

# **A.R.T.H.U.R.**

Archaea Reengineering Terraformation to Humanize Uninhabitable Resources

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**Katie Tardif**

Hometown : Raleigh, NC  
Activity of Choice : Backpacking or Skiing  
Favorite Animal : Squirrels

*'Most answers reveal themselves through doing, not thinking.'  
- Jan Sinoëto*

The architectural tool that best reflects myself is canary yellow trace paper. Commonly used for iterating, it's the space where I can test ideas, articulate thoughts or just plain doodle. Trace paper is the physical space to release swirling thoughts.

But, what makes trace paper most impactful, is the ability to layer ideas and concepts to develop a richer experience. It allows for technical detail drawings or loose, abstract theories and everything in between. These layers develop into a journey which is the foundation of design.

I embody trace paper because I understand and value the ideas brought to the table by my fellow collaborators. Great design is only born from honest teamwork. Trace paper is most powerful in layers, parts of a whole, which is why I am most powerful when I am part of a whole, a part of a team and we take the design journey together.

This is not something that I always understood about the practice, however. I struggled early in my education because I failed to utilize my counterparts and the strengths they bring to the table. As a result, my work faltered and remained stagnant. I was not able to fully experience the design journey because I was a lowly piece of trace paper, without my layers. Through my education, I learned the value of teammates and feedback and allowed myself to be vulnerable to the process, because it is only in that state of vulnerability, are you truly able to lean on those layers and take that journey (however uncomfortable it may be), to a better designed future.



**Isaac Cantu-Backhaus**

Hometown : Chapel Hill, NC  
Favorite Color : Olive Green  
Favorite Animal : Okapi

*'...if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid.'  
- Albert Einstein*

When I think of what architectural tool defines me, the answer could only ever be Sketchup.

Sketchup exists as an endless page for you to place ideas, toy with forms, give form to what you can imagine, and slowly figure out your own expertise in a simple program. It is a place where I can play with forms and renders and design anything from a fun gadget or spare part to 3d print and iterate on.

What makes Sketchup powerful is its flexibility. building extensions and material libraries, finding sister programs that can do nuanced commands to help fill the gaps. Sketchup is a software that can do incredible things, and at its base, can fit and mold to accomplish almost anything. But where Sketchup shines is where you start to collaborate.

I embody Sketchup because, while I can do quite a few things on my own merit, I only truly shine when I reach out. I value those who can help, through their influence, I can elevate my work past what I thought my own limitations were. Through this collaboration, I have extended my own abilities beyond a singular program, building and exploring different softwares to help broaden my own base.

Much like sketchup, my work is often split between architectural endeavors, and artistic. Using the same tools I have gone from drafting a plan view to turning around and putting the final touches on a new model for a board game. This flexibility in how I utilize my skill set is what keeps me fresh and excited for what comes next.

# Katie Tardif.

## Education.

**University of Colorado - Denver** *Denver, CO* Aug. 2020 - May 2023  
*Master of Architecture*

**University of North Carolina at Greensboro** *Greensboro, NC* Aug. 2015 - May 2020  
*Bachelor of Fine Arts, Interior Architecture*

**Study Abroad Experience** *Barcelona, Spain* May - June 2017

## Experience.

**Architectural Intern** *Denver, CO - Architectural Workshop* May 2021 - current  
 - Developing concepts and drawing construction documents for a variety of projects including university work, airport amenities, and residential  
 - Collaborating on web/social media publications and award submittals  
 - Creating material schemes including finish selections

**Fabrication Lab Assistant** *Denver, CO - College of Arch. and Planning, CU Denver* Jan. 2021 - June 2021  
 - Oversaw laser cutting lab  
 - Managed and ran laser cutting jobs

**Main Street Fellow** *Greensboro, NC - Center for Community - Engaged Design* Jan. - May 2020  
 - Conducted archival research, developed work write-ups  
 - Collaborated on a team to design historic facades for storefronts and upper level apartments  
 - Assessed, documented building conditions, in the field

