of the ISS will be put together using this connector, and it will also be used to transfer small cargo from the space station to the outside while in orbit.



THE MARS COLONY

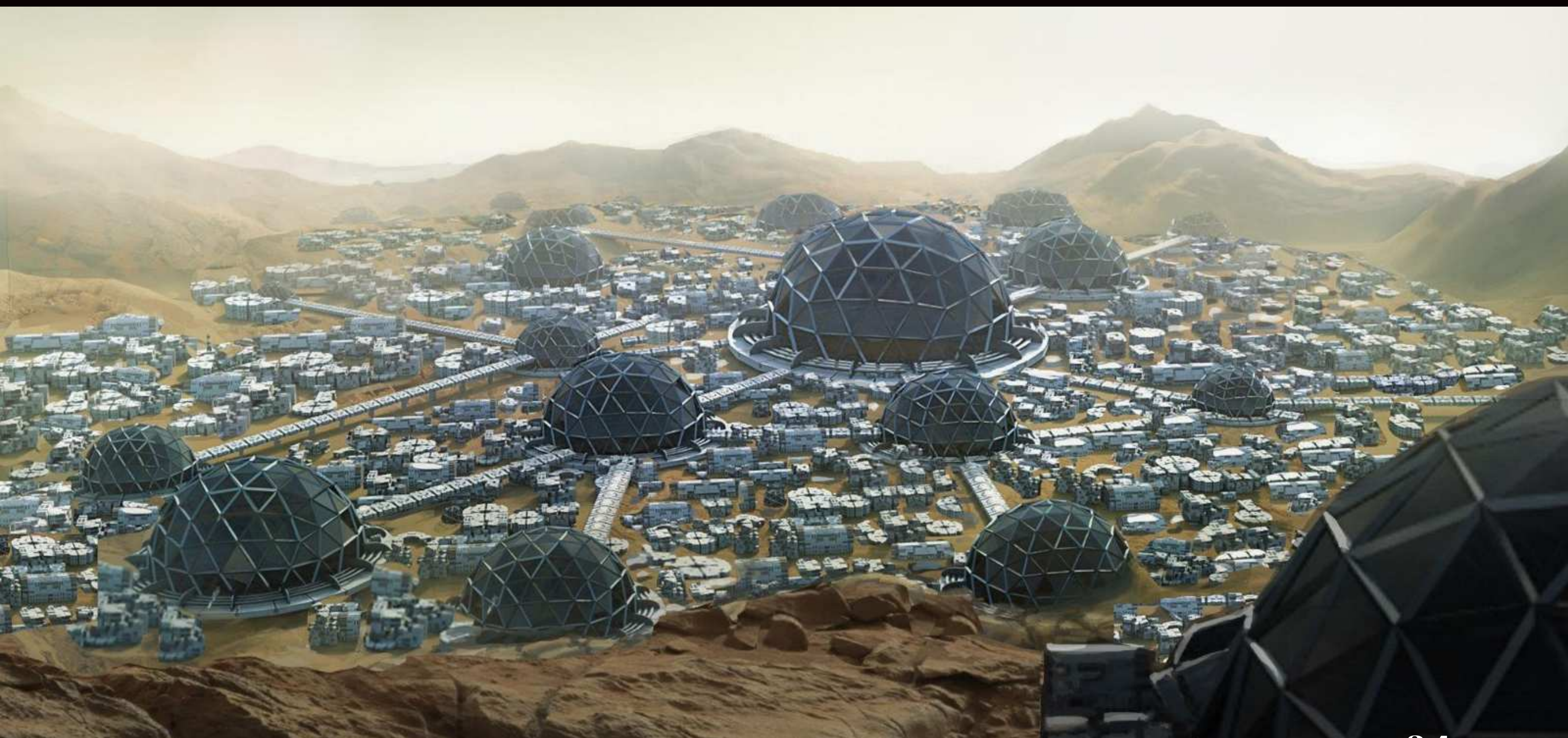


Since almost the moment of the red planet's discovery, many people have entertained the thought of establishing a colony there.

There is no doubt that Elon Musk wants to visit Mars, and his organization, SpaceX, intends to establish a colony there in 2022. The base and colony will first be built using ships. The colony's building will then start.

Various plans are now being considered to establish a Mars colony, including:

The Ice House at Mars using in-situ resources to create bricks for building 3D printing with recycled, transported, or in-situ materials

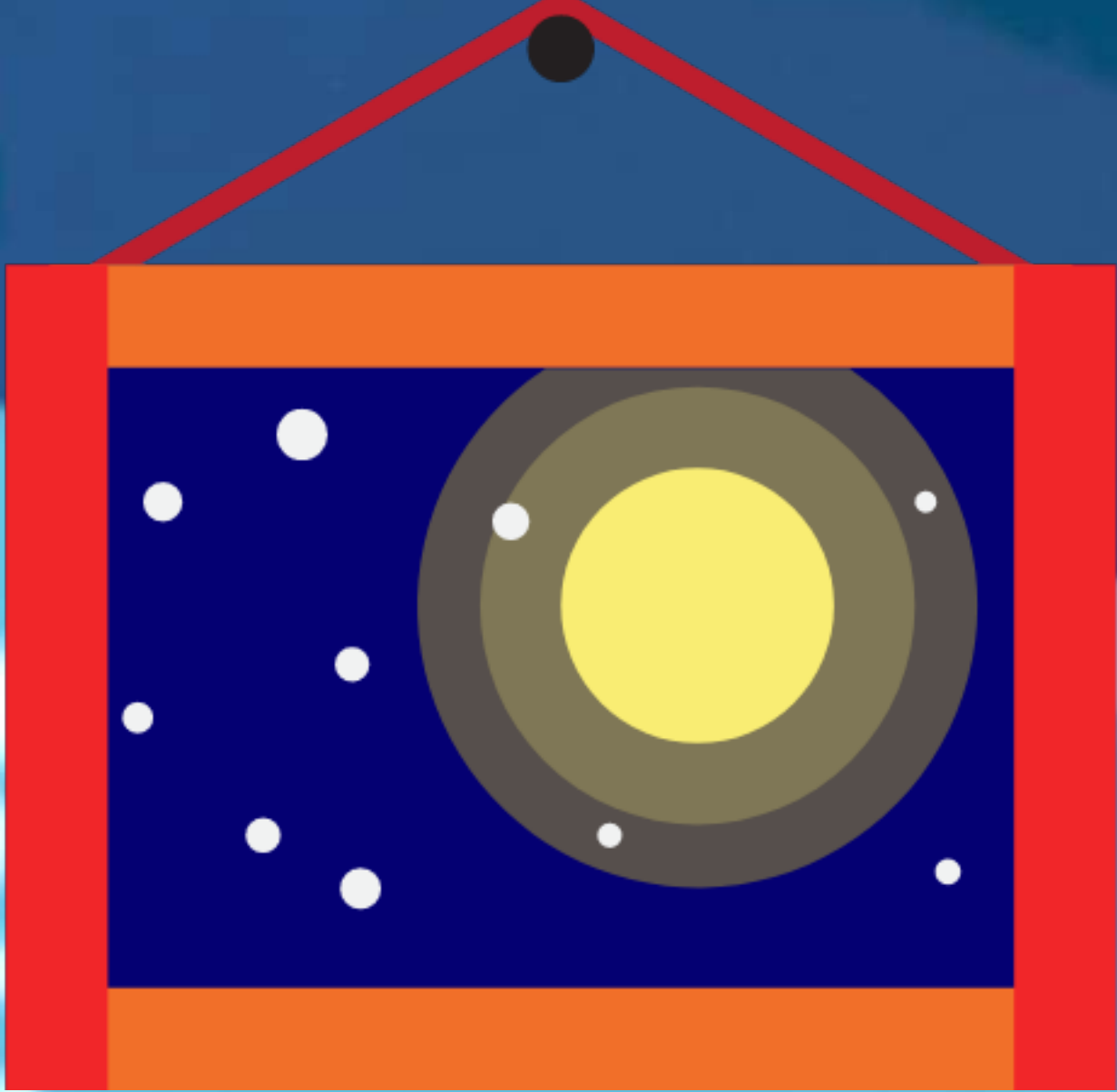
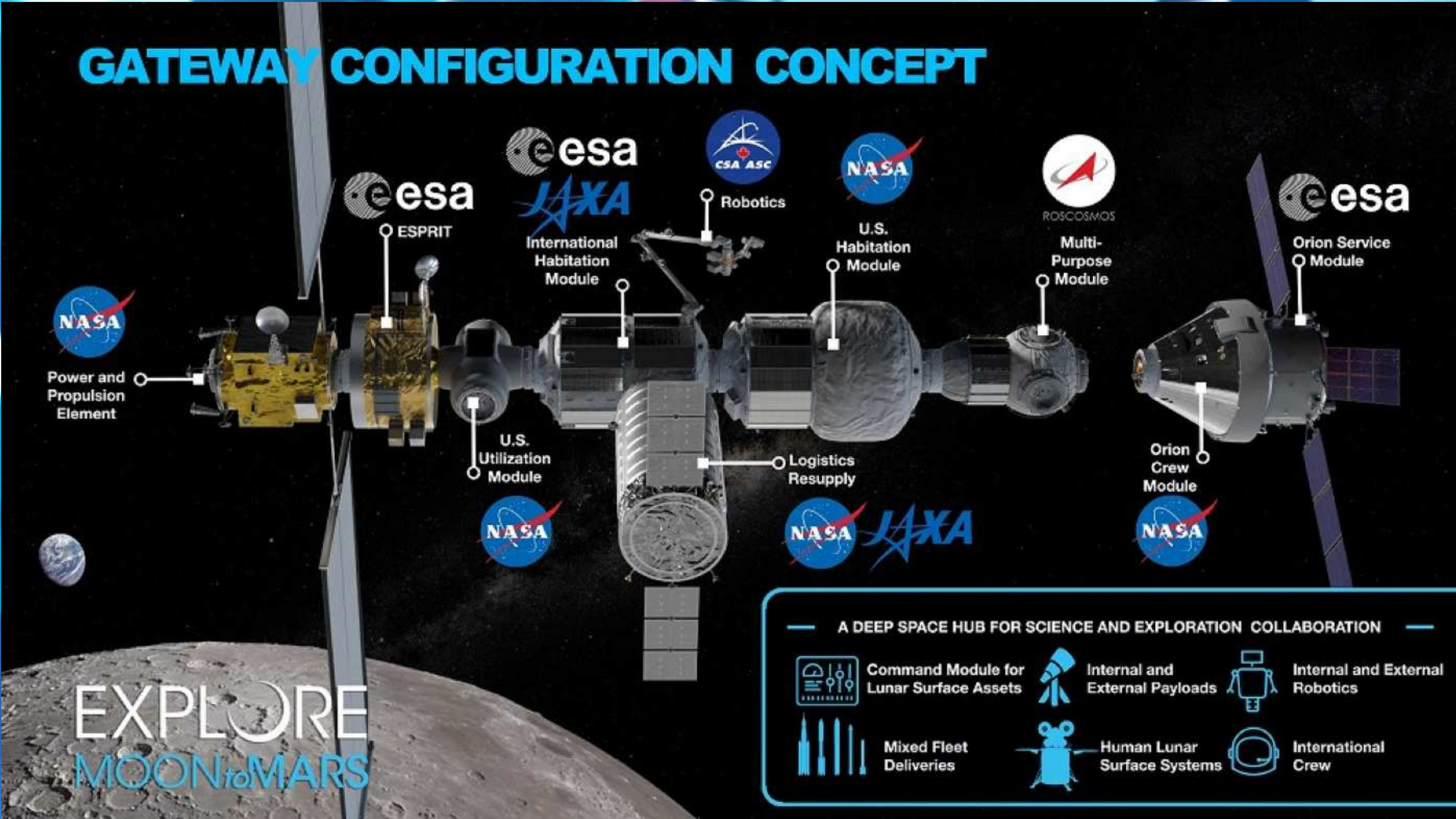


