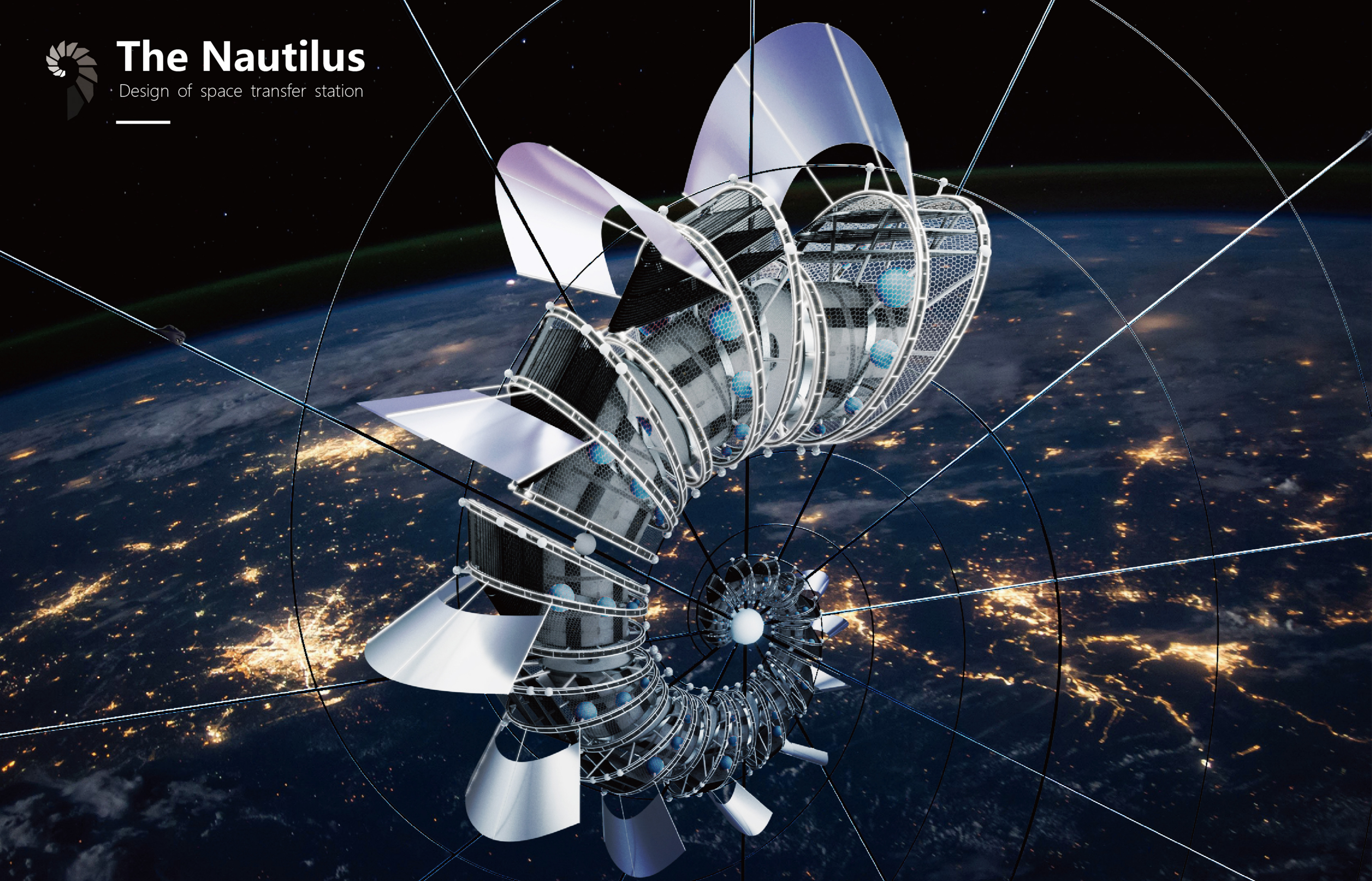




The Nautilus

Design of space transfer station



2021 JACQUES ROUGERIE FOUNDATION AWARDS

Award's category : 《An orbital or on a star space port》 Focus

Project's Name

The Nautilus

Description

A transfer station working as Skyhook inspired by nautilus



Inspired by the growth mode of nautilus, this design can provide a safer and adaptive development for the transfer station. Skyhook is an efficient way that can greatly save spacecrafts' energy. The core function of the Nautilus is to transit the spacecrafts to their destinations as a sky hook. In addition, it also provides hotel, tourism, entertainment, offices, scientific research and other services.

The power sources from nuclear energy, solar pressure and solar energy. It resist cosmic radiation through the artificial magnetosphere; By recycling space waste and exploiting planetary resources, it gets supply and expansion materials for itself, and the rest can create economic benefits by sending back to the earth. through vegetation planting and water circulation, it creates ecological benefits and livable environment.

Concept

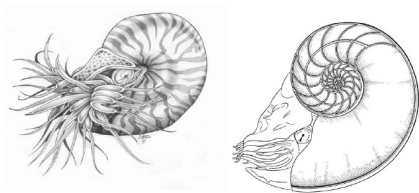
Cameroceeras



The linear growth strategy is not the optimal solution. It is not only a waste of space, but also easy to be damaged during movement.



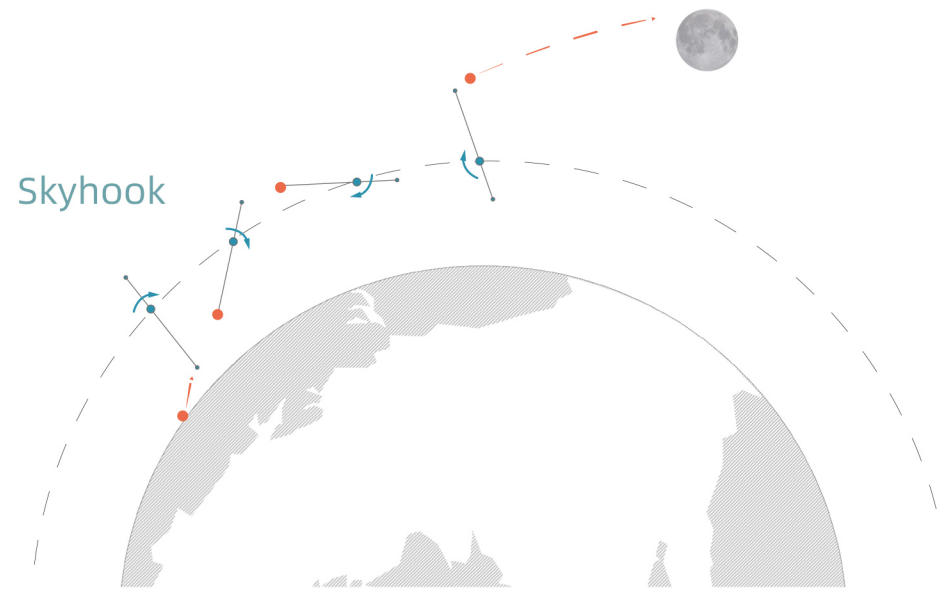
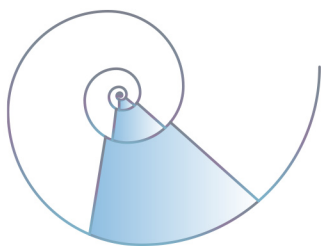
Nautilus



The spiral growth mode can accommodate the object to grow longer and larger, and each stage is self similar.