## Involvement

**Research Assistant** *Greensboro, NC - Dept. of Interior Arch., UNC-Greensboro* May - Nov. 2019  
 - Conducted, analyzed research to determine design elements contributing to crime rates on campus  
 - Utilized Virtual Reality, NeuroSky Mindwave, and SpaceSyntax technologies  
 - Awarded 2nd place at Thomas Undergraduate Research and Creativity Expo (UNCG)

**Design Build Competition** *Englewood, CO - Museum of Outdoor Arts* Aug. 2020  
 - Designed a hypothetical 500 sq. ft. shelter for respite off a recreational trail in the Sonoran Desert, collaborated with Isaac Cantu-Backhaus  
 - Awarded 1st place



# isaac bodhi backhaus

## EDUCATION & EXPERIENCE

**UNC Greensboro Interior Architecture** 2016 - 2020

bachelors of fine arts  
 drafting of multi-level floor plans and supporting documents  
 analyzed interior and exterior building design  
 creation of material and furniture spec sheets  
 use and proficiency of multiple design softwares

**Presidential Campaign Volunteer** 2012 / 2020

voter registration & campaign signage  
 door-to-door advocacy

**Volunteer Construction** 2018

assisted in building sustainable homes for low income households

**Arboreum Care and Maintenance** 2018

gardening and upkeep of greensboro arboreum

**Campus Building Restoration** 2018

collaborative design and fabrication of interior furnishings and mural

## WORK HISTORY

**West Elm** 2017 - present

advanced from stock associate to home stylist  
 conducted redesigns for residential and commercial interiors  
 fabrication of floor plans and presentation boards for clients  
 spearheaded overhaul of cloud storage system through corporate office

**Computer Assisted Making** 2017 - 2020

oversaw maintenance of machinery and created instructional videos for upkeep  
 laser pattern design and cutting  
 vinyl design and cutting  
 3d design and printing  
 textile design and printing

**Regina Andrew Design** 2017 - 2019

sales and assistant at furniture market

## SKILLS & EXPERTISE

- google sketchup
- revit
- autocad
- illustrator
- rhino
- photoshop

## SOCIAL & CULTURAL

**Team Strategy Tabletop Games** 2015

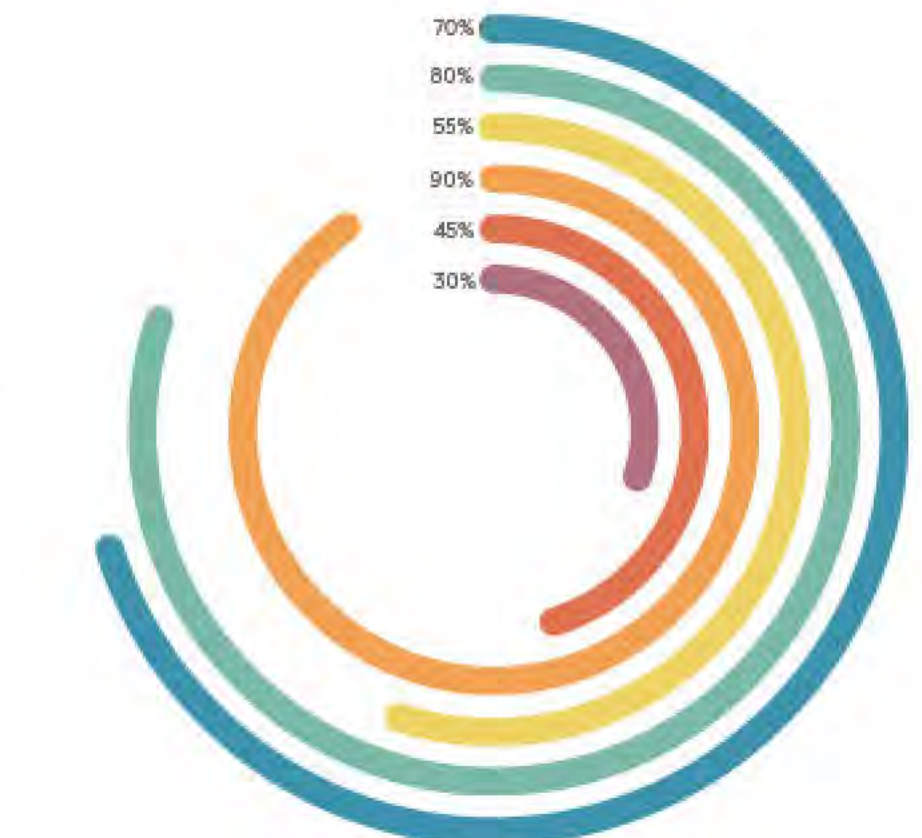
collaboration & communication skills building  
 worldbuilding and character creation involving extensive immersion and background details