THE LUNAR GATEWAY

The Gateway, a new NASA spacecraft with a variety of labs, living quarters, and docking ports, will serve as an astronauts' temporary residence and workplace. The objective is to construct it over the course of at least five rocket launches, launching all the station's components into orbit and constructing as they arrive.

Through a collaboration between many businesses and international organizations, substantial portions of the Gateway will be launched up into space for automated assembly. Even if not everything will be constructed in space, the construction will commence sometime in 2022, which is a monument to how far design and construction of what effectively amounts to an office space has progressed.

Just as people are currently creating structures beneath the surface of the ocean, the idea of inhabiting space isn't as far off as it once would have looked. In fact, preparations to populate other planets are already in motion, therefore it is already happening. Once everything is official, there will be plenty of business for the building sector, and even though space and Earth are not particularly similar, the necessary construction abilities can be used to space architecture.



Chapter 4

Importance of Space Construction

We will examine the fascinating area of space construction as part of our World Space Week program. Space construction is a significant reality, not simply sci-fi fiction.

The equipment, the materials, and how construction may be done in zero gravity are just a few of the significant problems that space construction faces.



Understanding what we can do beyond the Earth depends on our ability to master construction in space.

Our space activities are restricted to what we can launch into space with a rocket since we can't develop in space. However, with space construction, we can build complete structures and original ideas in space and on brand-new planets.

This is necessary, for instance, in order to build whole new structures on Mars or repair space stations.

The concept of building space homes and colonizing new planets has been discussed for some time. Construction of the space is necessary to do this.

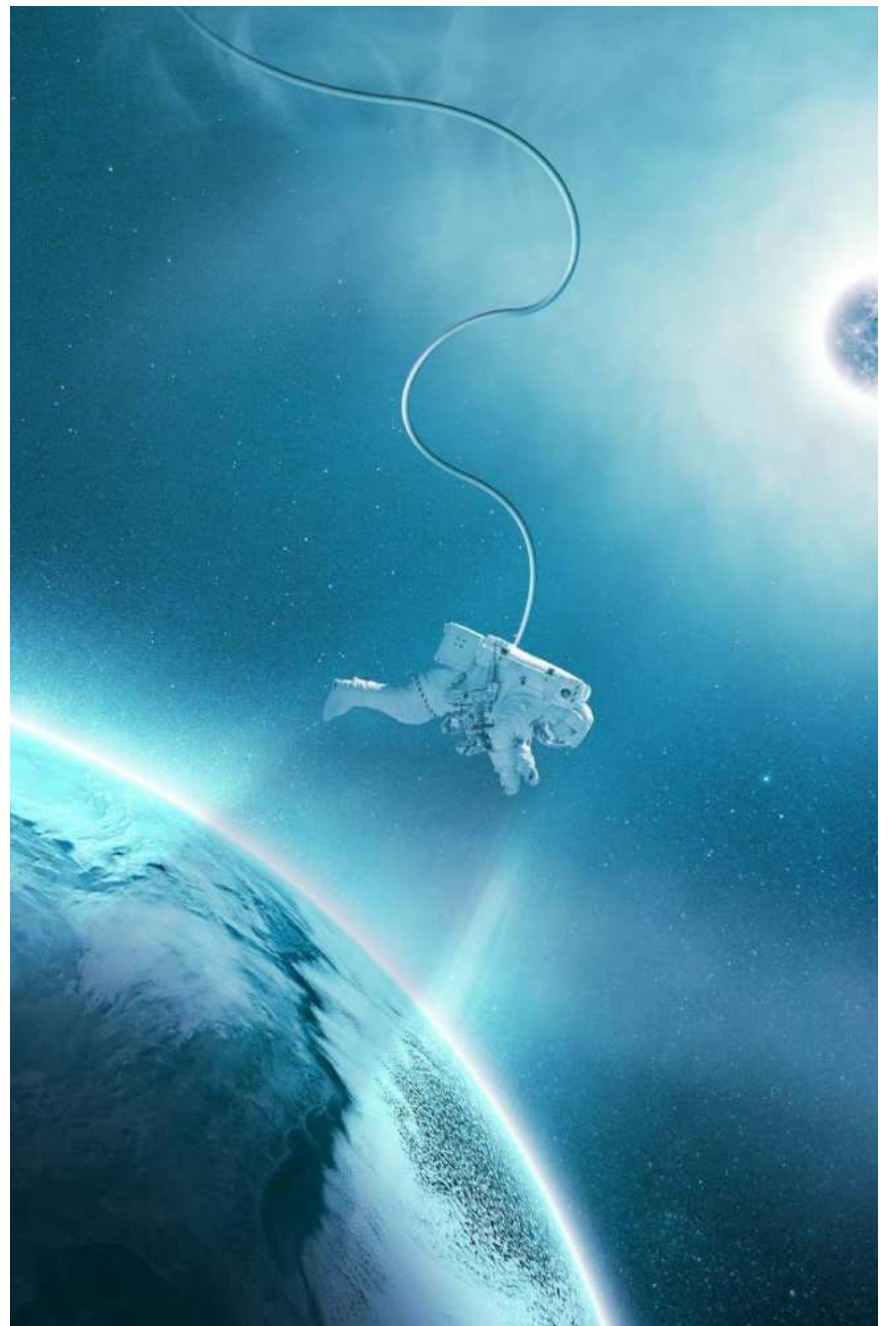
Expandable habitats and terrestrial habitats are the two main types of habitats used in space.

Challenges of Space Construction



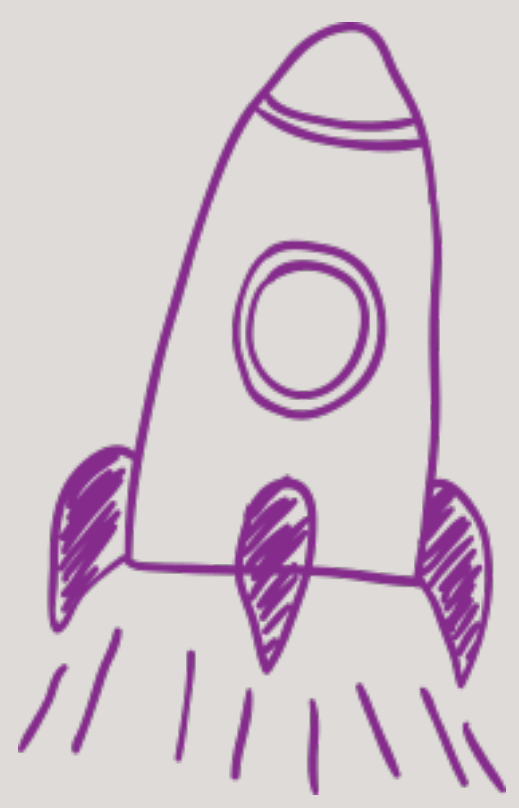
Based on the components of the space mission, we may group the difficulties in building in space. The first stage of the transportation system for trips to the Moon or Mars can be used to highlight difficulties including launching against the force of gravity, navigating in space, isolating personnel, and the possibility of a landing accident. Then, after arriving on the planet, there are a number of technical challenges, such as creating a habitat, producing electricity, or utilizing numerous systems. The problems are still present, though! Additionally, astronauts must safeguard the habitat against asteroids and space debris, the latter of which consistently poses a hazard to multinational space stations due to its large population.

Yet another formidable obstacle comes to mind when we consider space exploration—one that is not directly related to a mission. Cost is the issue. We must raise automation, boost reusability, improve safety, and cut the cost of entry to space if we want to make space a sustainable and accessible environment for people.



...

...