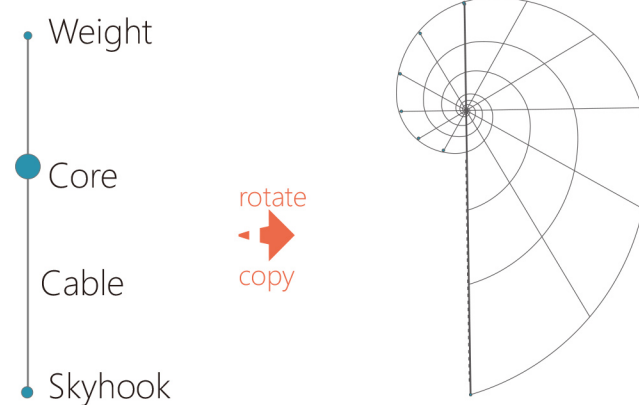
Equiangular spiral



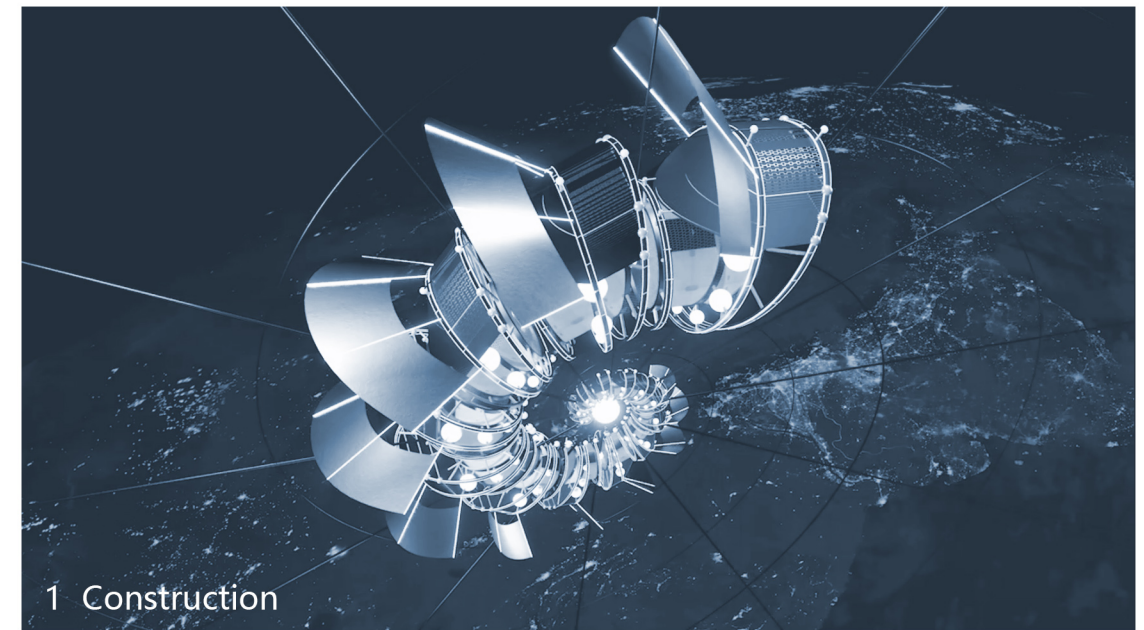
A rocket needs to reach a speed of about 40000 kilometers per hour to escape from the earth. In order to get this speed, rockets are mostly containers for fuel with a tiny tip of payload, which makes space transportation expensive. The sky hook system can effectively solve this problem.

Bionics

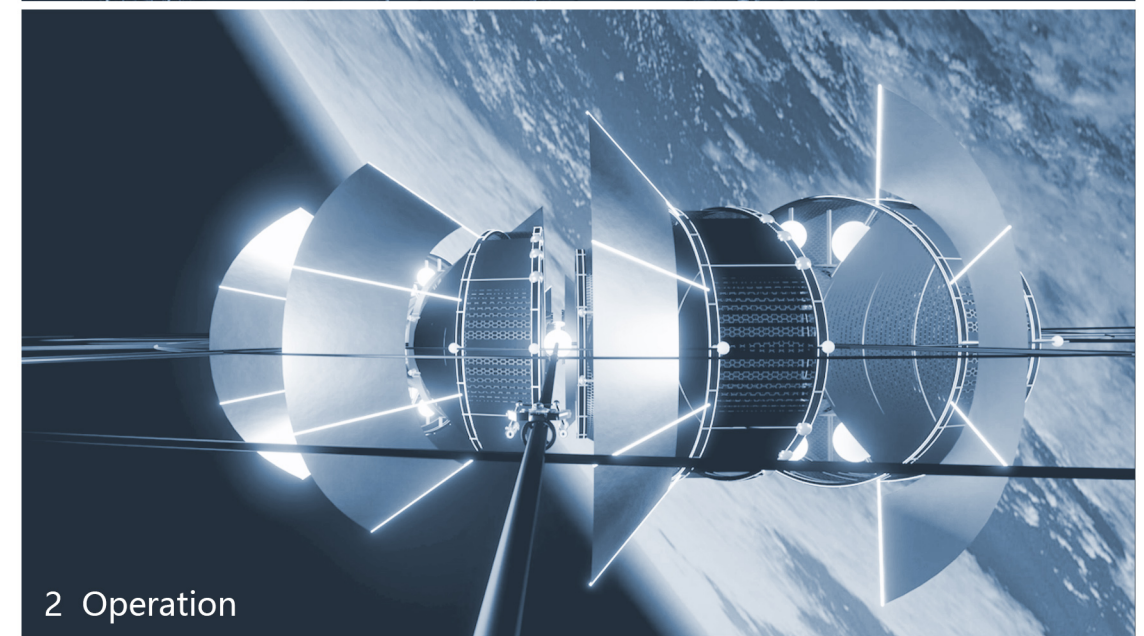
The skyhook revolves around the earth and rotates itself. Capture the spacecraft when the hook reach the lowest point of the earth, and launch the spacecraft to the destination like a catapult when turning to the highest point. The energy consumption of the spacecraft in the whole process is much less than that of the rocket.



Inspired by the nautilus, we increase the number of skyhooks based on the Archimedes sequence, and weave them into a web, which can launch spacecrafts to different destinations, making the skyhook flexible.



