2020 - 2021 City Model Slideshow

City School : Saint Cecilia School

Educator : Debra Brewster

City Name : Orbis Noctem

Deliverable Details

- This slideshow is your chance to present your model.Whether your team created a single model or multiple segments, here is where you show off the future city you designed to the judges.
- Choose photos of the various segments that best show the requested content.
- Do not change the size of the text boxes in this template, All written text must fit within the boxes and cannot be smaller than 14 Calibri (or equivalent) font.
- When finished, save the slideshow as a PDF and upload to the Online Portal at FutureCity.org.

Section 1
City Design

Residential Zone

Located in a subterranean lava tube to protect residents and structures from solar radiation and meteoroids. Citizens live in multi-use, high rise buildings that rotate. They have access to shopping, healthcare, work, education and entertainment within a 10 minute walk of their homes. Each floor rotates to create a centrifugal acceleration that simulates the earth's gravity. This artificial gravity eliminates the bone mineral loss and organ calcification experienced during long-term exposure to low-gravity environments.

Commercial Zone

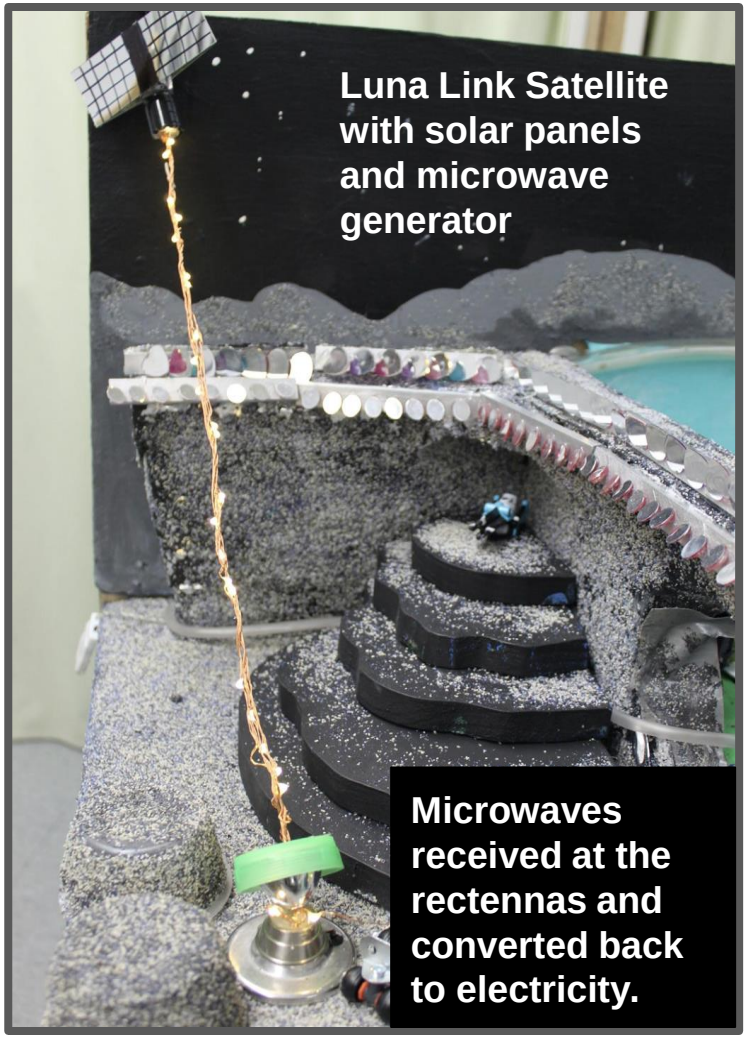
The Orbis Noctem Planning Commission zoned the bottom 5 floors of all high rise buildings as commercial spaces. Shops, offices, theaters and restaurants are located throughout the city. Gyms and wellness centers provide the necessary services for residents to live an active and healthy lifestyle and markets stock locally sourced fish and produce harvested from our aquaponics industry. Our low-g sport, Moonball, is a favorite attraction for citizens and visitors. The stadium is a short transit ride from all city buildings.

Industrial Zone

Located outside the subterranean section of the city in the Tycho crater is our industrial zone. Limiting the public's exposure to the risks associated with the production of our main exports and electricity generation keeps our citizens safe. The high temperatures, high voltage and volatility of the products produced from our L.A.S.E.R technology as well as the microwave radiation from our LunaLink rectennas require the physical separation of industry from the controlled environment of the subterranean city.

Infrastructure
Example 1

Pictured is the power, communications & positioning satellite system, LunaLink. Positioned in geosynchronous orbit above the city in continuous line-of-sight of the sun, solar collectors generate electricity 24/7. Microwave generators convert the electricity to microwaves beamed to rectennas in the Tycho crater where they are converted back into electricity to power industry & the city. Communications and lunar positioning are also provided by the satellites.