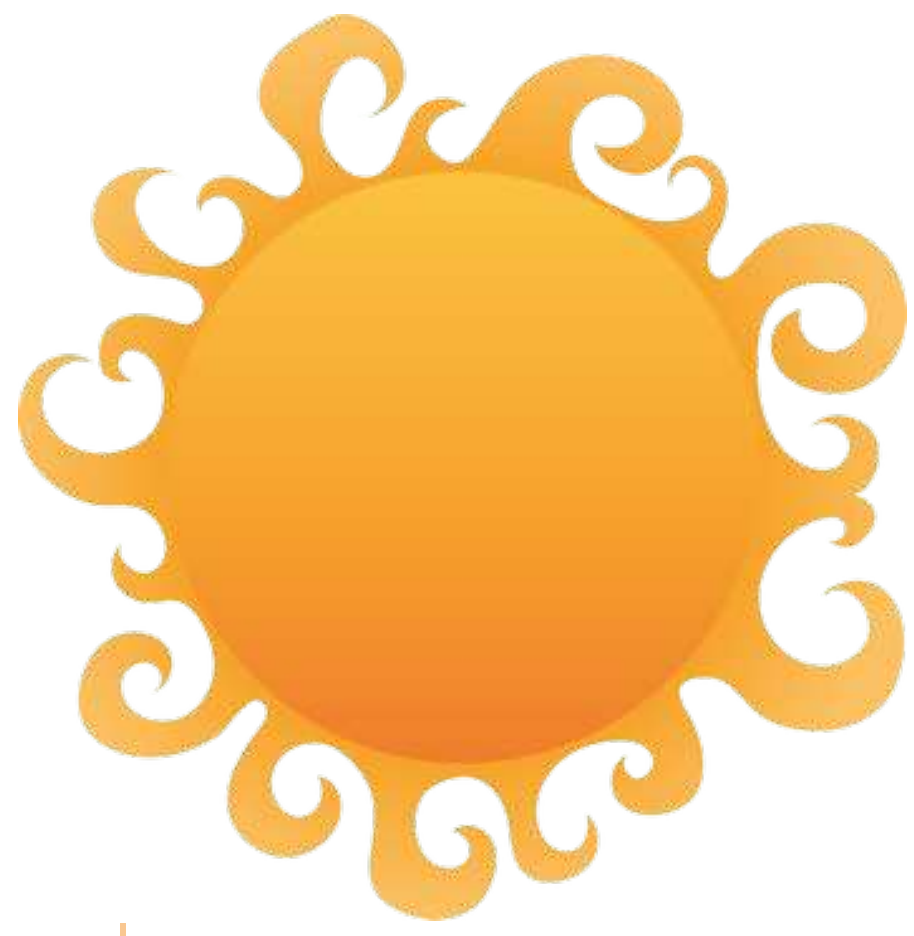
HOW CAN WE MAKE IT POSSIBLE TO LIVE IN SPACE?

We must take into account a number of factors to make it possible to live in space (on Mars or the Moon). Specialists in the space industry must reimagine every step of the building process in light of the aforementioned difficulties. Since we cannot carry all the materials there from Earth, buildings must be constructed using natural, locally available materials. Building in various environments and with gravity require new construction methods and equipment.

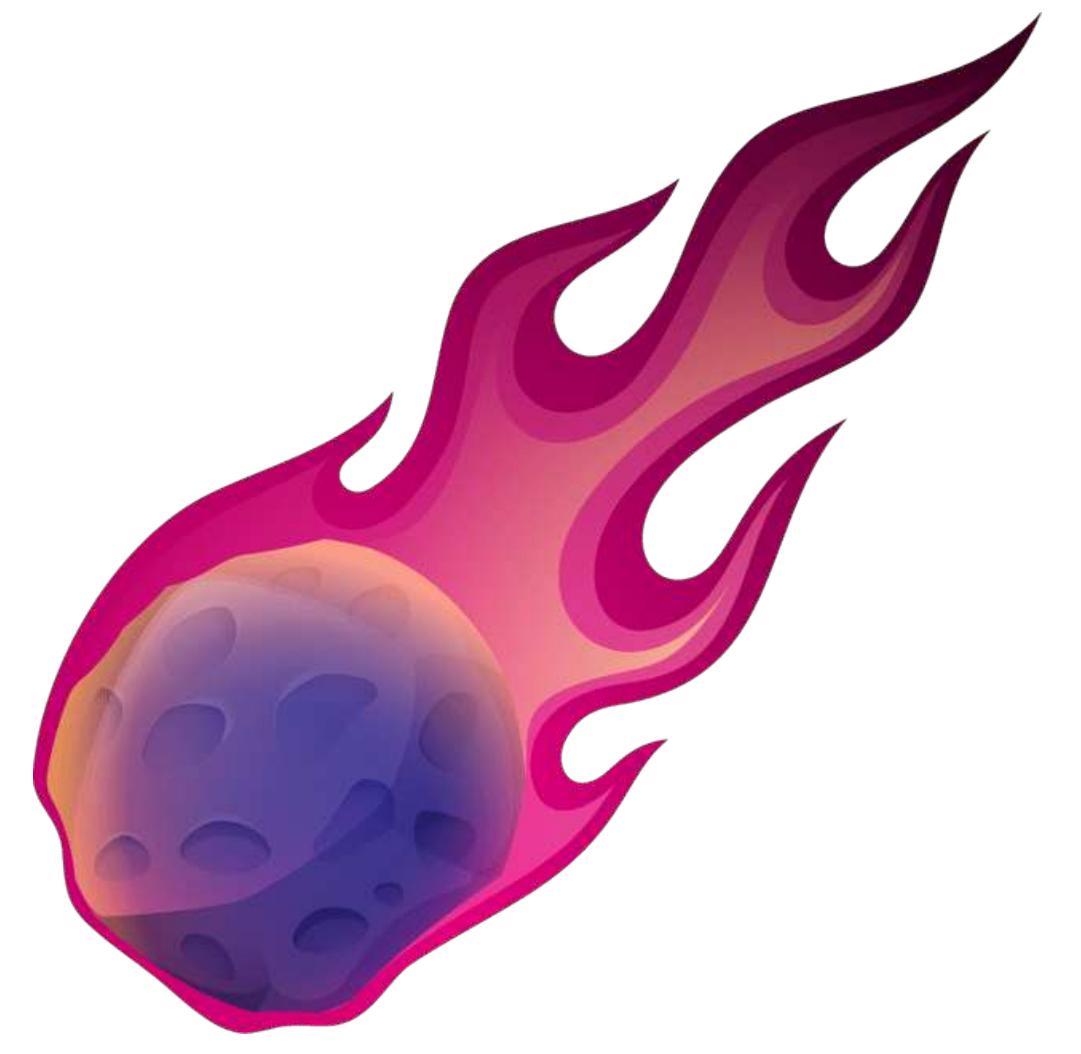
Their dwellings must be fully constructed and functional when humans set foot on Mars.

They haven't been in microgravity for six months, so we can't expect them to start building houses right away. However, due to the communications' 12–20 minute delay caused by the distance between Earth and Mars, we are now unable to directly manage the building equipment from Earth.





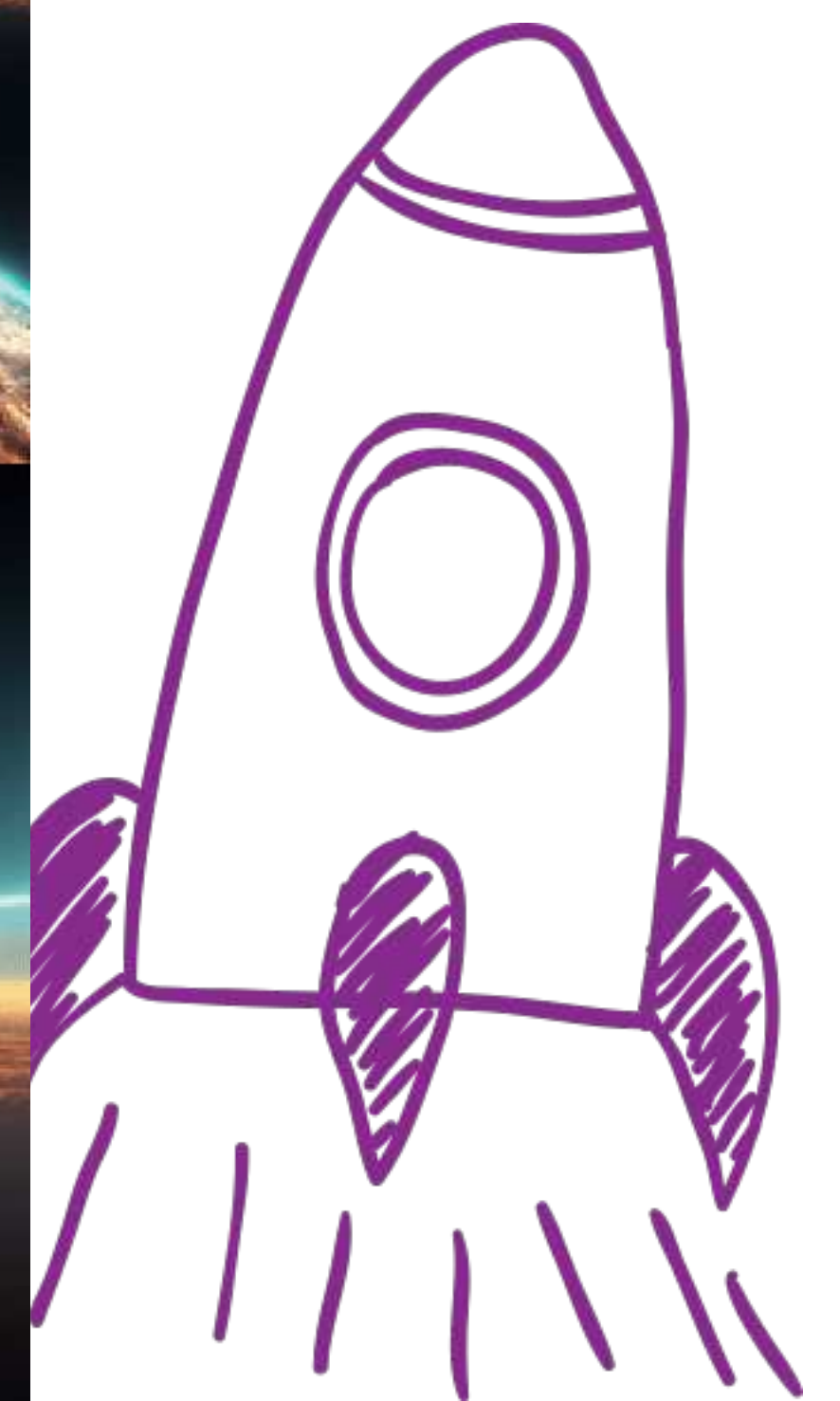
How Can a Proper Space Habitat Be Designed?