**development of creative problem solving**

created visuals explaining out of box concepts  
 management of multiple individuals along with specific details 2012 - present

**Almost Champion**

4th of July pie eating contest 2nd place



*'Any sufficiently  
advanced technology  
is indistinguishable from  
magic.'*

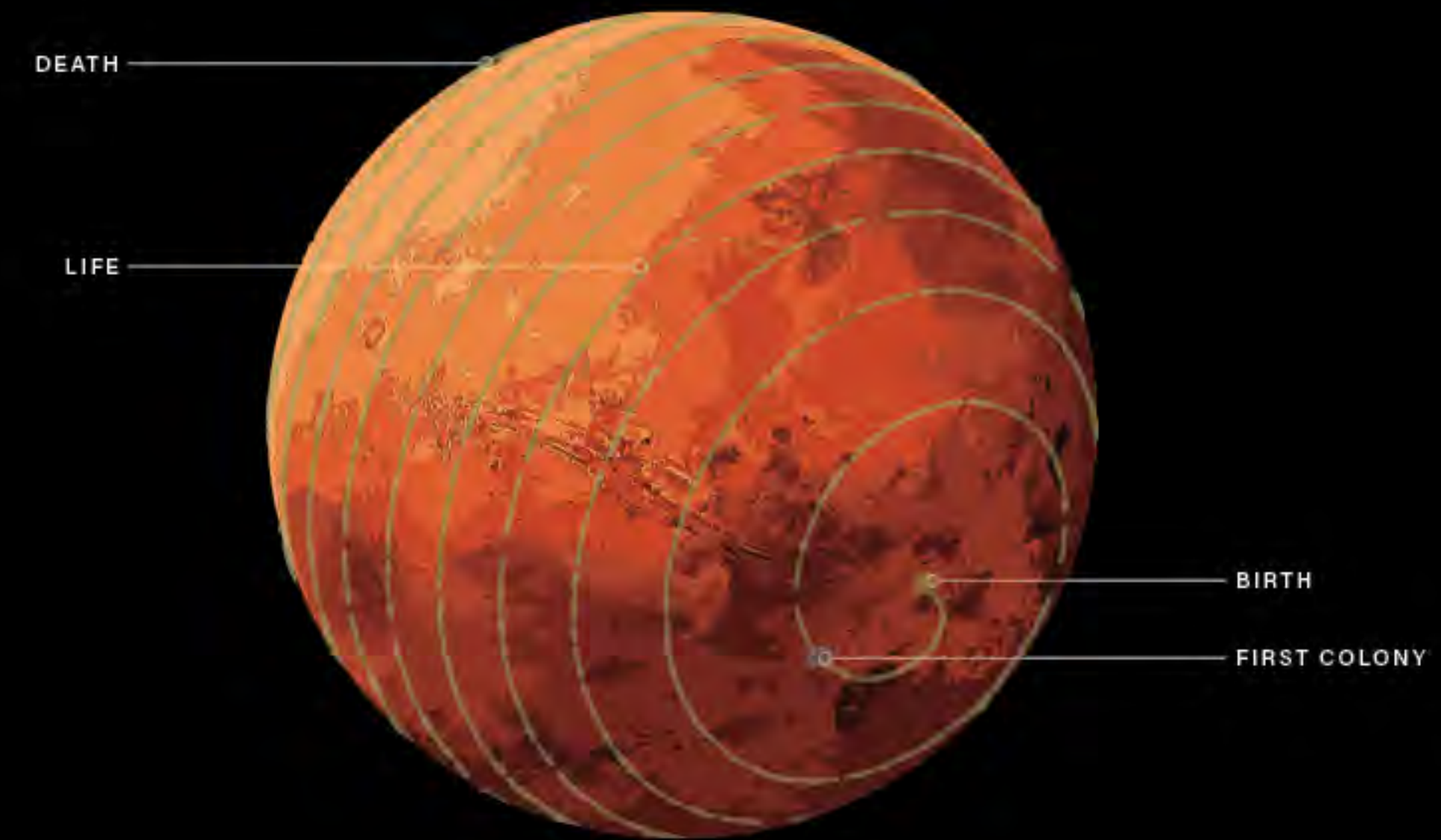
- Arthur C. Clarke

Life on Earth began with a single-celled organism called an Archaea. Before Archaea, Earth was uninhabitable for any other living being. There was far too much carbon in the atmosphere to support more complex life. These tiny wonders engineered Earth for our use by consuming carbon and producing oxygen, day in and day out, for billions of years. Archaea transformed the once uninhabitable Earth over time due to their resiliency. They can survive extreme temperatures, high acidity and alkalinity, reproducing and even thriving despite these conditions. These extreme conditions echo those that currently exist on Mars.

A.R.T.H.U.R. is the first Archaea on Mars. An unnaturally natural 'living' being, manufactured by the greatest scientific minds of the future to metamorphosize the Red Planet, much like its Earthly ancestors.

This being said, the site for A.R.T.H.U.R. is, simply put, Mars. A.R.T.H.U.R. crawls the surface of Mars, tilling and terraforming in its wake, transforming the Red Planet, Green. A new environment that hosts biodiversity, allowing increasingly complex life to thrive on its once barren surface.