Infrastructure

Example 2

The aquaponics, water reclamation, and CO_2 algae scrubber systems are pictured here. Fish and vegetables are produced in the aquaponics system. Vegetables growing in aquarium water clean the fish waste from the water and use it as fertilizer. Wastewater is processed, filtered and UV treated for reuse. Treated waste is used as fertilizer. Carbon dioxide is converted to oxygen and energy for algae growth in the algae scrubbers. The algae is also used as fertilizer.

City Services Example 1

Education for our ON citizens is one of our top priorities. Our schools offer excellent teacher to student ratio, hands on learning from the youngest of students, curriculum that is in line with the US and International partners in space. Best ratings for students in transient families who live in ON workers and families for short stays. Rated highly for students who pursue engineering as a career.

City Services Example 2

Orbis Noctem's Citizen Services Building houses the main fire station, police station & health services. Fire training and the best in flame extinguishing equipment are deployed from this central location. Also located here, the ON Police Department, ONPD is the central administrative authority for the city responsible for law enforcement. Healthcare Services is located on the top floors of the ONCSB. Home of International Space & Health Research Agency IS&HRA

Transportation Example 1

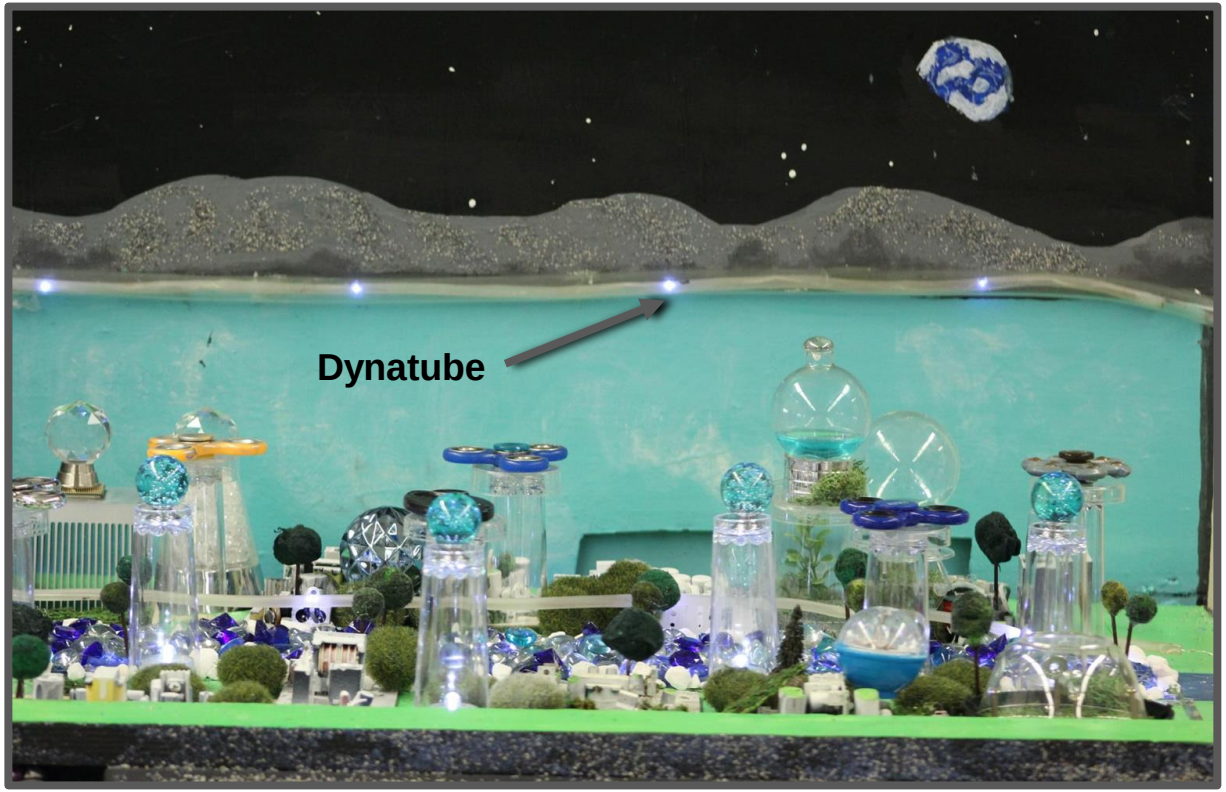
Orbis Noctem Starships

The starship spacecraft is built to transport passengers and goods between the Intergalactic Transportation Station in low moon orbit and Orbis Noctem. Each starship is equipped with high pressure storage tanks used to transport ON’s two (2) main exports; liquid oxygen and hydrogen for refueling rockets in space and Helium-3, a fuel used on earth and deep space shuttles to produce electricity in fusion reactors.