Space architecture, which draws on a variety of disciplines including sociology, psychology, and physiology, is the theory and practice of designing and constructing for space. The main goals of any space habitat are to safeguard the crew from the environment outside and to provide a comfortable, earthlike environment for them. They should be simple to maintain or repair because there is no opportunity for error.

(Aastha Kacha)

But how can we create an environment similar to Earth in a location completely unrelated to what we are accustomed to on Earth? A space architect must integrate many different elements to do that. A space habitat must include all necessary tools, laboratories, and systems in addition to meeting human requirements with accommodations for sleeping, using the restroom, communicating, working out, and even having a greenhouse.



chapter 5



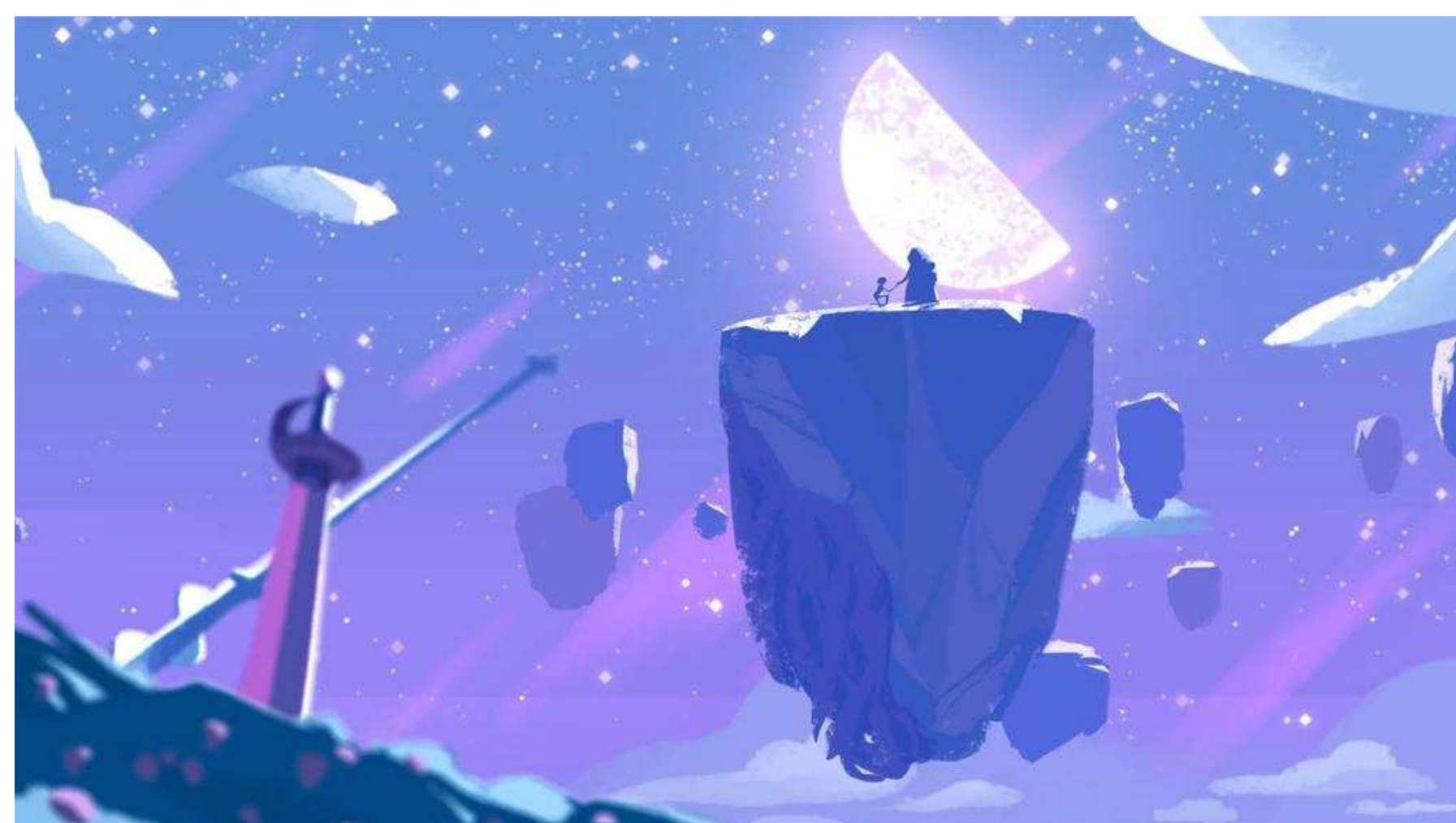
Space vs Earth Architecture

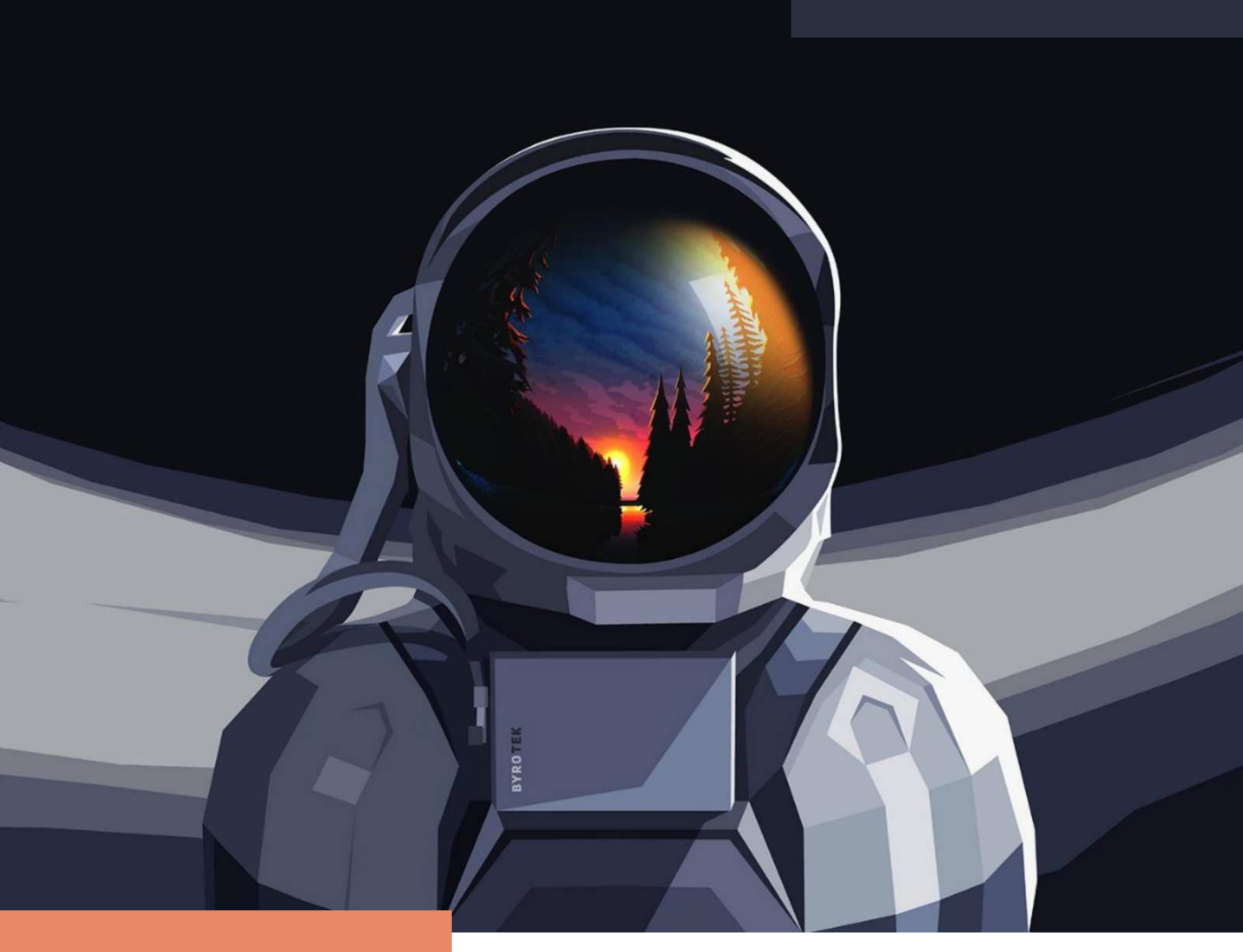
Space (orbital or deep space) and planetary are two distinct construction environments in space architecture that are characterized by significantly varied environmental circumstances.

The first one has a close relationship to construction in space, such as at the International Space Station. Any building project must take into account factors like microgravity, continuous exposure, space radiation, micrometeoroids, and debris.

Construction in planetary space may at first look resemble construction on the ground. There are also significant variations, though, such as the gravity ratios ($1/6$ on the Moon vs. $1/3$ on Mars) or ongoing radiation exposure.

We must consider the psychological factor in both types of space architecture because astronauts (as well as future habitat residents) would have to endure months or even years without human contact.





HOW ARE EARTH CONSTRUCTION AND SPACE CONSTRUCTION RELATED?

Space architects are forced to find some creative solutions because they are designing and building in a very unusual and challenging environment (lack of water, different gravity, risk of asteroids). Even while some of them might not end up being utilized during the space flight, they can be extremely useful on Earth and improve the speed and sustainability of building.