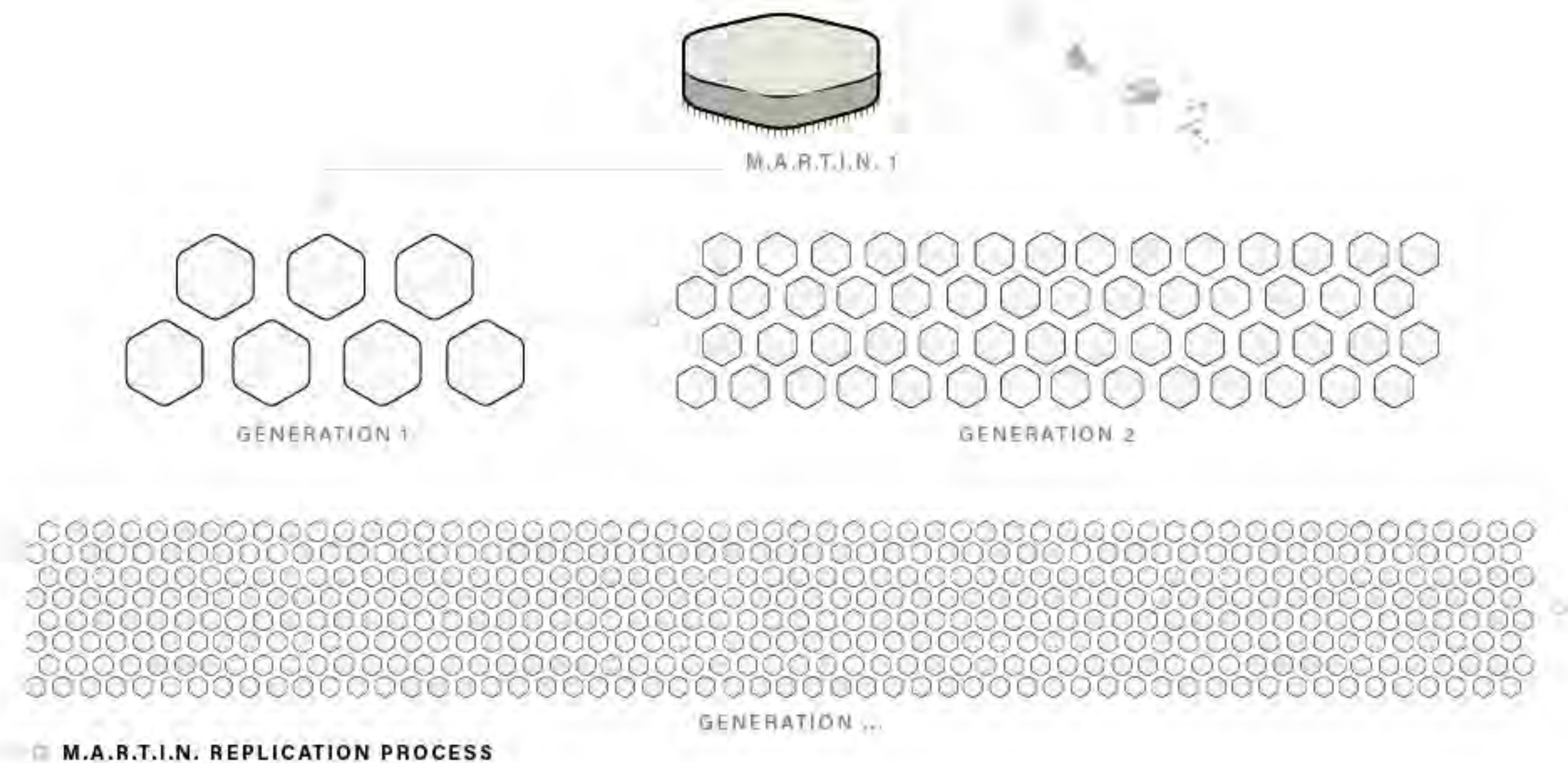
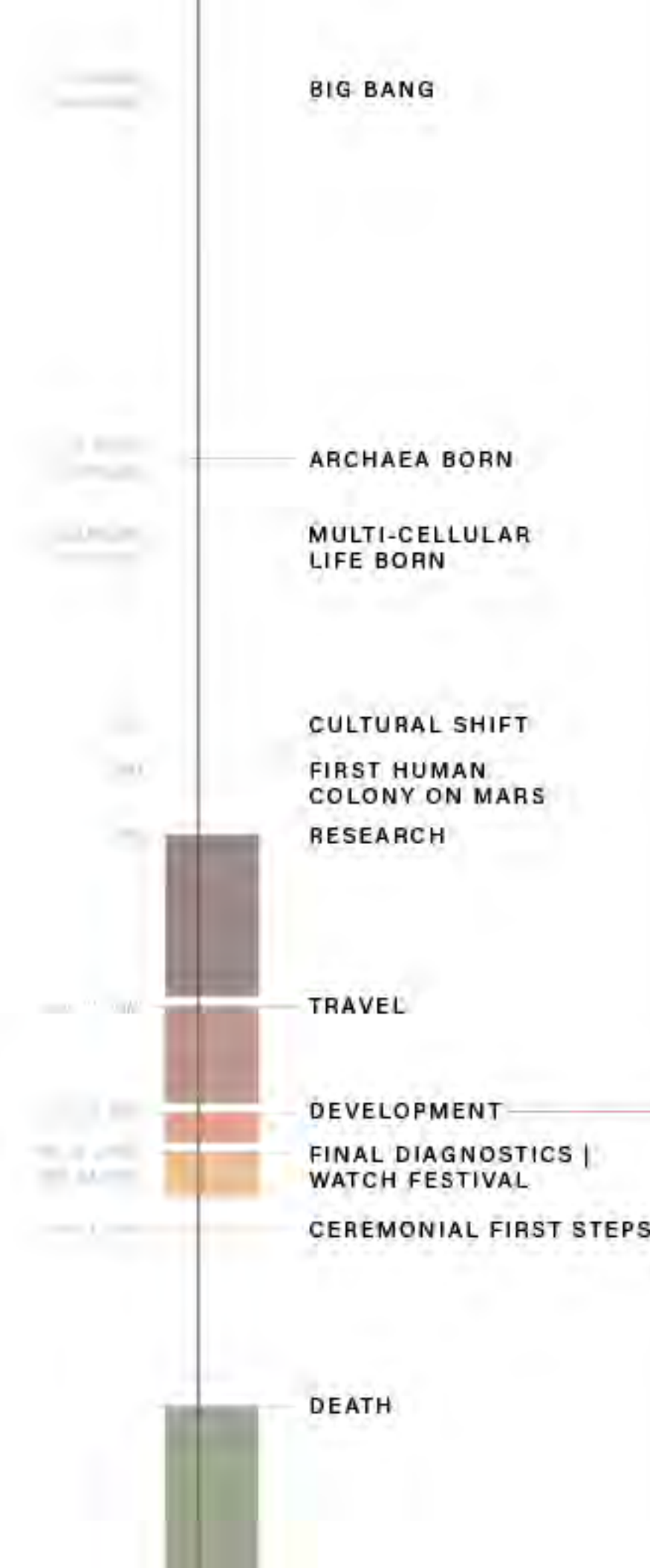
A.R.T.H.U.R. is born at 233N, 13E, (at the base of Olympus Mons) will spend hundreds of years roaming the planet where it will come to its final resting place.