Transportation Example 2

Dynatube Transportation System

This high speed, subterranean transit system is ON's principal mode of transportation. Abandoned boring tunnels make up the transportation network. Using electromagnetism to hover in the low gravity, low friction environment, linear magnetic accelerators provide the propulsion for this efficient mode of transportation. In addition to moving residents throughout the city and Tycho crater, the Dynatube connects ON to other lunar cities and outposts

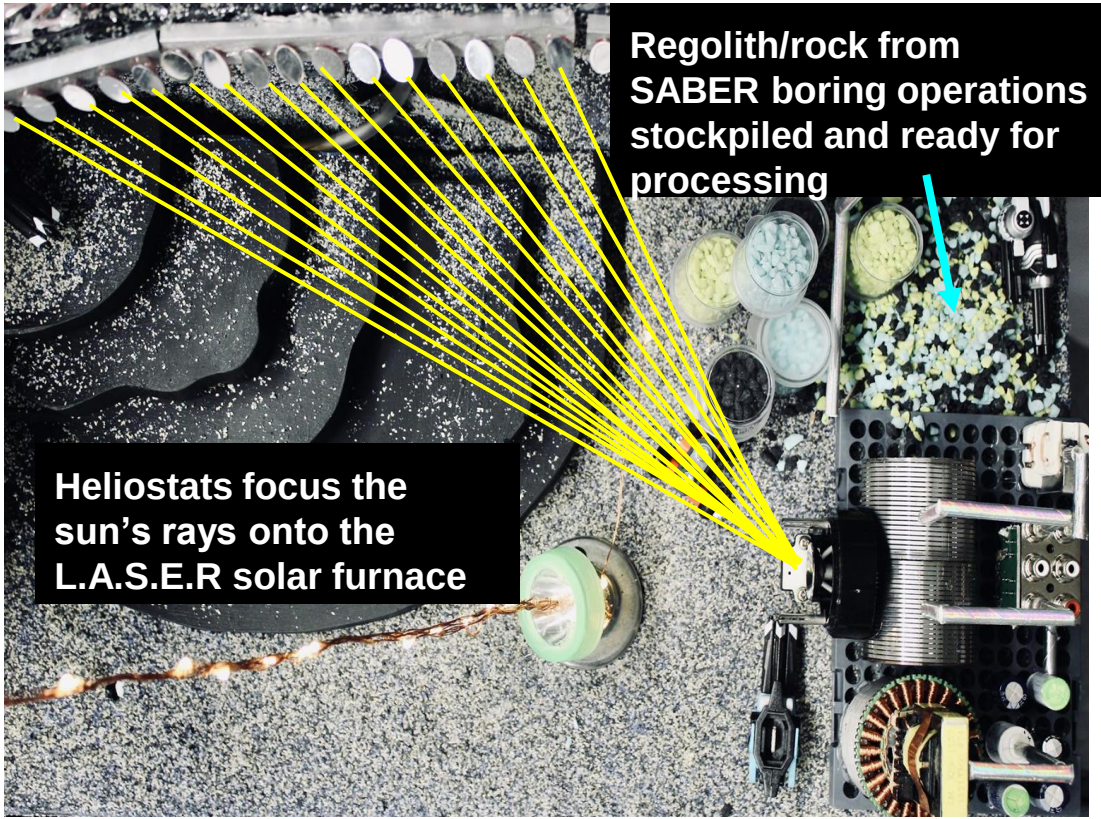


Living on the Moon

Resource #1 Example 1

It's Water...actually, it's H_2O!!!

Regolith and lunar rock are pictured here. This material is processed in our technology named L.A.S.E.R, Lunar Asset Solar Element Refinery. Heliostats focus the sun's rays onto the solar furnace. Regolith/rock enters the furnace where ice water is vaporized at 100C, collected, condensed, and either used for water in the city or sent to an electrolyzer where oxygen and hydrogen are produced for use as rocket fuel.