Everything will need to be recycled on Mars in order to generate resources for human existence to continue, which will eventually aid in the development of cutting-edge recycling systems on Earth. Additionally, studying about building habitats on Mars teaches us vital lessons about how to construct with less water (which can be essential in terms of environmental changes on Earth).

Earth construction and space construction are related despite their apparent distinctions. There are numerous parallels between a construction project and a space mission. Both of them make use of cutting-edge tools including 3D printing, BIM, and drones. Additionally, big data and artificial intelligence are modern trends. Both industries are becoming more and more dependent on online tools that digitize the procedures. Transferring these vital technologies and data leads to deeper innovation and a quicker transition to the building industry's future.

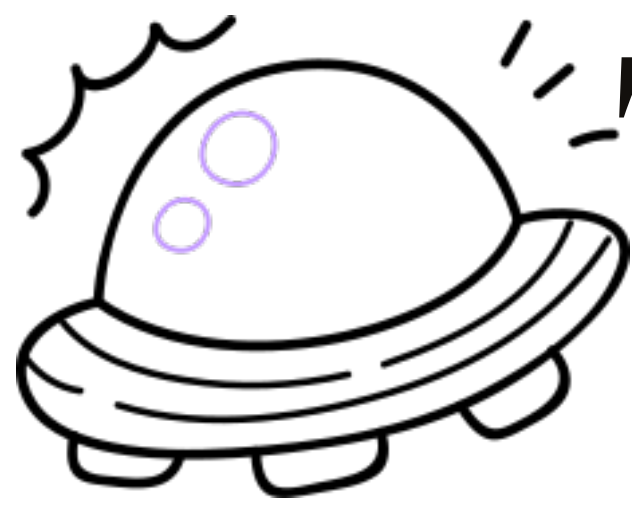
IS THERE A COMPETITION BETWEEN **GREEN** BUILDING AND CONSTRUCTION IN SPACE?

Looking ahead at the building sector is undoubtedly exciting at the moment. Who would have imagined, a few generations ago, that the builders and architects of today would be thinking about the very future of humanity?

The discussion is focused on two types of building: construction for outer space and environmentally friendly, sustainable building.

Recent years have seen an unheard-of growth for both. For instance, the market for green building materials is anticipated to reach roughly \$574 billion in value by 2027, growing at a rate of 11.3% CAGR. And just NASA has planned out how they will spend up to \$150 billion over the next eight years pursuing missions to the Moon and Mars, both of which need a major investment in space construction. SpaceX, among others,

Furthermore, NASA alone has planned how they will spend up to \$150 billion over the next eight years in order to pursue trips to the Moon and Mars, all of which necessitate a large investment in space construction. Businesses like SpaceX and Blue Origin might increase their investments.



The case for space construction



Although the idea of constructing in space is not entirely new, the technology has only lately begun to be seriously researched. This increase in interest is due to a few factors:

The swift advancement of planned lunar and Mars colonization missions by businesses like Space X and Blue Origin.

The need for larger, more potent satellites and space telescopes than what can currently be launched on rockets.

The fervent belief of some, including prominent scientists like Stephen Hawking and Michio Kaku, that the only way for humanity to survive is to travel to other planets.

The issue that unites all three of these motives is that they cannot be fulfilled by creating and launching spacecraft from the earth as we have in the past. The size of the rockets we can launch into space is constrained by gravity. Therefore, anything we wish to create for use in space must either already exist and be able to withstand the jarring journey necessary to get into orbit, or it must be sent up in modules and put together utilizing crude techniques like spacewalking humans and hand tools. Both options are not ideal, particularly for some of the elaborately planned, massive projects we'd like to see.

The issue that unites all three of these motives is that they cannot be fulfilled by creating and launching spacecraft from the earth as we have in the past. The size of the rockets we can launch into space is constrained by gravity. Therefore, anything we wish to create for use in space must either already exist and be able to withstand the jarring journey necessary to get into orbit, or it must be sent up in modules and put together utilizing crude techniques like spacewalking humans and hand tools.

Both options are not ideal, particularly for some of the elaborately planned, massive projects we'd like to see. For instance, at the beginning of 2020, NASA disclosed a deal with Maxar Technologies to launch the 16-foot-long robotic arm known as SPIDER — which will be used to build modular gear in space — into orbit. Assembling a massive antenna array that is more than double the size of what can be launched using traditional methods will be the arm's first duty. Future satellite broadband capabilities, GPS signals, and satellite communications will all benefit greatly from this.

Habitats for people residing on the Moon or Mars, as well as larger, more versatile space stations or spacecraft meant for longer stays in space or perhaps interstellar travel, are further projects that would require new and enhanced space-building technology. China is already building its own orbiting space station, which will take ten flights to complete over the course of two years.

In just the previous few decades, all of these possibilities have quickly transitioned from science fiction to viable options, and building experts all around the world are taking notice.

5.

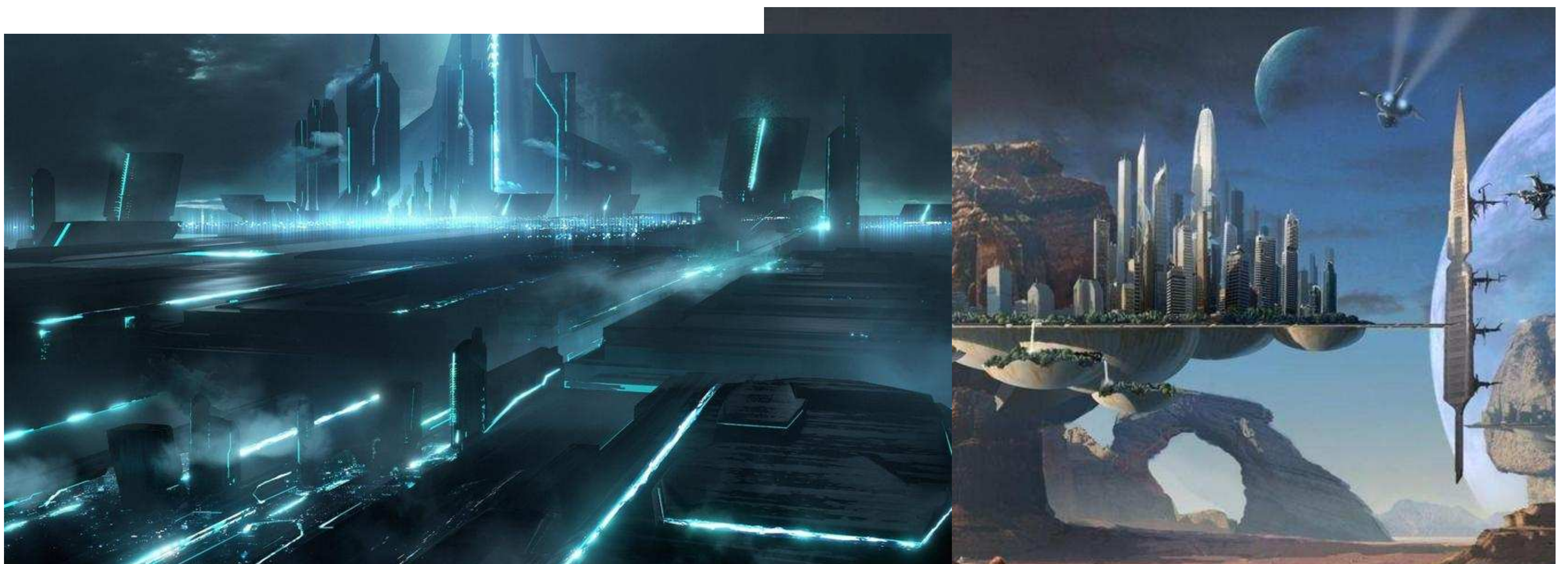


What the doubters believe regarding building in space

Extreme environments will demand novel building materials, some of which are experimental and others of which have not even been created yet (for example, temperature variance and micrometeor collision).

To function in the weightless vacuum of space, almost all of our present construction tools and techniques need to be drastically modified. Some would require a complete reimagining.

In the construction sector, skilled labor is already in short supply. Just consider include astronaut training in the list of application requirements.



[The case for green construction](#)

You are undoubtedly far more familiar with green building and sustainable building practices, and you may already be making some effort in this direction. Although adoption is happening at different rates and levels all throughout the world, the general trend is unquestionably rising, as evidenced by the growth mentioned previously.

This is because compliance and certifications, particularly in developed areas, are becoming increasingly important in commercial development. Companies are under clear societal and legal pressure to support their claims of ecological stewardship, and several huge corporations are impressively setting the standard in this regard.



Scientific Experiments on Space Construction



Space construction refers to the assembly and maintenance of structures and systems in space, including satellites, space stations, and other human-made objects that operate in space. There have been numerous scientific experiments conducted as part of space construction activities over the years.

Some of these include:

Materials Science: In space, microgravity conditions provide an ideal environment for conducting experiments on the behavior of materials and their properties, such as crystal growth, combustion, and fluid physics. This information can be used to develop new materials and manufacturing processes that can be applied on Earth and in space.

Biology and Life Sciences: Space agencies have conducted many experiments on the effects of microgravity and radiation on living organisms, including plants, animals, and humans. These experiments help us understand the impacts of space travel on the human body and develop ways to counteract these effects.

Physics and Astronomy: Space-based telescopes and observatories provide unique opportunities for studying the universe and its phenomena, such as black holes, supernovae, and dark matter. These experiments can only be conducted in space, as the Earth's atmosphere can interfere with observations.