1 Construction



2 Operation



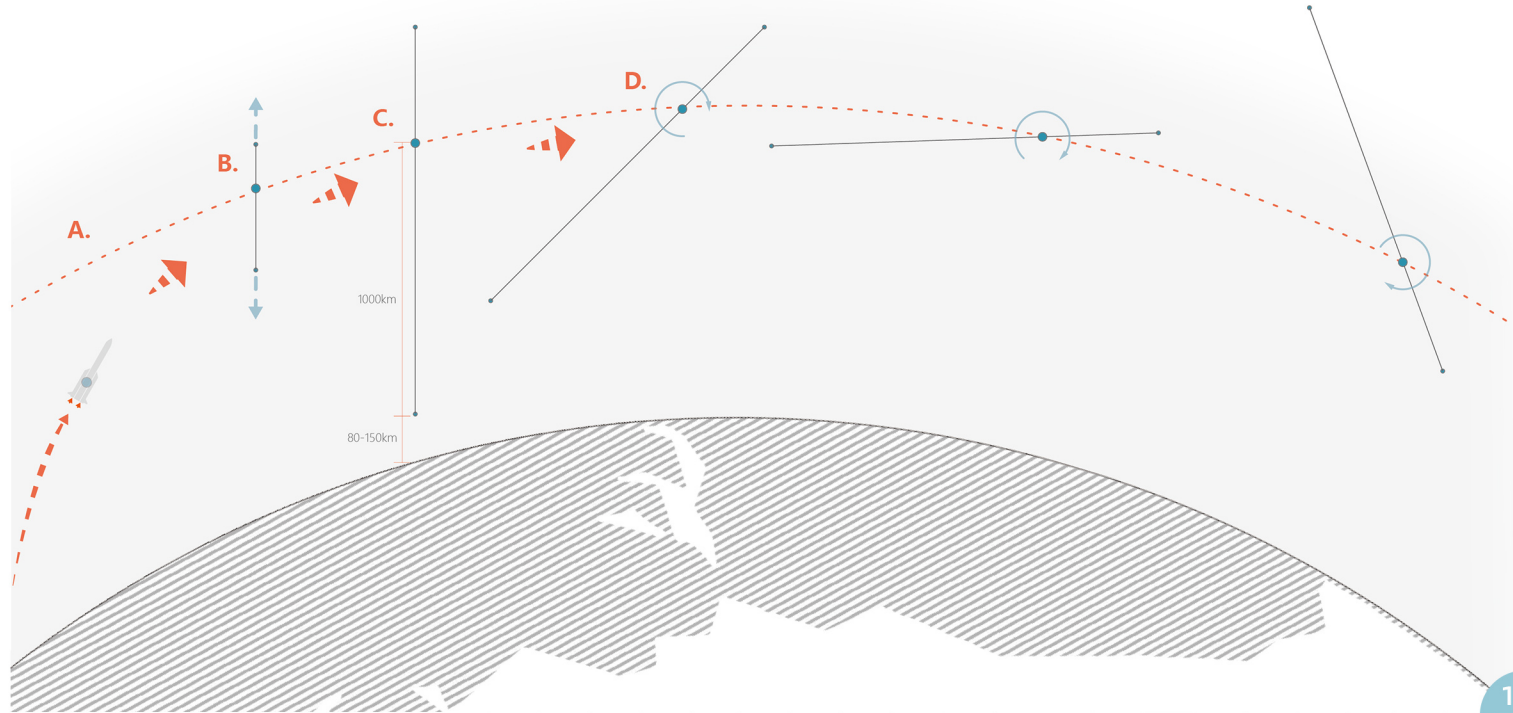
3 Interior

Context

Construction Process

Launching

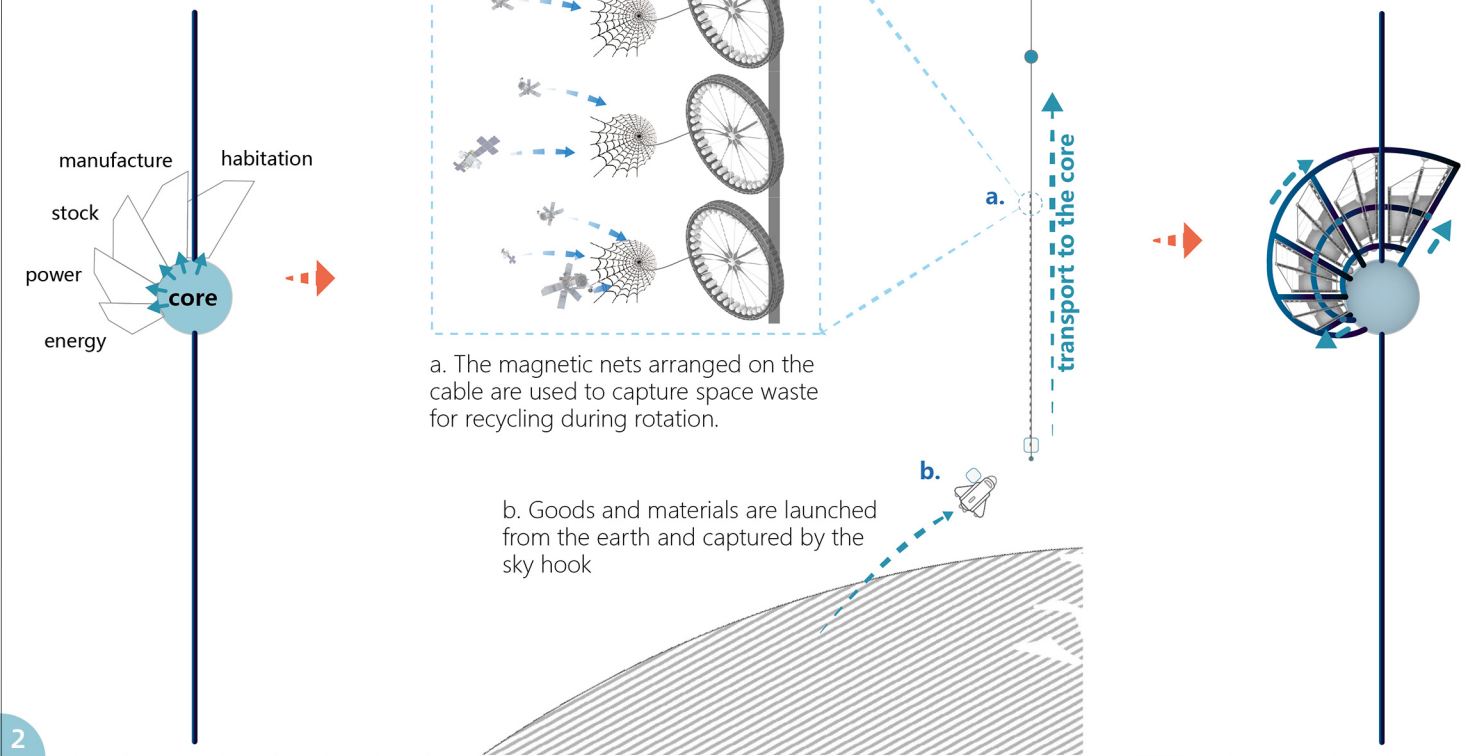
- A. The core launched from earth
- B. Reach the orbit and extend the cable from both sides
- C. One end is the sky hook, 1000km away from the core and 80-150km away from the earth's surface. The other end is a weight for balance
- D. In the process of revolution, it rotates on the plane perpendicular to the earth's surface, making the sky hook in a cycle of constantly approaching and away from the earth



1 2
3 4

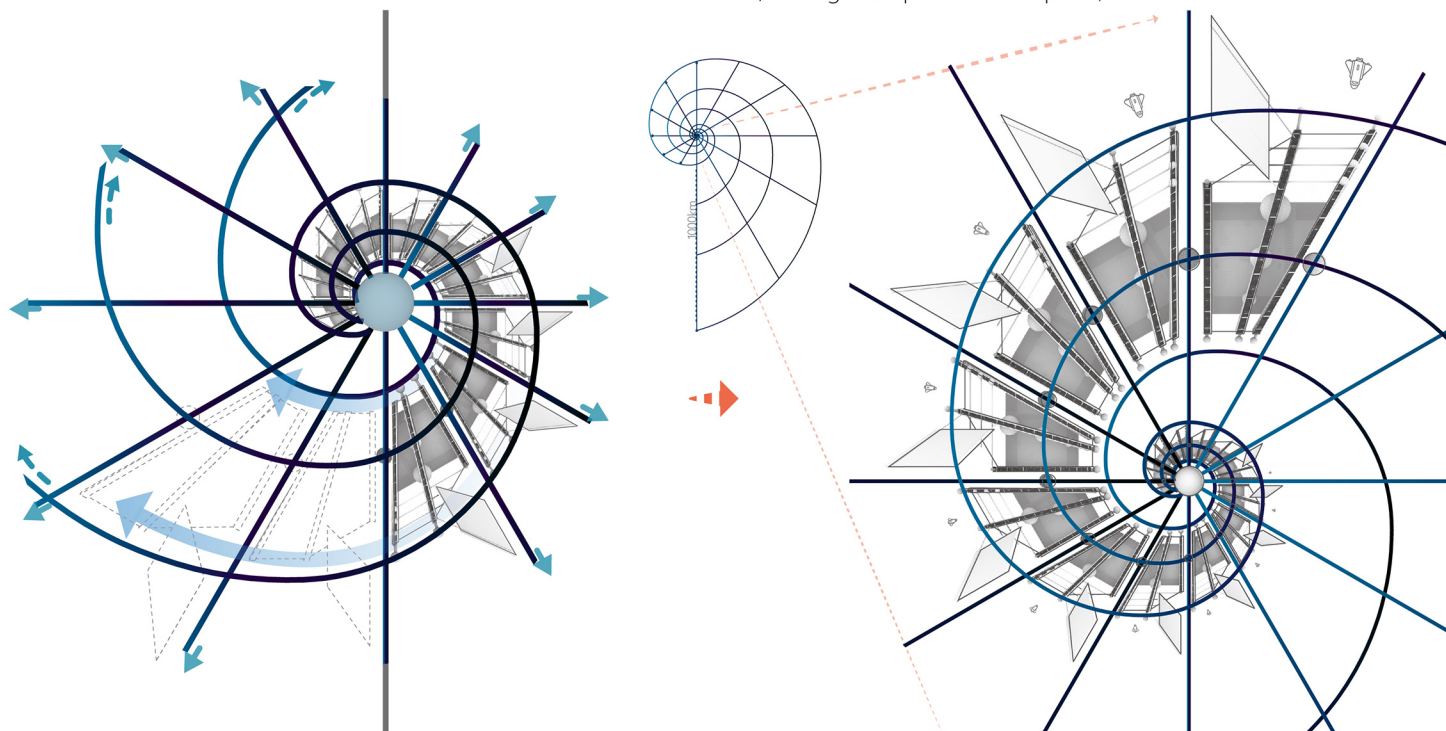
Expansion 1

- E. Initial form: unfold the basic-function modules from the core
- F. Building materials are obtained in two ways:
 - a. The magnetic nets arranged on the cable are used to capture space waste for recycling during rotation.
 - b. Goods and materials are launched from the earth and captured by the sky hook
- G. Use the collected building materials to build a cable network system to create conditions for transportation and further expansion