Living on the Moon

Resource #1 Example 2

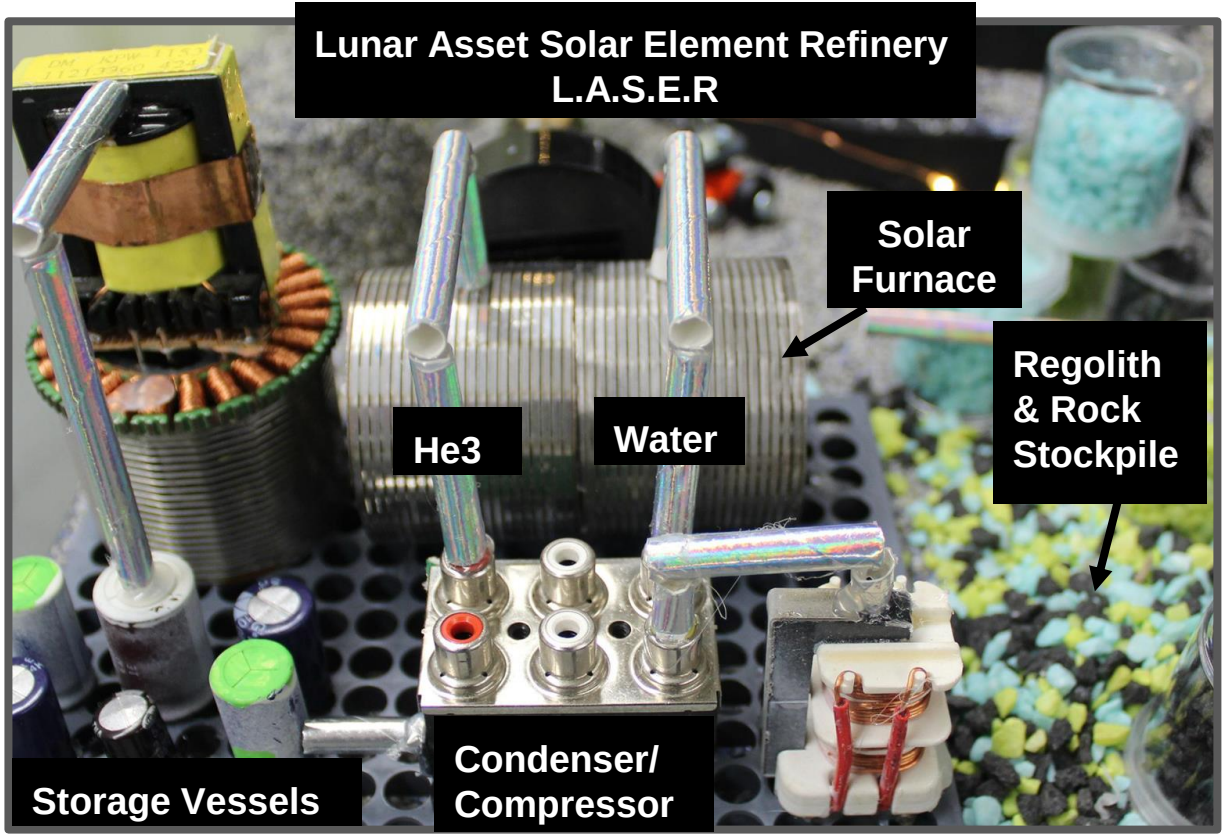
The liquid oxygen and hydrogen produced from the electrolysis of water are two (2) of Orbis Noctems major exports. From the electrolyzer, the O_2 and H_2 are compressed into liquid form and transported via pipeline to the starport storage vessels where it is stored in preparation for loading onto ON starships to be sent to the Intergalactic Transportation Station. Here you see the pressure vessels of liquid and oxygen and hydrogen ready to be loaded onto starships.

Living on the Moon

Resource #2 Example 1

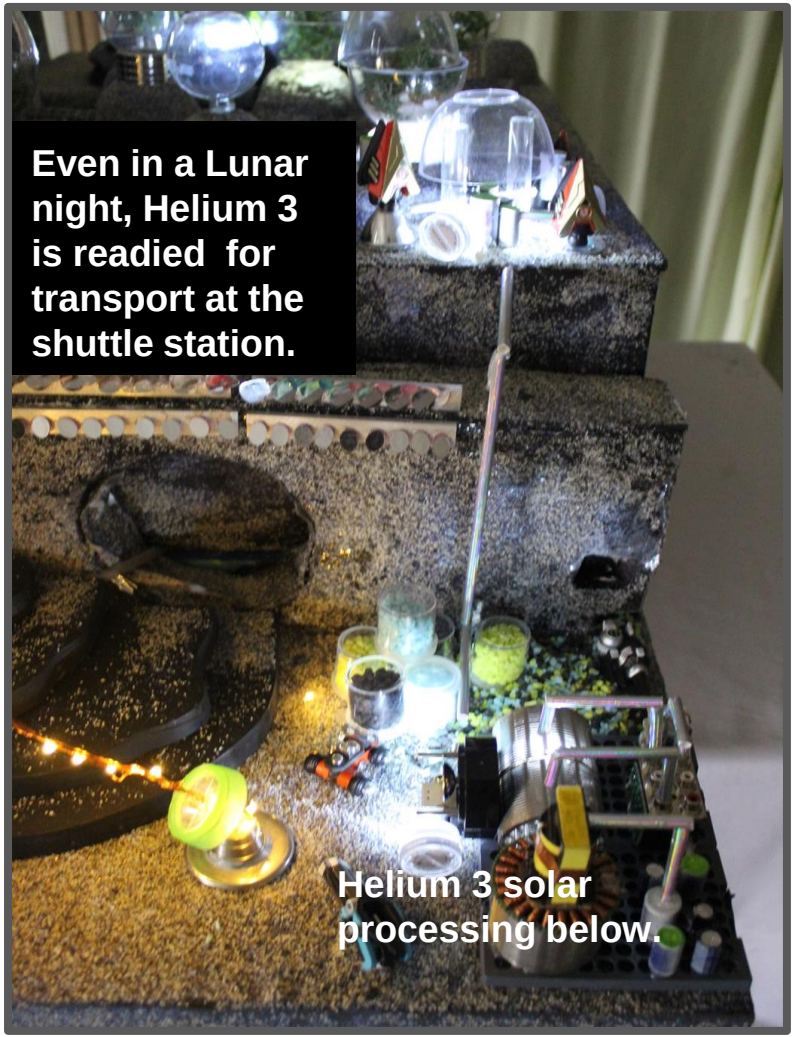
It’s Helium-3!