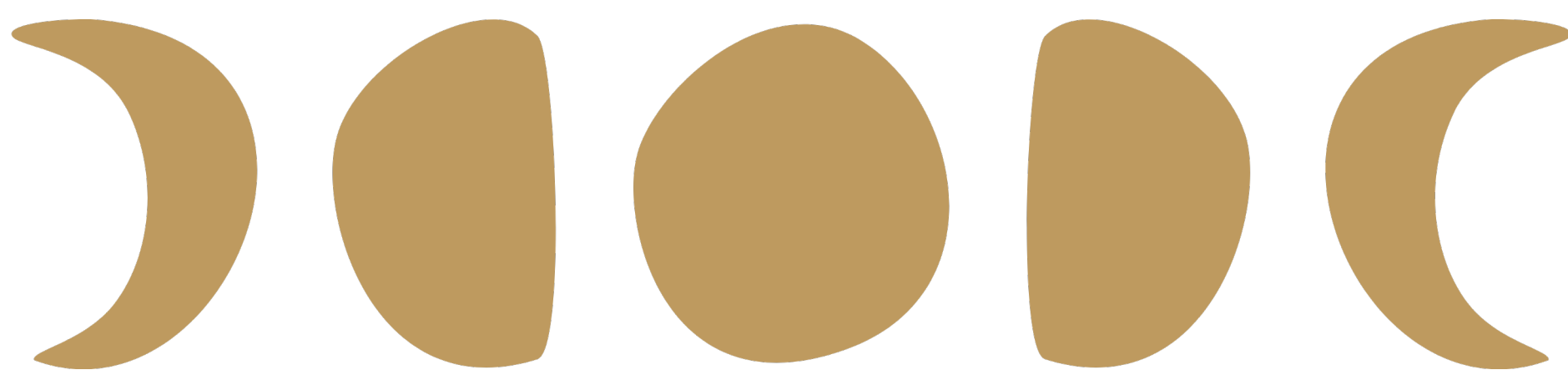
Robotics and Automation: Robotics and automation play a critical role in space construction, as they enable humans to remotely operate and maintain systems and structures in space. Experiments have been conducted to test and improve the capabilities of robots and automation systems for use in space.

These are just a few examples of scientific experiments that have been conducted as part of space construction activities. Space construction provides a unique and challenging environment for scientific research and discovery, and it continues to play a vital role in advancing our knowledge and understanding of the universe and its phenomena.





Secrets of space construction



Space construction is a complex and challenging field that involves many technical, engineering, and scientific disciplines. While many aspects of space construction are well understood and documented, there are also some closely guarded secrets and confidential information that are not publicly available.

Here are a few examples of secrets in space construction:

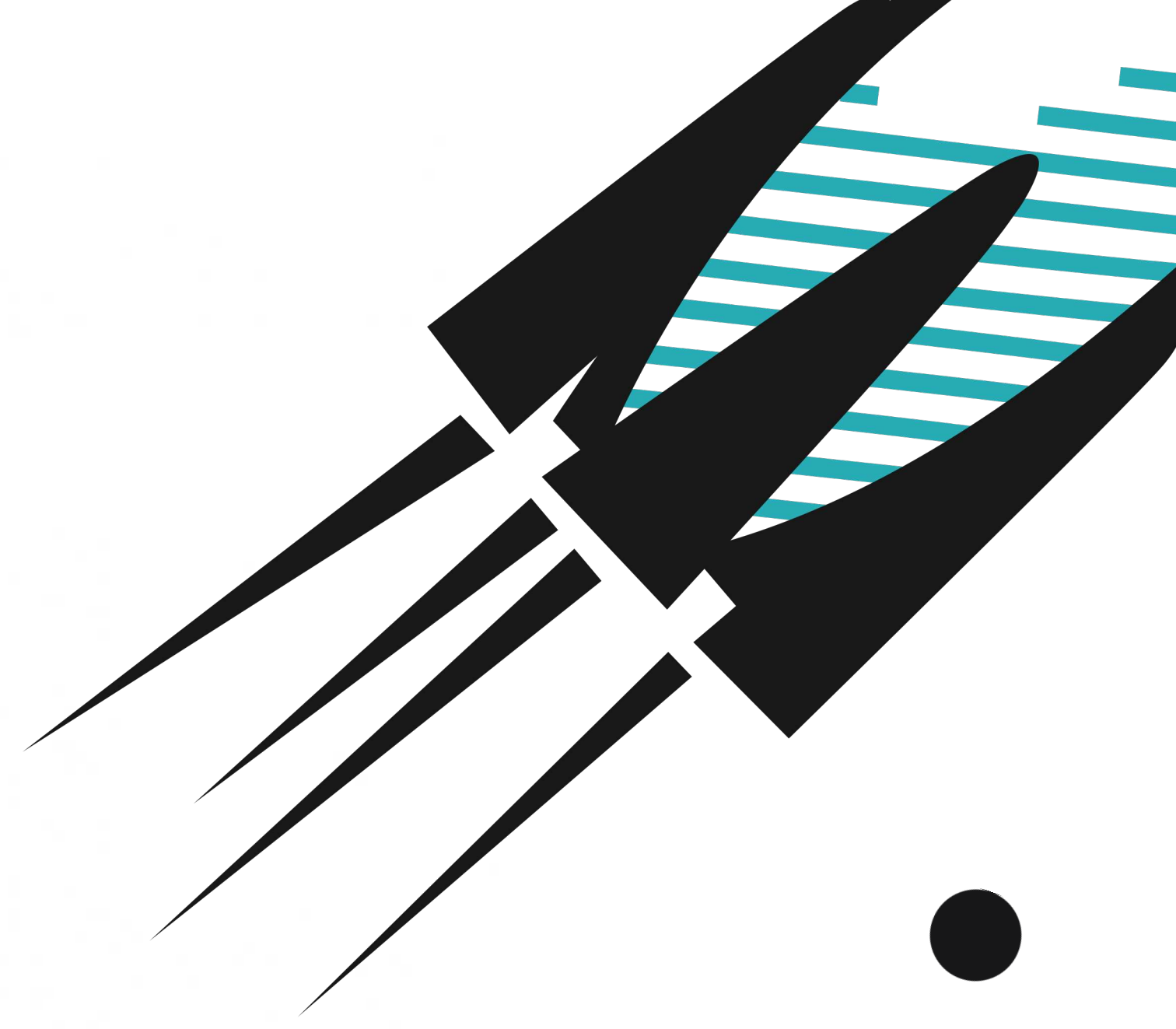
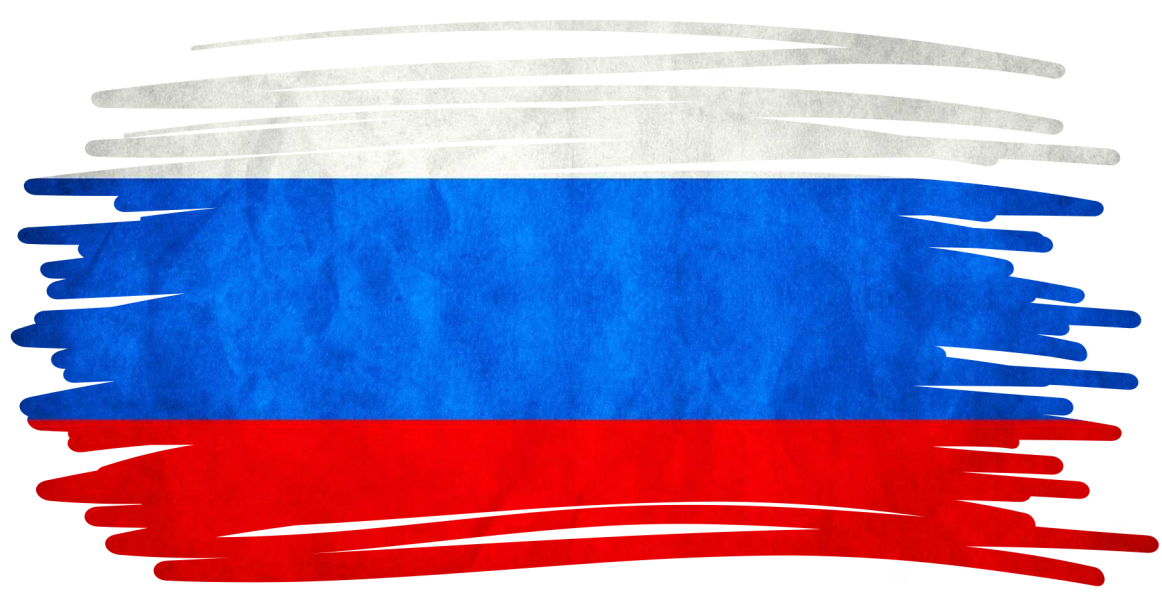
Proprietary technologies: Many space construction technologies, such as spacecraft systems and components, are protected by patents and trade secrets. Companies and organizations involved in space construction often guard the details of their technologies and designs to protect their competitive advantage.

Classified missions and payloads: Some space missions and payloads may be classified for national security reasons, and their details may not be publicly disclosed. This is particularly true for military and intelligence-related missions, which may involve sensitive technologies and information.

Sensitive data: Space construction involves collecting and transmitting large amounts of scientific and engineering data, some of which may be confidential or proprietary. This data may be protected by security measures and strict access controls to prevent unauthorized disclosure.

Secret launch facilities: Some countries have secret launch facilities that are not publicly disclosed, and their locations and activities may be closely guarded.

These are just a few examples of the secrets that are associated with space construction. While much of the information and knowledge related to space construction is publicly available, there are also some aspects of this field that are closely guarded and protected.