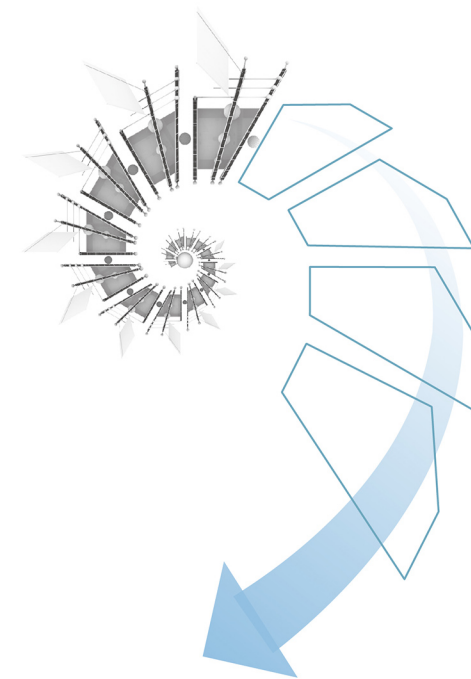
Expansion 2

- H. Expand the cable system and gradually increase the new modules with bigger and bigger size to meet the needs of more functions and the parking spaces for spacecraft of different sizes.
- I. Final form: The cable network finally forms a skyhooks system with a maximum distance of 1000km, which can send spacecraft of different sizes to different heights. At the same time, modules of different sizes make up the whole multi-functional space transfer station providing hotels, laboratories, offices, mining and spacewaste disposal, etc.



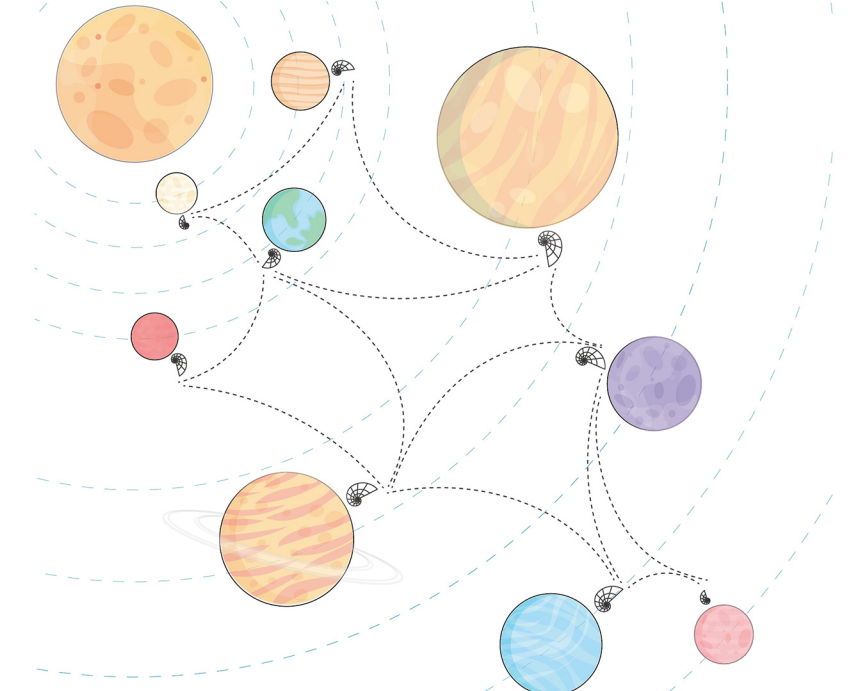
Future Plan

expanding and growing

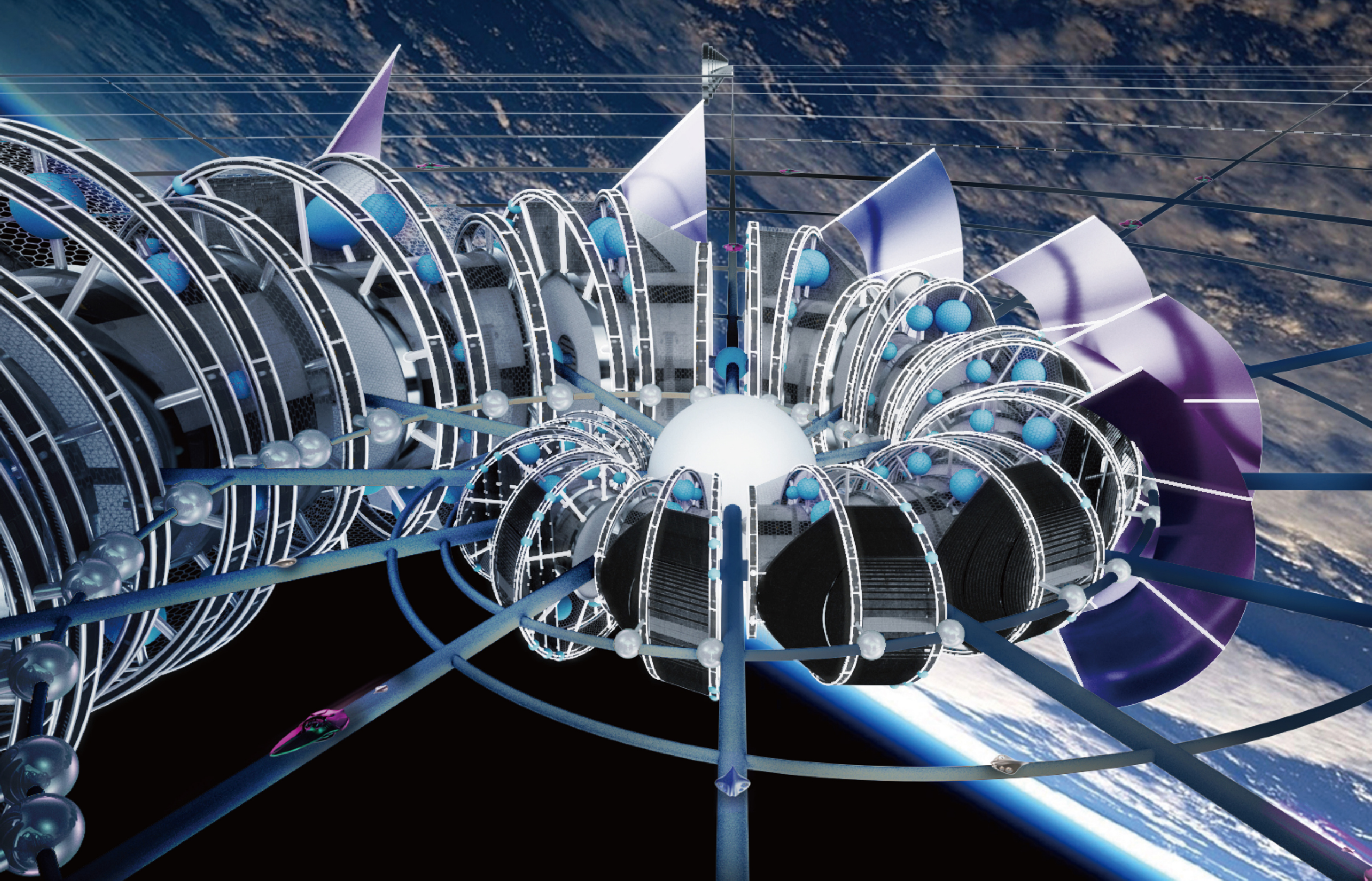


With the development of technology and needs, continue to expand this transfer station.