At 600C in the L.A.S.E.R solar furnace, Helium-3 evolves from the regolith and rock stockpiled from the ON Boring Company tunneling operations. The Helium-3 gas is collected, compressed and stored in pressure vessels where it is transported to the starport for export to the Intergalactic Transportation Station.



Living on the Moon
Resource #2 Example 2

A consortium of earth world nations, government agencies and Orbis Noctem engineers developed a clean, non-radioactive nuclear fusion power generation technology. Helium-3 is fused with a hydrogen isotope, Deuterium, to create elemental helium and releases large amounts of energy. Helium-3 is unavailable on earth but abundant on the moon due to its lack of atmosphere

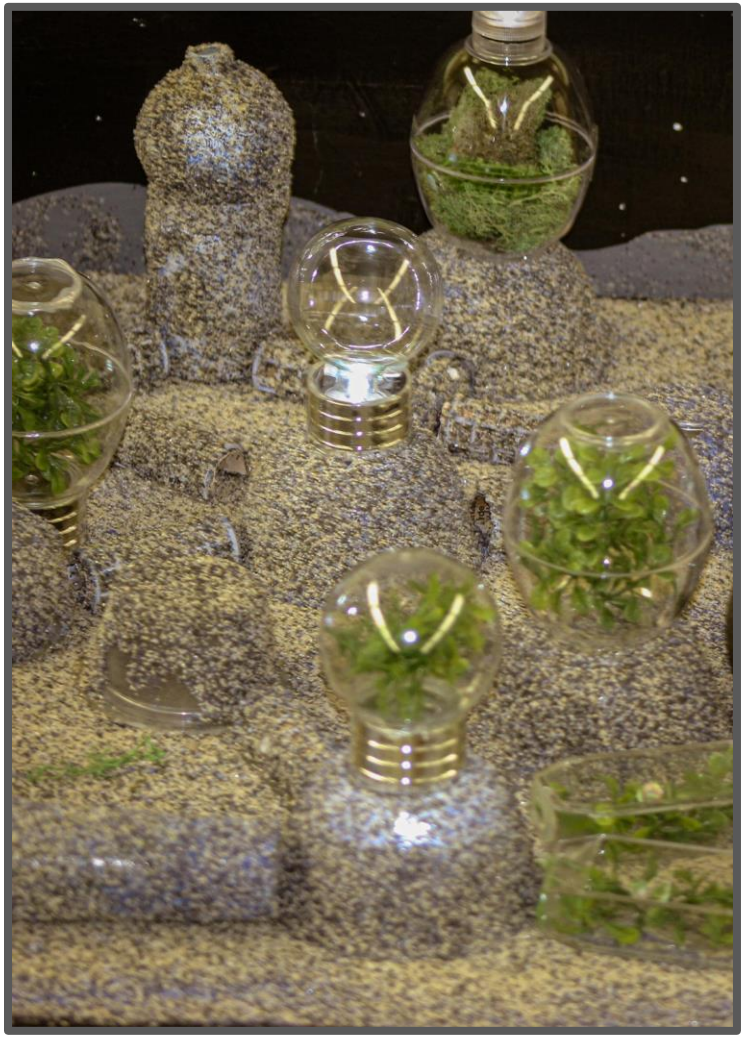


Section II

BUILD IT : QUALITY, SCALE, AND MATERIALS

Innovative Material & Use Example 1

Plastic snack-sized applesauce containers and clear glass christmas bulbs are used to represent our 3-D printed regolith structures. Students painted the plastic containers with a mixture of elmer's glue and water and dipped the bowls into sand to represent lunar regolith.



Innovative Material & Use Example 2

Fidget spinners were donated by students to represent the rotation of our buildings that create our artificial gravity. Each floor spins around the center elevator shaft and fire tower, providing each floor with customizable artificial gravity. Artificial gravity is required for humans to spend prolonged periods in the city. Without gravity, bones lose density and muscle mass is lost.