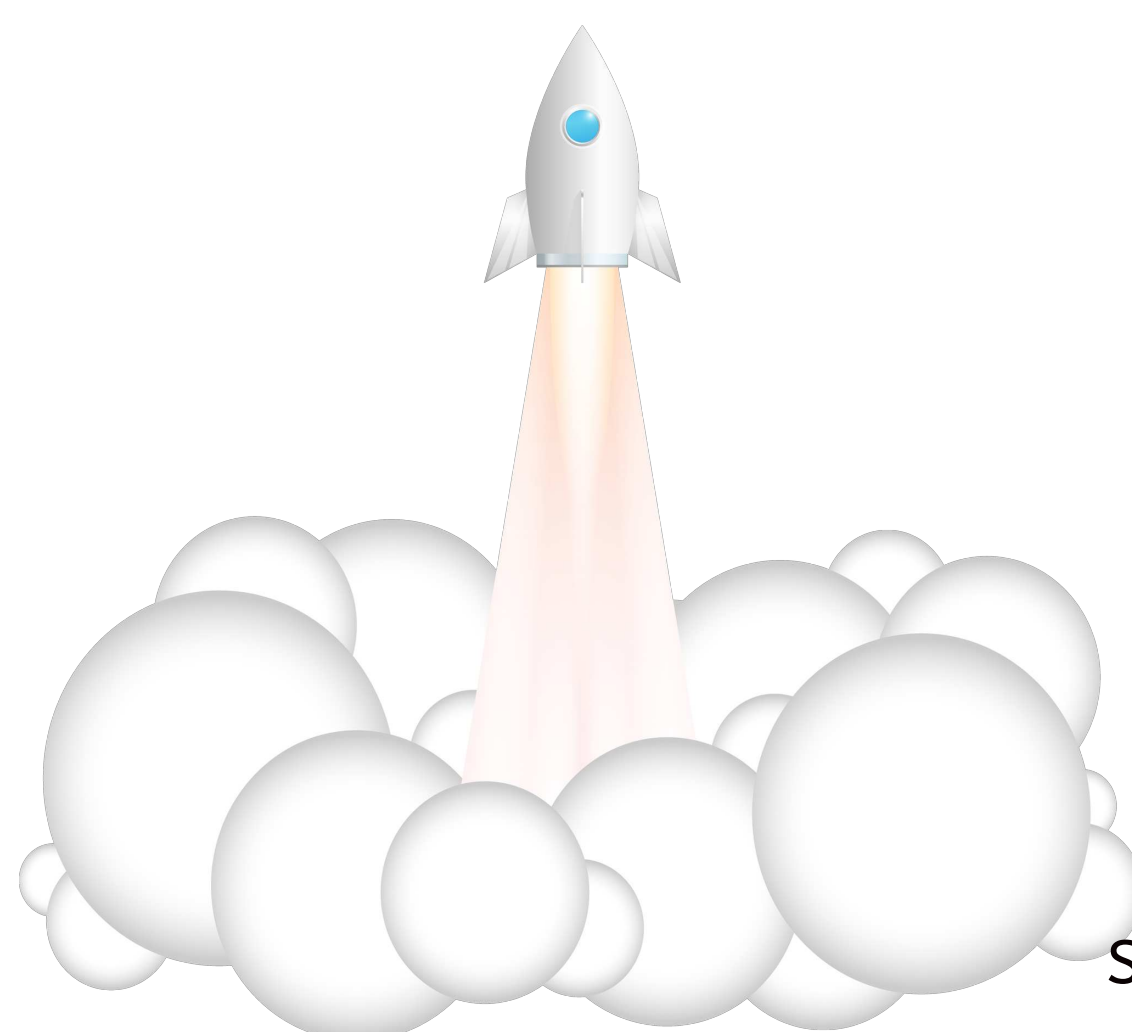
Russian Astronomy in Space Construction

Astronomy has been a field of interest for Russians since ancient times.

With the development of space technology, the Soviet Union became one of the pioneers in space exploration and construction. In this literature review, we will examine the contributions of Russia to the field of astronomy in space construction.

The Soviet Union launched the first artificial satellite, Sputnik 1, on October 4, 1957, which marked the beginning of the space age. This event created a significant impact on the scientific community, inspiring the development of new technologies and the establishment of numerous research institutions. The Soviet Union continued to lead the way in space exploration, launching the first human, Yuri Gagarin, into space in 1961.

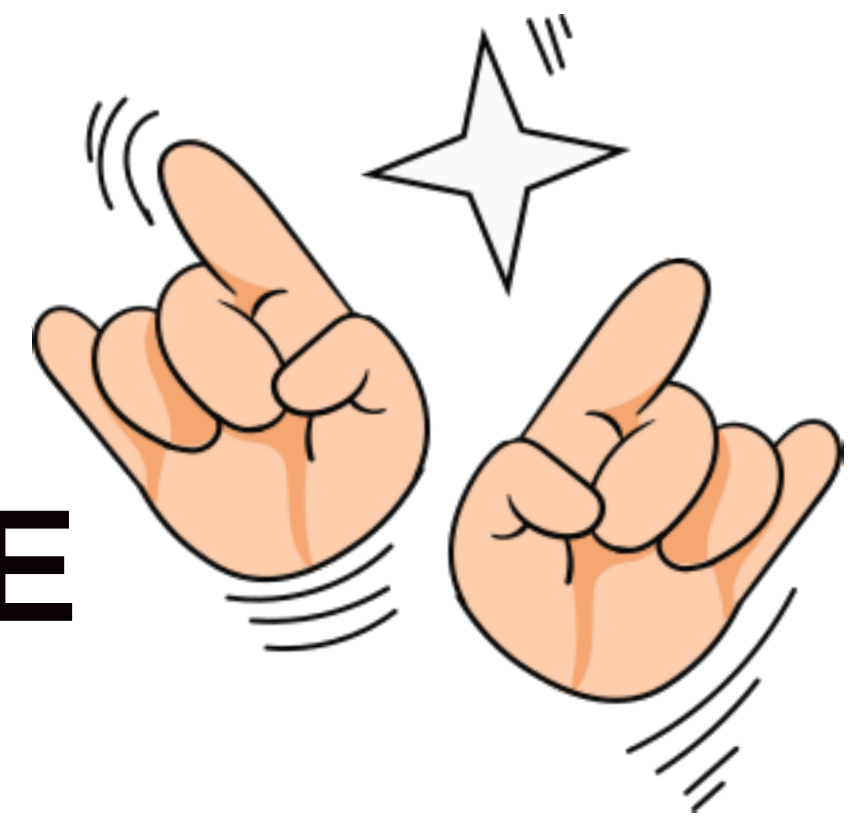
In the following years, the Soviet Union developed several space-based observatories, including the Venera and Vega missions to study Venus and the Zenit missions to observe the Earth's atmosphere. These missions provided valuable data on the physical and atmospheric characteristics of these planets, contributing to the understanding of our solar system.



In recent years, Russia has continued to contribute to the field of astronomy in space construction. The Russian Space Agency, Roscosmos, has launched several missions to study the sun, including the Interhelioprobe and the Spectrum-X-Gamma missions. These missions have provided important data on the sun's magnetic field and corona, helping scientists better understand the processes that drive solar activity.

In addition to its contributions to solar astronomy, Russia has also been involved in the construction of several international space-based observatories. The Russian Space Agency has played a key role in the development of the Spektr-RG observatory, a collaboration between Russia and Germany, which will study the large-scale structure of the universe. Furthermore, Russia has also been involved in the development of the International Space Station (ISS), a joint project between several space agencies including NASA, the European Space Agency, and the Japanese Aerospace Exploration Agency. The ISS provides a unique environment for conducting scientific experiments in microgravity and studying the effects of long-duration spaceflight on the human body.





COSMONAUT IN FUTURE SPACE



In the future, space exploration will likely become even more advanced and sophisticated, with cosmonauts playing a crucial role in this advancement. Space agencies, such as NASA and Roscosmos, will continue to train and send cosmonauts to the International Space Station (ISS) for extended missions, as well as to the Moon and potentially Mars for shorter missions. These cosmonauts will conduct scientific experiments and help maintain the ISS, as well as gather valuable data and experience for future deep-space missions.

Advances in technology will also lead to the development of new spacesuits and life support systems, allowing cosmonauts to safely explore new frontiers. Additionally, private companies, such as SpaceX, are working to make space travel more accessible, which may lead to an increase in the number of people traveling to space in the future.

As we continue to explore space and expand our understanding of the universe, the role of cosmonauts will continue to evolve. They will be instrumental in leading humanity towards a more sustainable future in space and unlocking its full potential for scientific discovery and exploration.

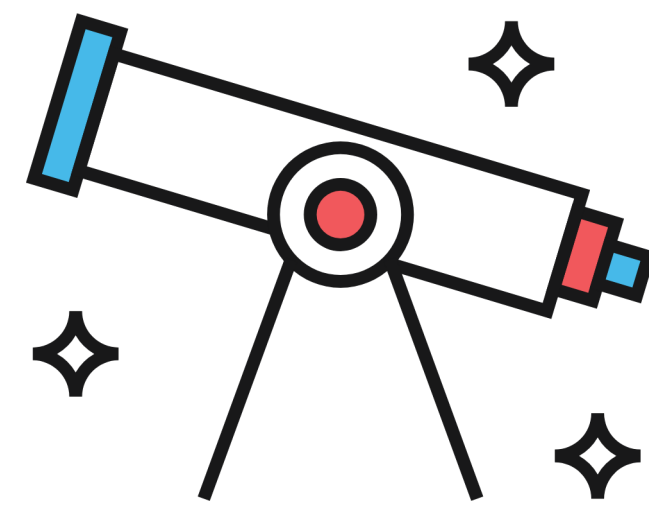




PREDICTIONS MADE BY SCIENTISTS

ABOUT THE FUTURE OF

SPACE CONSTRUCTION



Space construction has been a hot topic for scientists and experts for many years now. Here are some predictions made by scientists about the future of space construction:

Development of autonomous robots for space construction: Scientists predict that autonomous robots will play a crucial role in future space construction projects.

These robots will be equipped with advanced sensors and AI algorithms that will allow them to perform complex tasks without human intervention.

Advancements in 3D printing technology: Scientists expect that 3D printing technology will be significantly improved in the coming years. This technology will allow for the production of large-scale structures and components in space, reducing the cost and complexity of traditional space construction methods.