Space Network



Build the Sky Hook network of the solar system, gradually expand the field of human exploration to the Milky way, and then go to the larger universe!



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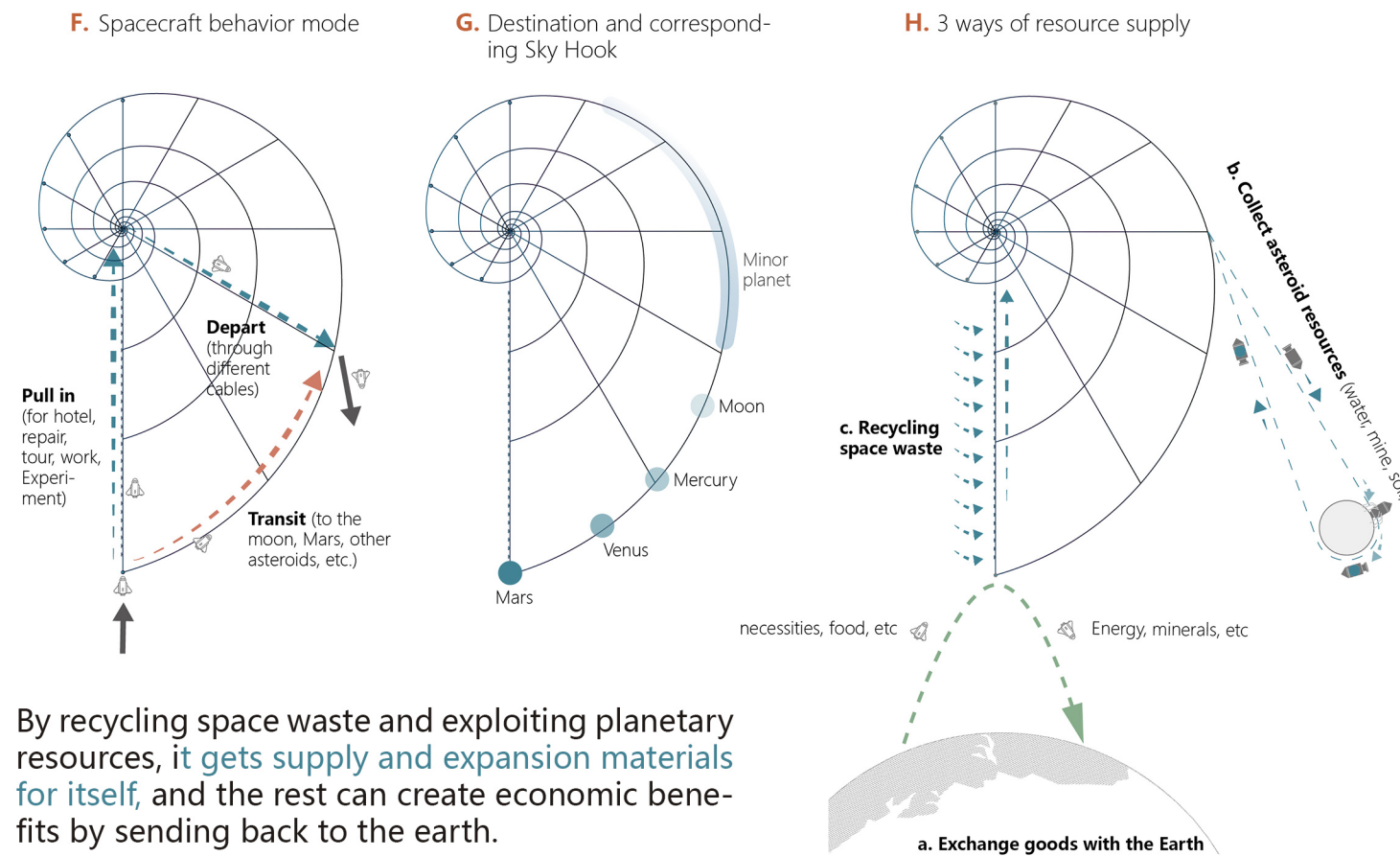
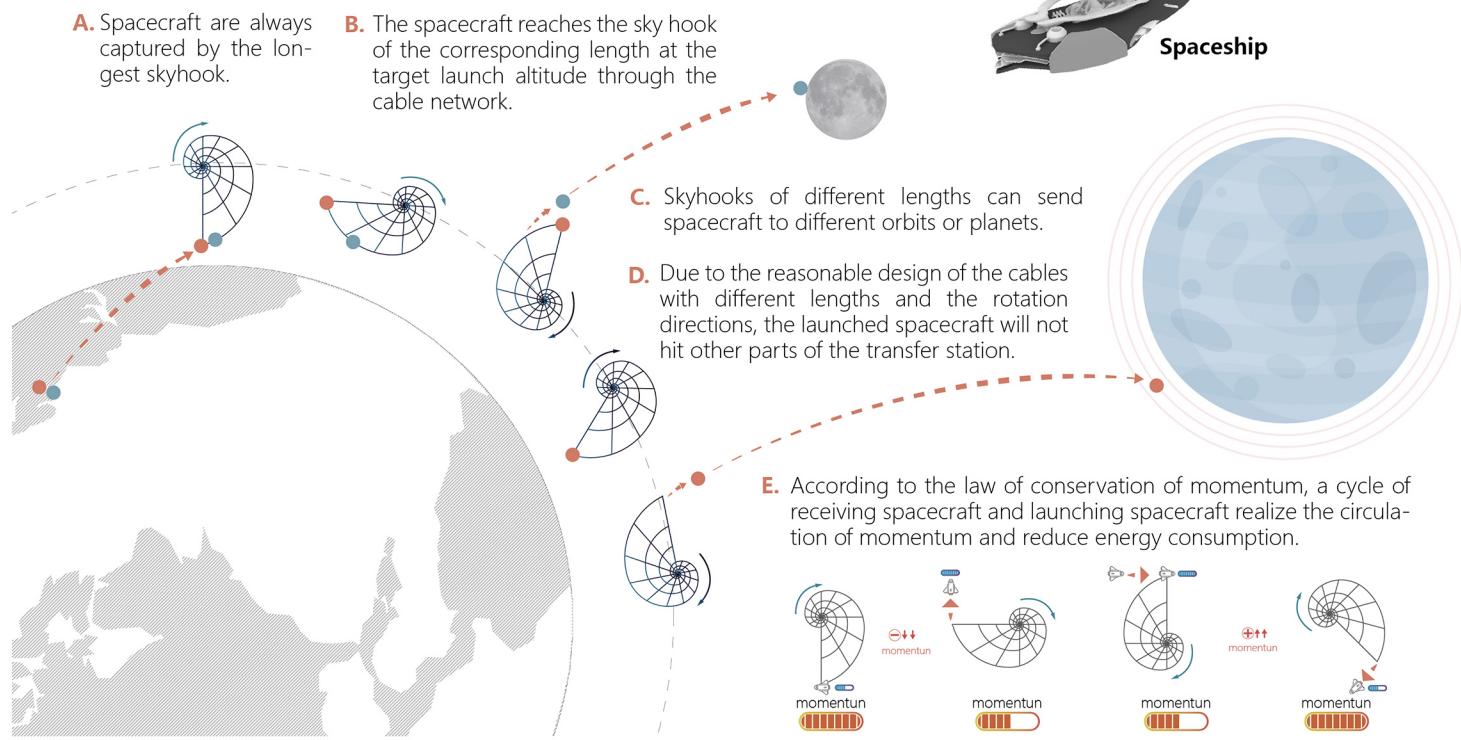
The Nautilus