Innovative Material & Use Example 3

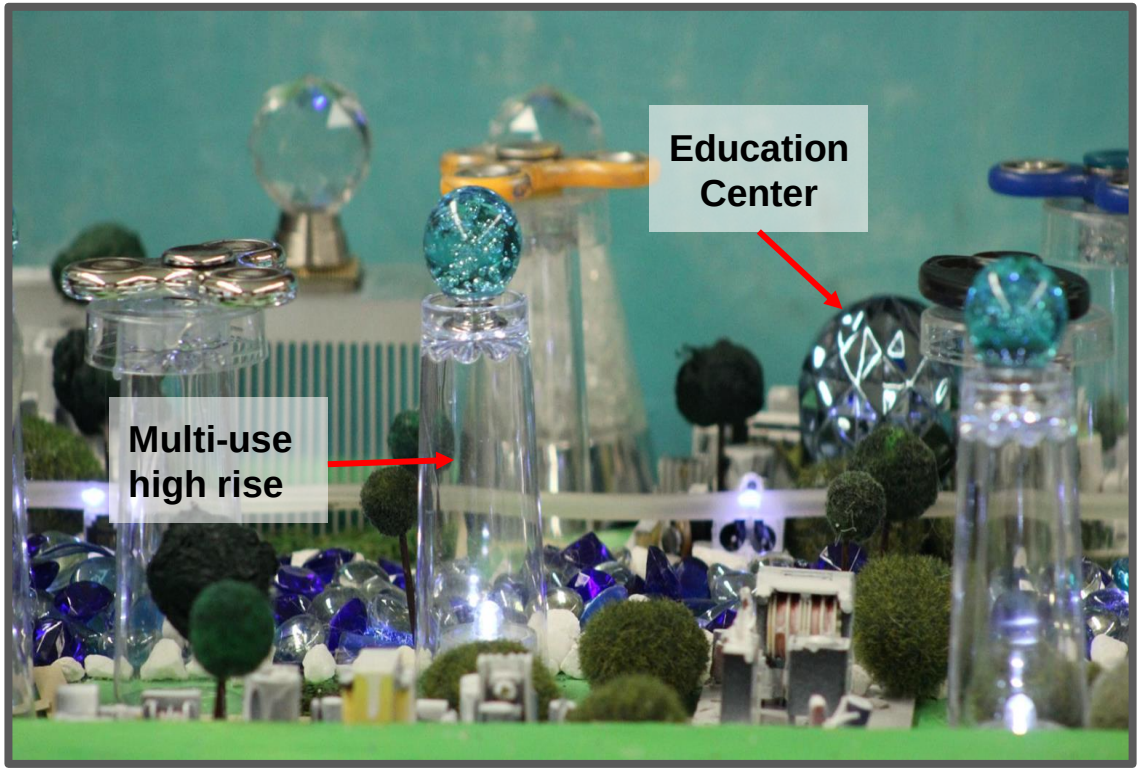
Our Engineer Mentor, George Gaynor, is our most innovative material. For some reason, he comes back every year. The term recycled, meaning, ”used again”, fits perfectly. George personifies innovation. He is the key for us to understand everything engineering and sort through our “interesting” ideas.

Sample of scale

Scale- 1 inch = 50 feet

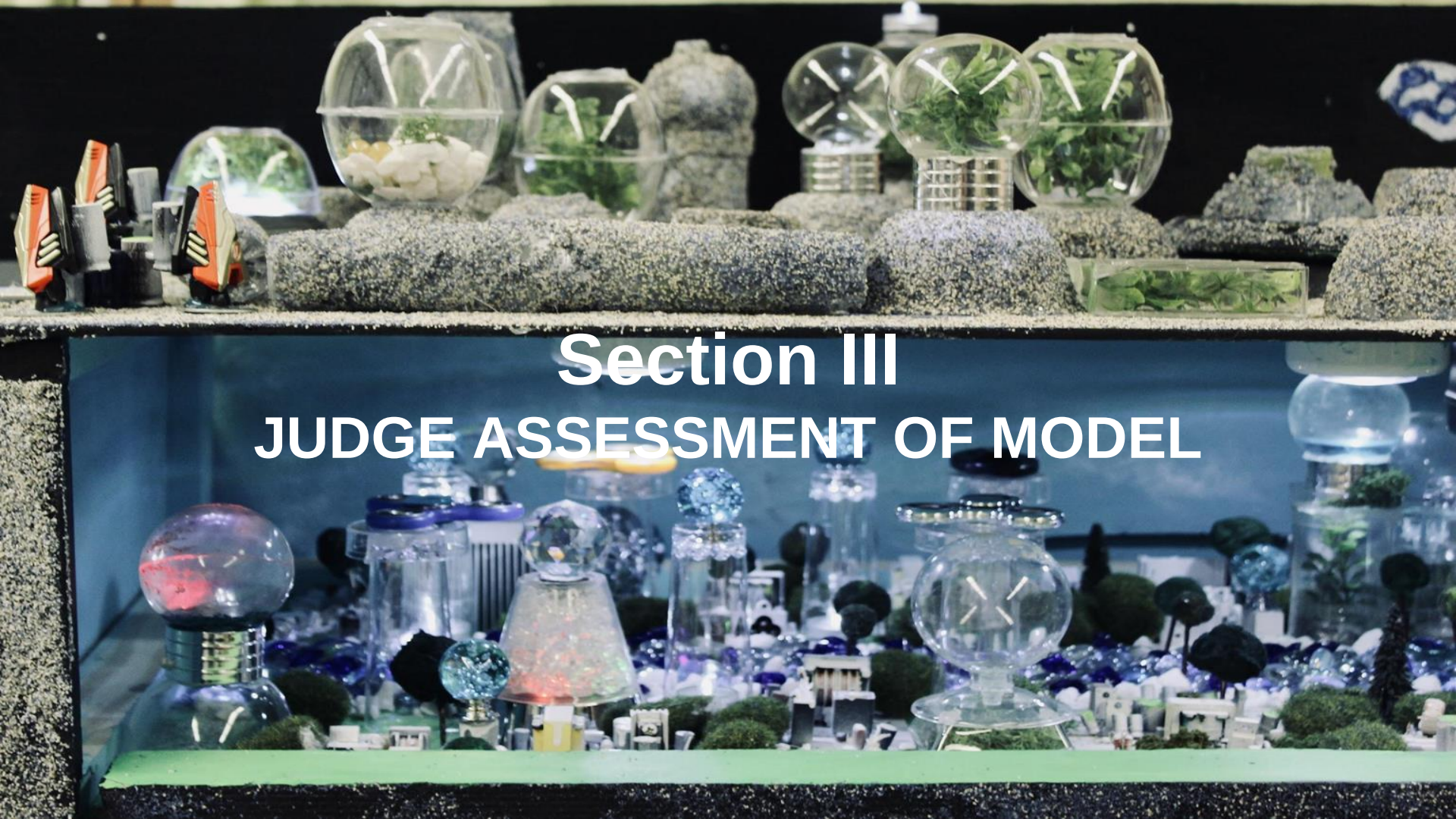
- Multi-use, high rise buildings
  - Actual Height- 5“
  - Scale Height- 250’