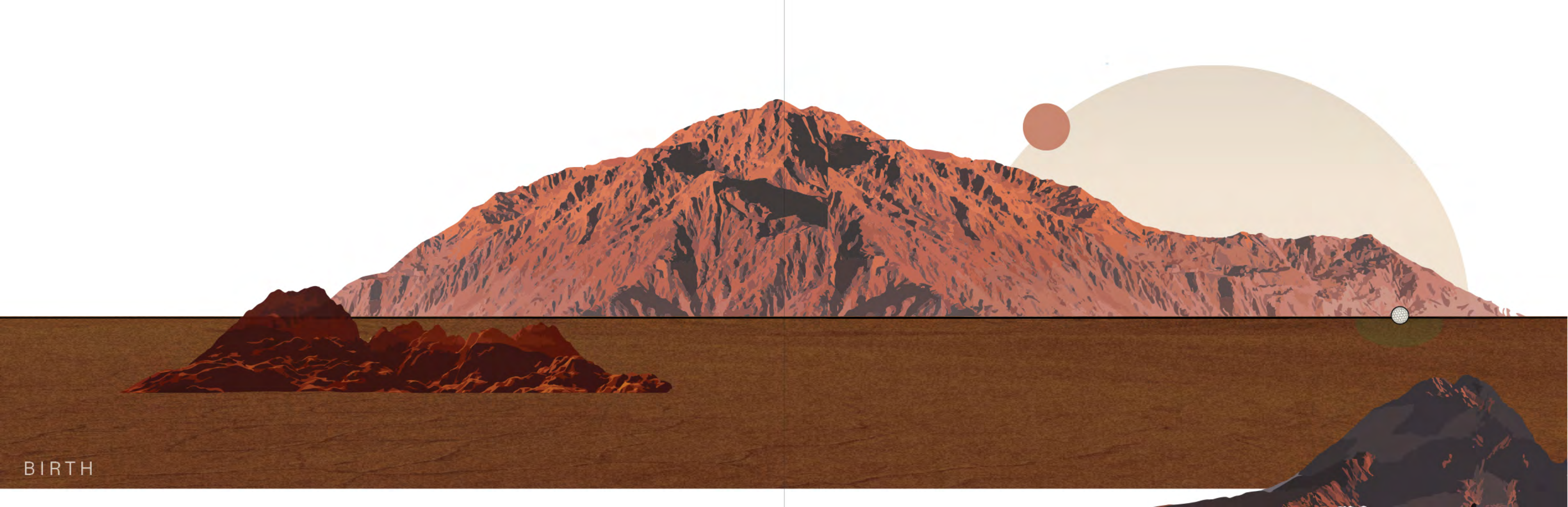


The first Archaea reproduced exponentially via fragmentation, asexually splitting from a single cell into two, from two to four, from four to eight and so forth. The development of A.R.T.H.U.R. follows a similar process.

A single, autonomous 'M.A.R.T.I.N.' (Mars Autonomous Replicating Transformative Neuman) probe is launched to the surface of Mars, which then seeks raw material and matter, with the goal to print replicas of itself. The process repeats exponentially through multiple generations of probes until 2,178,309 units are produced.