Description

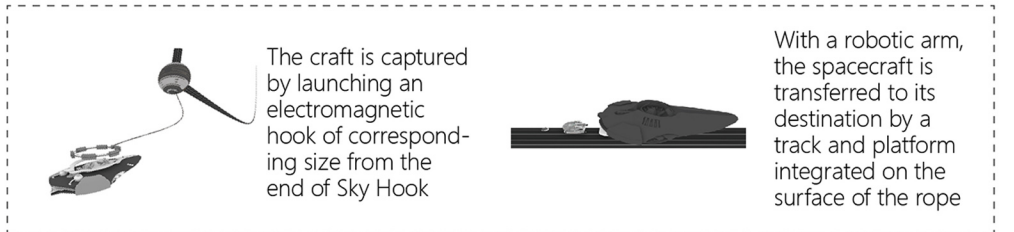
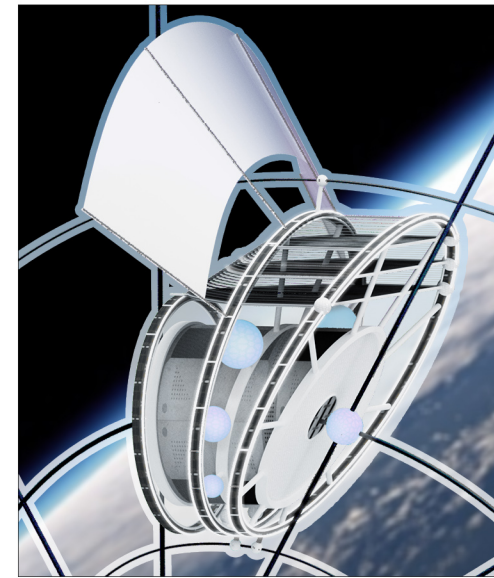
A transfer station working as Skyhook inspired by nautilus

Operation

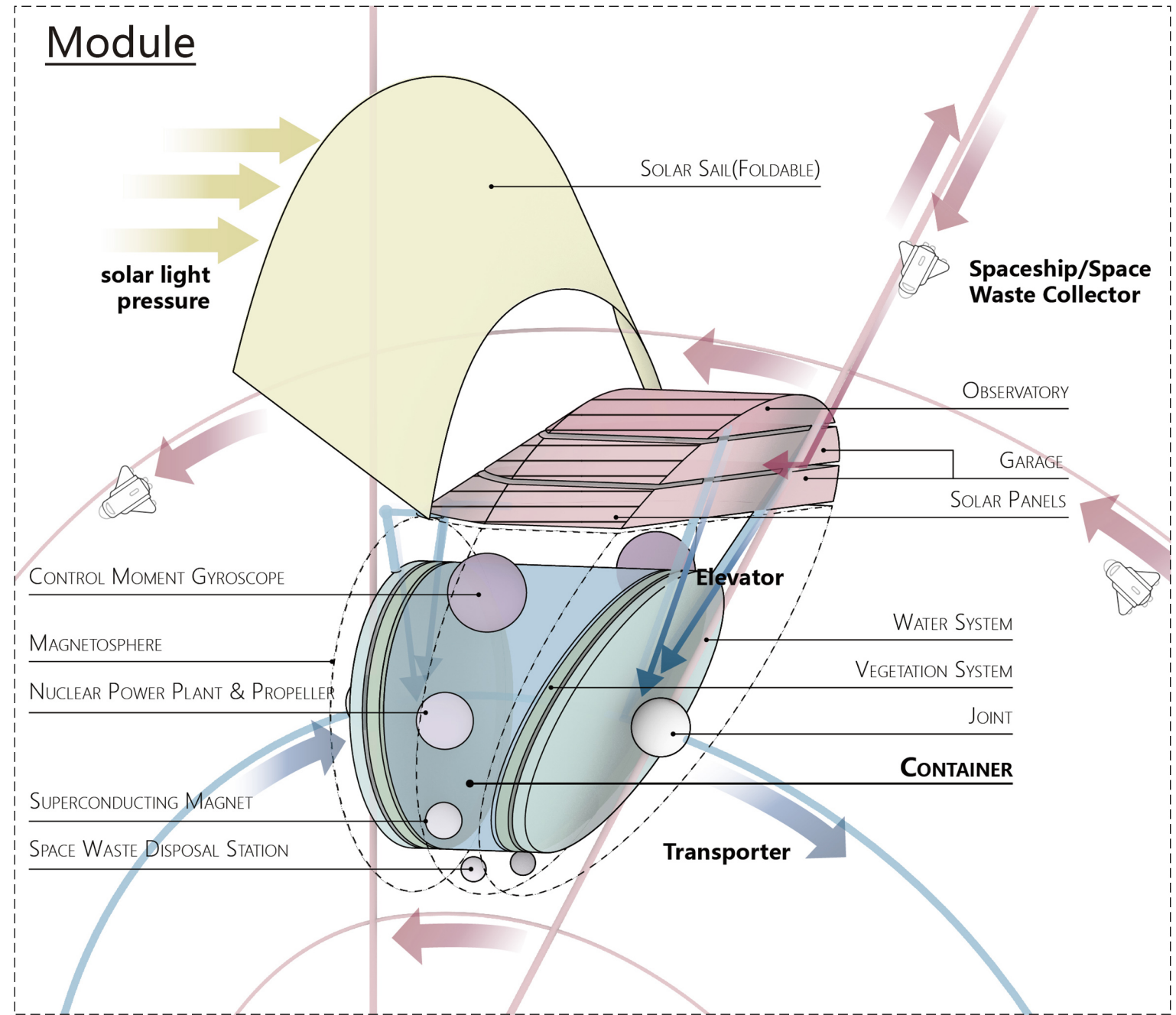
The skyhook allows the spacecraft to be captured near the earth and then thrown into the universe by the rotation of the transfer station, which consumes much less energy than the rocket.



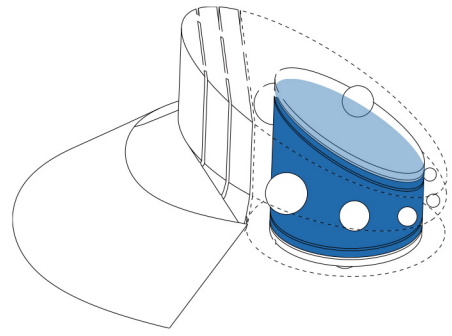
By recycling space waste and exploiting planetary resources, it gets supply and expansion materials for itself, and the rest can create economic benefits by sending back to the earth.



Each module is similar, but different in size. Except for the basic-function modules, the new ones are multifunctional and can provide several functions like parking, garbage disposal, experiment, hotel, office and planting. During operation, solar pressure, solar energy and nuclear power can be absorbed and used to provide power. It resist cosmic radiation through the artificial magnetosphere. Internal accurate control of temperature can realize water circulation and vegetation planting.