- Orbis Noctem Education Center
  - Actual Height- 2”
  - Scale Height- 100’



Moving Parts

1. **Spinning Model Base**
   - Orbis Noctem (ON) moving model base is built using wood and an industrial Rockler 12” metal Lazy Susan screwed to the base.
2. **Rotating Display of Orbis Noctem Outpost structures**
   - The moving outpost on top of the model is a plastic Lazy Susan. A 2” piece of a ¼“ wooden dowel connects the lazy susan to an old, battery-operated grill rotisserie.
3. **Removable Moon Surface**
   - The ON Lunar outpost consisting of 3-D printed regolith buildings and farming domes, located on the top section of the city model is manually removeable by a student presenter to view the subterranean city.
4. **Spinning Building Tops**
   - Artificial gravity generators technology is represented using moving fidget spinners at the top of buildings.
5. **Video link:** https://www.youtube.com/watch?v=WiqnCyGTpyU

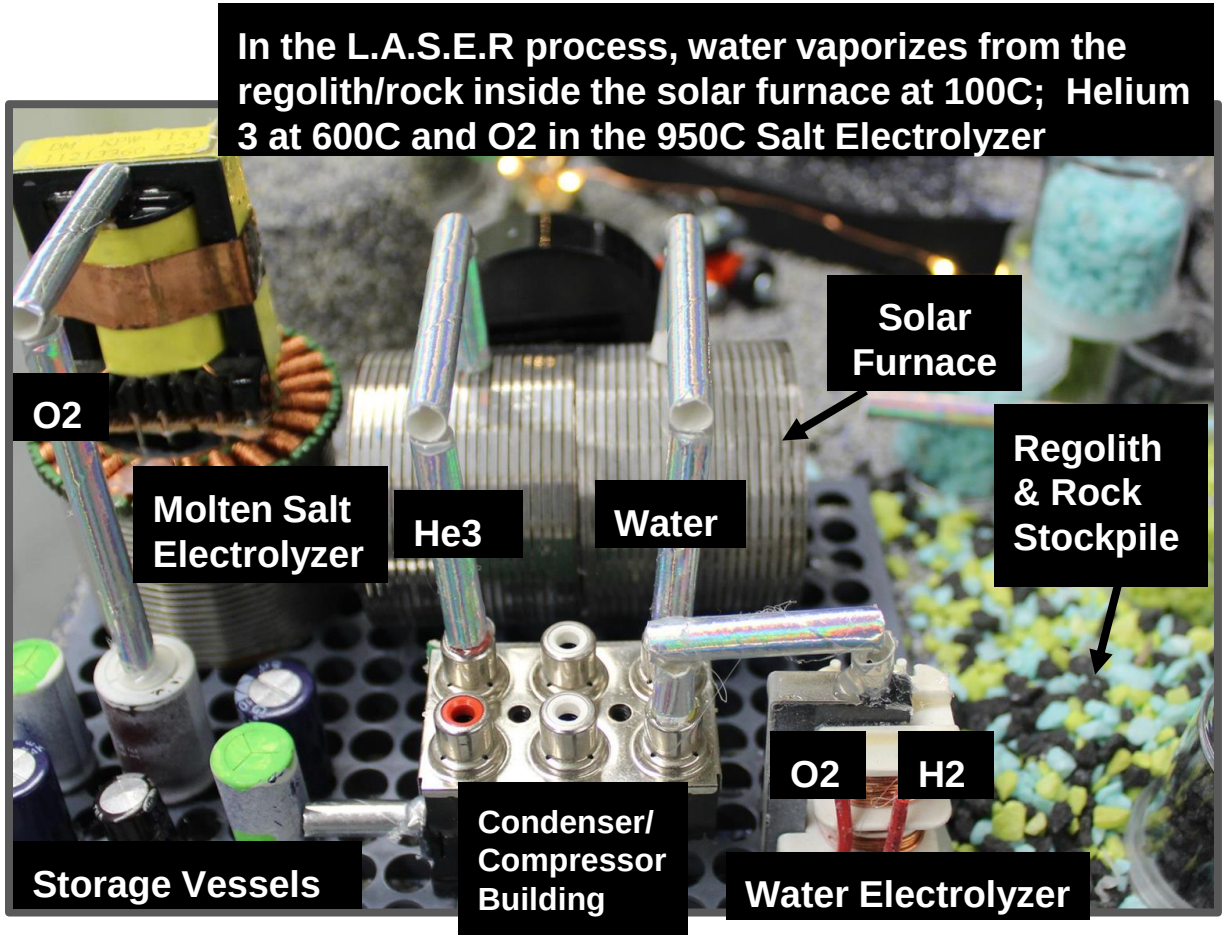


Section III

JUDGE ASSESSMENT OF MODEL

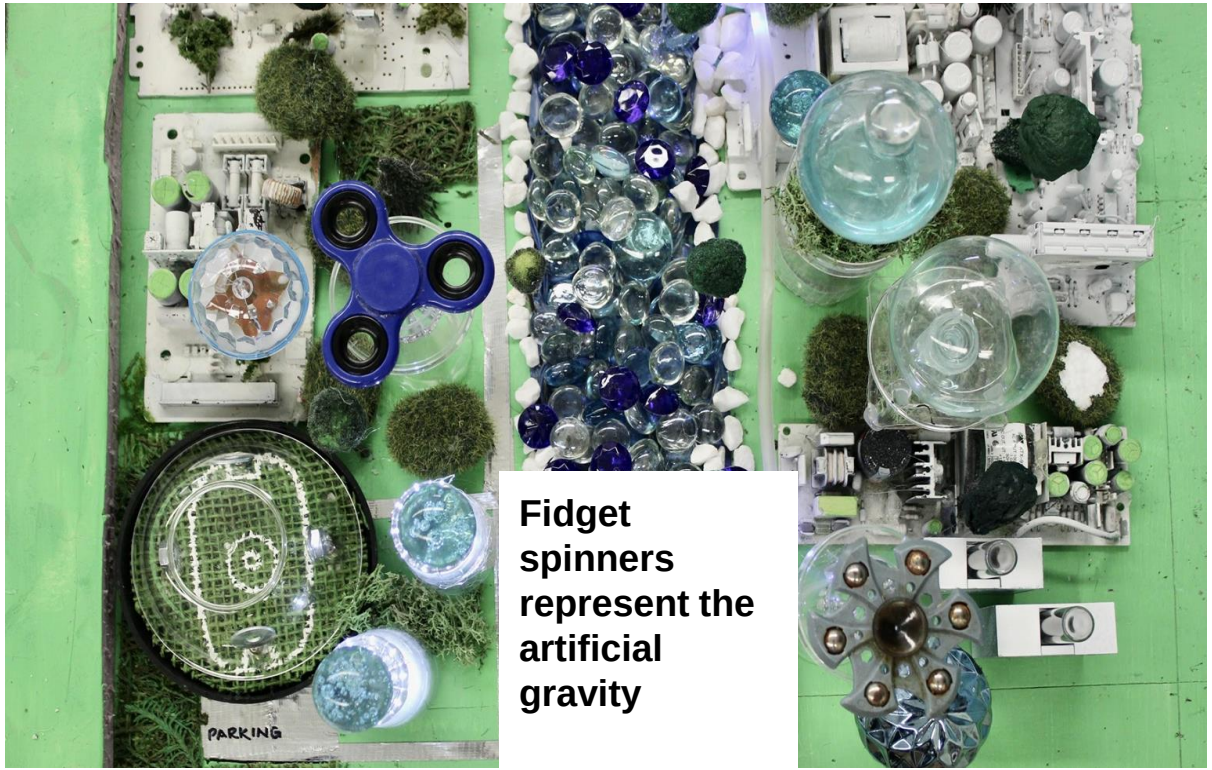
Futuristic Technology Example 1

Our S.A.B.E.R and L.A.S.E.R technologies are the backbone of the Orbis Noctem economy. The **S**urveying **A**utonomous **B**oring **E**xtraction **R**overs generate and stockpile regolith and rock for element refining in the **L**unar **A**sset **S**olar **E**lement **R**efinery. The SABERs are how the early crews tunneled into the lava tube to establish the city. LASER extracts water, Helium-3, oxygen and hydrogen from the moon soil and rocks.



Futuristic Technology Example 2

Orbis Noctem’s multi-use, high rise buildings spin to create their own artificial gravity with each floor spinning independently at a rate that exerts a centrifugal acceleration equal to that experienced on earth. Residents of ON need to experience earth’s gravity a minimum 8 hours each day to prevent the bone loss and organ calcification caused by long term exposure to low/zero gravity environments. Fitness trackers notify residents and visitors when they need to return to artificial gravity.



Fidget spinners represent the artificial gravity