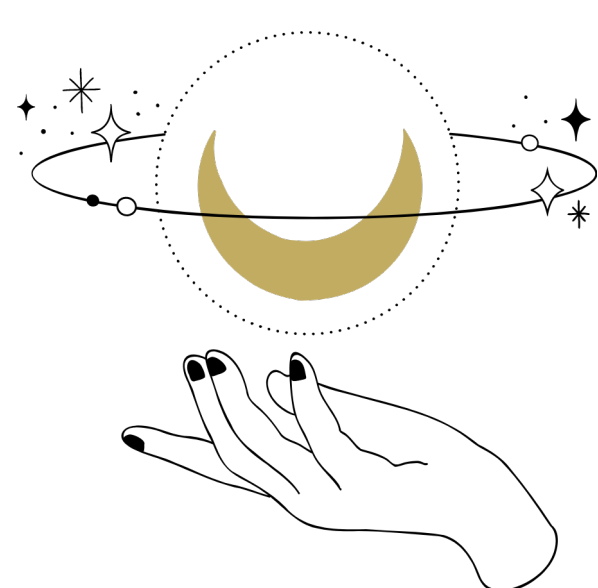
Expansion of human settlements in space: Scientists predict that human settlements in space will become a reality in the near future.

These settlements will be designed to support human life and will include habitats, research facilities, and other infrastructure necessary for long-term human presence in space.

Development of reusable spacecraft: Scientists believe that reusable spacecraft will be an important part of future space construction projects.

These spacecraft will be designed to be used multiple times, reducing the cost of space missions and making it possible for space construction to become a more sustainable industry.

Use of advanced materials for space construction: Scientists expect that advanced materials, such as graphene, will play a crucial role in space construction. These materials will provide improved durability and resistance to extreme conditions, making it possible to build structures and components that can withstand the harsh environment of space.





NEW TRENDS IN ASTRONOMY THAT WILL EFFECT TO FUTURE SPACE CONSTRUCTION

There are several current trends in astronomy that are likely to have a significant impact on future space construction. Some of the most notable include:

The search for exoplanets: With the discovery of thousands of exoplanets in recent years, the focus is shifting towards understanding the conditions on these planets and the potential for finding habitable environments. This is likely to lead to new missions and technologies aimed at characterizing these planets and exploring the possibility of establishing human settlements in the future.

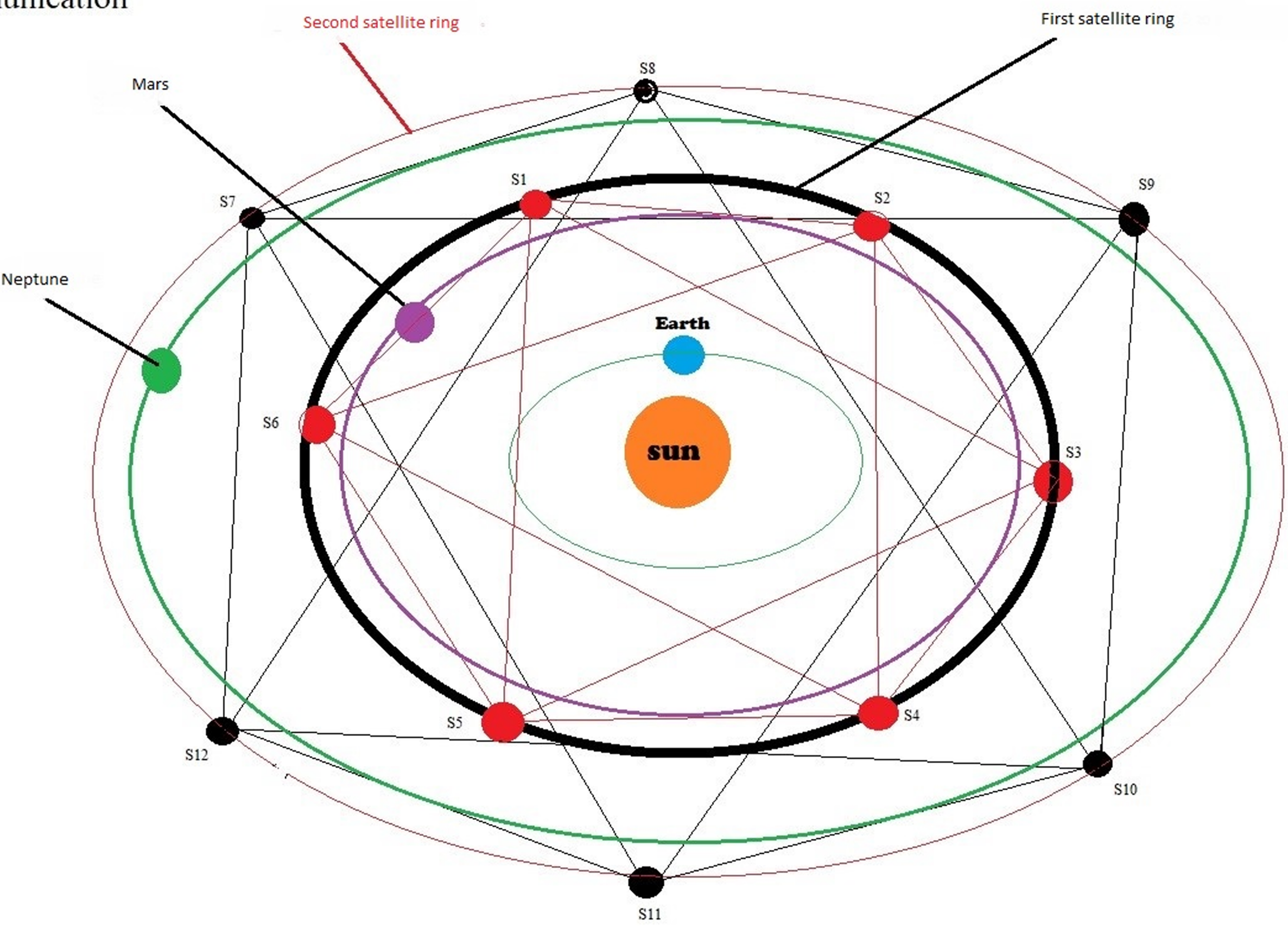
The study of asteroids: The study of asteroids is becoming increasingly important as scientists seek to understand their composition, origin, and potential for use as resources for future space missions. This is likely to lead to new missions and technologies aimed at prospecting and mining asteroids for valuable materials.

The study of dark matter and dark energy: The study of dark matter and dark energy is one of the most active areas of astrophysical research, with implications for our understanding of the evolution and structure of the universe. This research is likely to lead to new technologies and missions aimed at detecting and characterizing these mysterious components of the universe.

The development of new space observatories: The development of new space observatories, such as the James Webb Space Telescope and the Wide Field Infrared Survey Telescope, will provide astronomers with unprecedented views of the universe, leading to new discoveries and a better understanding of the cosmos.

INTERPLANETARY COMMUNICATION SYSTEM

Interplanetary Communication
System



In space projects, one or more communication satellites usually have to be launched simultaneously with the mission in order to successfully carry out the general activities related to the mission by making the communication activities easier.

Although this method was used in the early space missions, space debris was created due to the abandonment of the satellites at the end of the mission. In the later period, this created a big problem. Sometimes there were also reported cases that threatened the safety of the earth. Also, this space debris interfered with the operations of active satellites. There were also opportunities to come.

The earth's rotation time was affected by the earth's rotation time in the communication by the big satellites used in the early period. Sometimes there was a time delay in the communication with the satellite related to the mission. For that, the earth's rotation as well as the positional distance were affected.

The interplanetary communication system can be established with the aim of reducing the cost of communication in space operations, managing space garbage and making communication work more efficient. For that, small cubic satellites can be used.

Here, 72 cubic satellites are orbited around the earth as a simple model and by placing these satellites in orbits related to the equator, Tropic of Cancer and Tropic of Capricorn, the basic phase of this communication network can be built.

For example, 36 small cubic satellites can be used for the satellite ring created around the equator. These satellites can be installed in a low earth orbit about 350 km from the earth's surface. Two satellite rings with 18 satellites each are installed near the Tropic of Cancer and the Tropic of Capricorn. It is possible. By conducting communication between satellites, a signal coming from any direction in the universe can be captured and transmitted to the communication center located on the surface of the earth in the respective space mission station. Although these 72 satellites are small in size, they can get the relevant coverage of all the space communication centers in the entire earth region.

can give 6 other satellites in an elliptical orbit between Agaharu's specific path and the receiving belt will capture the signals emitted by the inner planetary missions. Using

The selection of the relevant energy source is done automatically based on the energy requirement of the satellites. Nuclear energy is generated by nuclear reactors and most of it is used to transmit stronger communication signals.

6 satellites placed in an elliptical orbit beyond Neptune's exact path carry out communications related to space operations related to the outer planets.

The satellite rings associated with the inner planets and outer planets work together with the satellite network around the earth. The main operation center related to the interplanetary communication system has the ability to carry out communication activities related to operations through the accounts created and given to the related space research institutes. It is essential to apply a high level of security to the communication system.



PATCH LOGO

From the Union of
Futurevisionary

Backward

"Space Construction," written by Rusin Thathsara, an undergraduate of the University of Moratuwa and a product of Sivali Central College Rathnapura, is a captivating book that explores the history of space exploration. The book takes the reader on a journey through time, starting with South Asia's first space construction launch and ending with the memories of the Russian cosmos day.

Thathsara provides an in-depth look at the challenges faced by the engineers and scientists involved in the project, as they worked to overcome technical obstacles and push the boundaries of space exploration. The book's vivid descriptions and engaging writing style make it compelling, capturing the reader's attention and holding it from start to finish.

Through the memories of the Russian cosmos day, Thathsara provides a fascinating insight into the global history of space exploration, highlighting the accomplishments and contributions of those who paved the way for modern-day space travel. Overall, "Space Construction" is a must-read for anyone interested in the history and future of space exploration.



Gem City's Astro Union

Available At

amazonkindle

SPECIAL THANKS

Sivali Central College

University Of Moratuwa (Department of Building Economics)

Leo Club of the University of Moratuwa

Pasindu Lakshan Perera

Sci Fiction Author

Undergraduate in B.B.Mgt Honours in Financial Engineering

University of Kelaniya) For Interplanetary Communication

Part

Sapumali Dehigastenna

B.ENG Electronic and Electrical Engineering

ANC Education

Author: “Blossoms “For Proof Reading