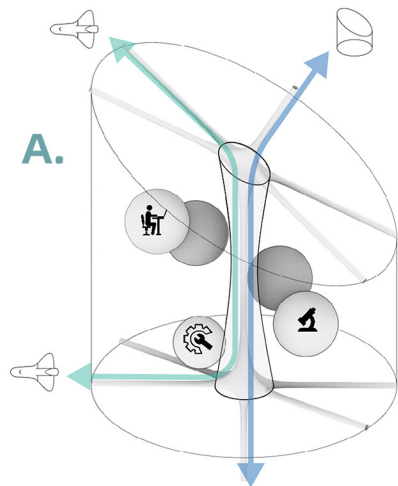
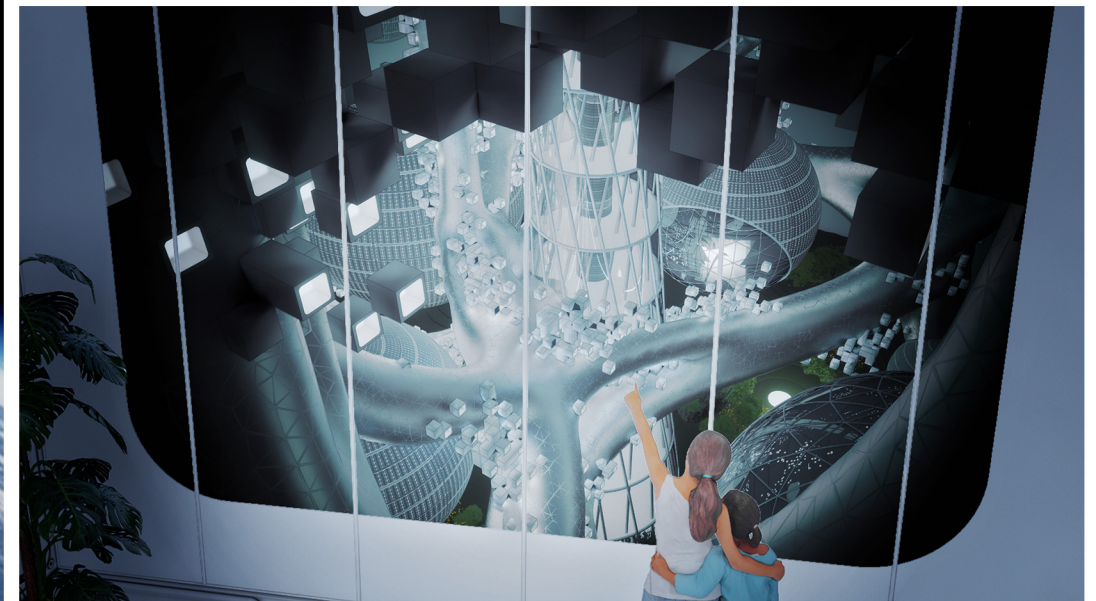
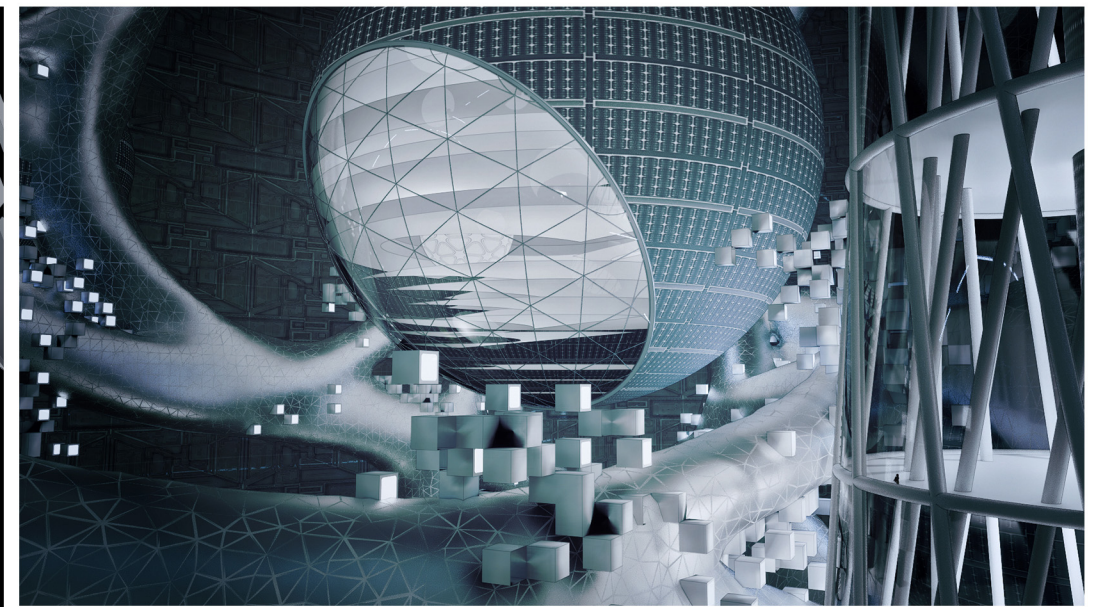
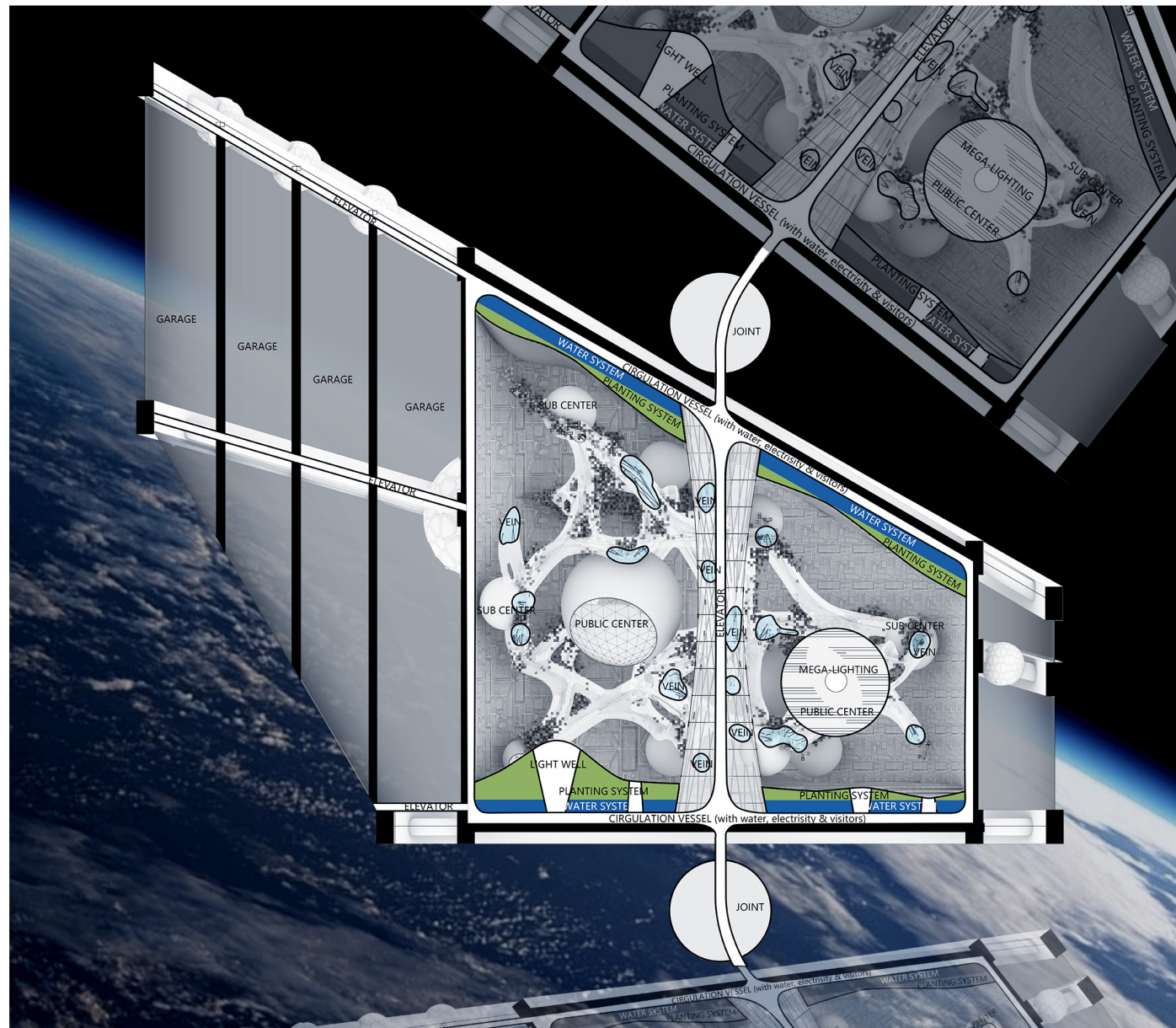


Inside The Module

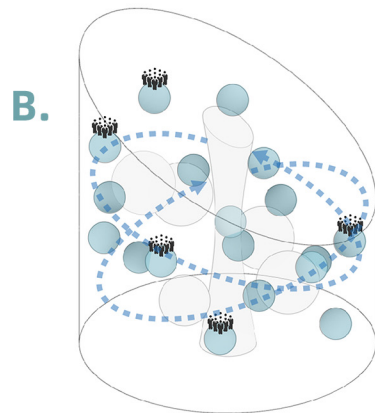


Slime Mold

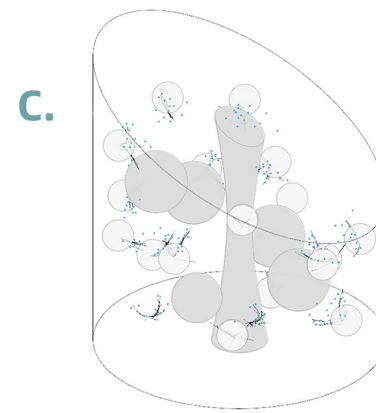
Slime molds will optimize the path while looking for food until a shortest path is determined. Because they can store the "memory" of past events in the traces left by other slime molds, and even learn, and then transfer the learned information through integration with other slime molds.



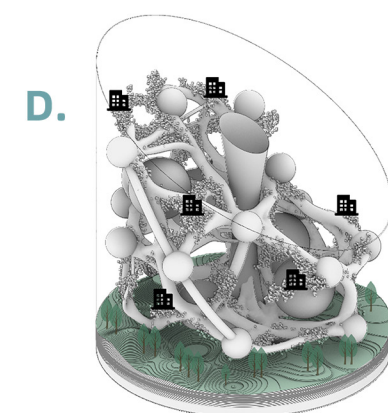
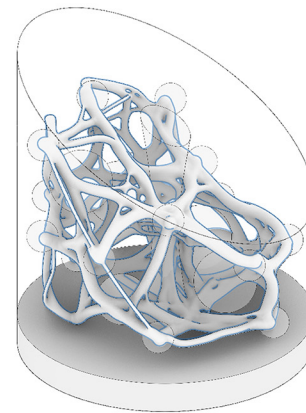
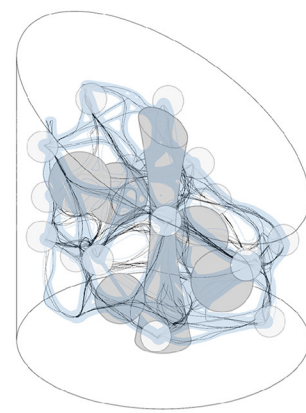
People can reach the two adjacent modules or go to the parking garage through the main channel. Large spheres are arranged around the pipe, with core functions such as experiment, office, management, manufacturing and production.



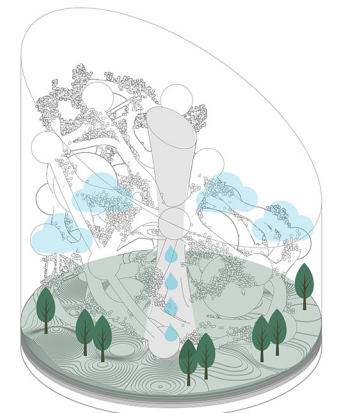
Several small spheres are arranged near the inner surface as the local control center and the space for public activities. They need an efficient way to communicate.

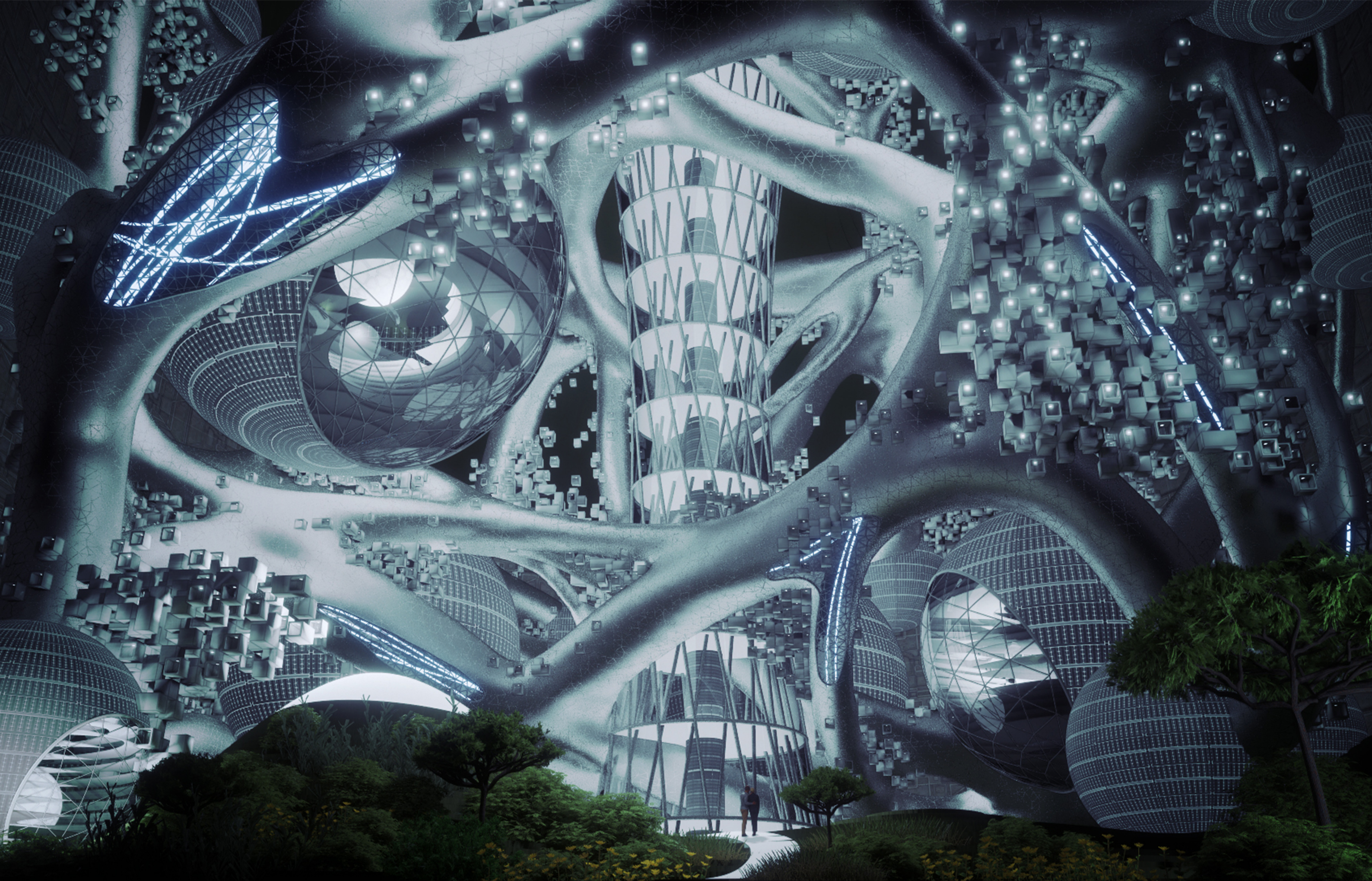


Slime molds will optimize the path while looking for food until a shortest path is determined. Because they can store the "memory" of past events in the traces left by other slime molds, and even learn, and then transfer the learned information through integration with other slime molds. This design simulates the growing mode of slime molds to generate the connection space. Each small sphere is used as a particle emitter to imitate the birth position of slime molds, other sphere as the food. The connection spaces are generated. At the same time, the culture medium for vegetation planting is arranged on the two bottom surfaces of the container.



The particles scattered around the optimal paths are transformed into a bunch of cube hotels for people to rest and stay. According to the distance between the culture medium and the spatial entities, surface of the culture medium distort to form the mountains and valleys. The water vapor floating in the container is condensed into water by the cold surface of the main channel to irrigate the vegetation on the culture medium.





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