The life of a single M.A.R.T.I.N. spans 8 weeks. Their first week of life is in the reproduction phase. Due to materials present on Mars' surface such as iron oxide (as a binding agent), aluminum, titanium, chromium (as a construction material) and perchlorate (as an energy catalyst), the M.A.R.T.I.N. is able to replicate itself. The focus shifts during its second week, with a renewed purpose, it develops and fabricates the interior anatomy of A.R.T.H.U.R. This construction phase can last anywhere from 4-5 weeks. At 8 weeks old, the now prostrated probe is broken down by younger M.A.R.T.I.N.s, its parts stripped and repurposed for the larger development to complete A.R.T.H.U.R. The final generation of M.A.R.T.I.N.s, their purpose complete, will converge onto the surface of the structure, coagulating into a protective carapace. Finally, they will each fabricate and sprout a tendril-like flagella from their surface.





BIRTH



## The year is 2144.

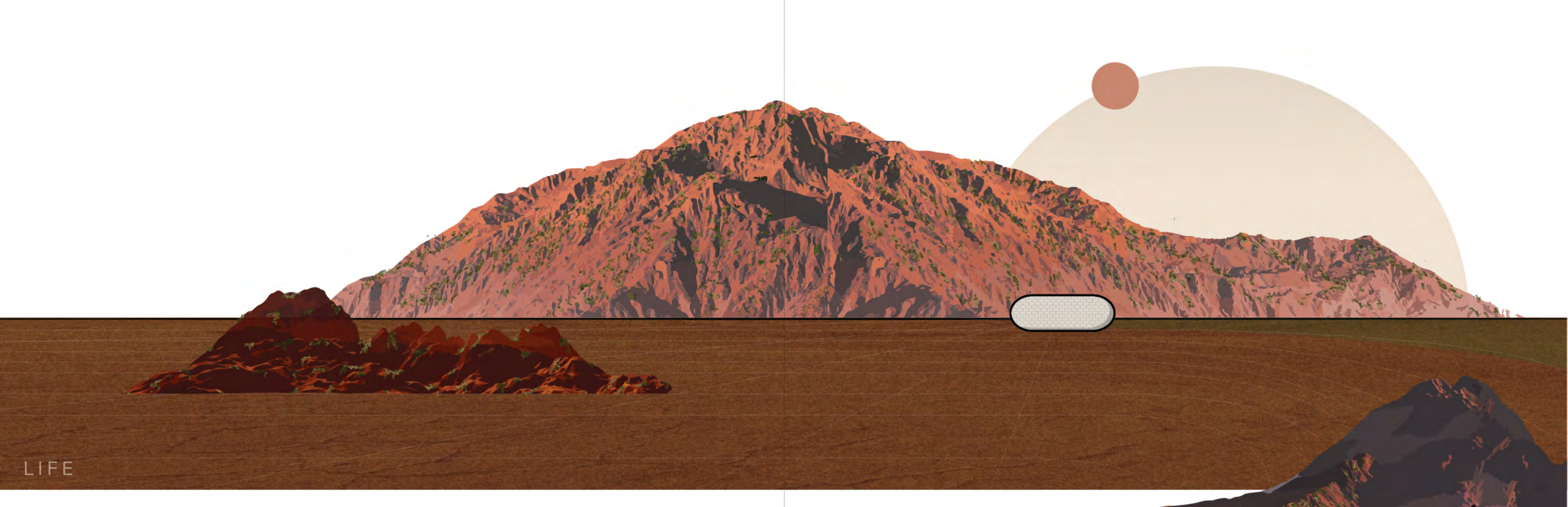
The drive for a solution to Earth's impending climate crisis forced world leaders and scientists to cooperate, sharing amongst them applied sciences, culture, and resources, altering our climate drastically. Earth's forests grew, biodiversity flourished, and over generations, we began to **thrive** on our Green Planet.

## It's now 2584,

and the entire world's culture has shifted.

In this future, borders have dissipated, resulting in the accelerated advancement of technology and innovation. Top professionals are able to gather and collaborate for the sake of innovation alone, rather than worldly gain. Collaboration is no longer a key to strive for, but a way of life.

As a result of this cultural progress, A.R.T.H.U.R. was conceived. Built on the back of 400 years of heavy alliance to transform the



LIFE

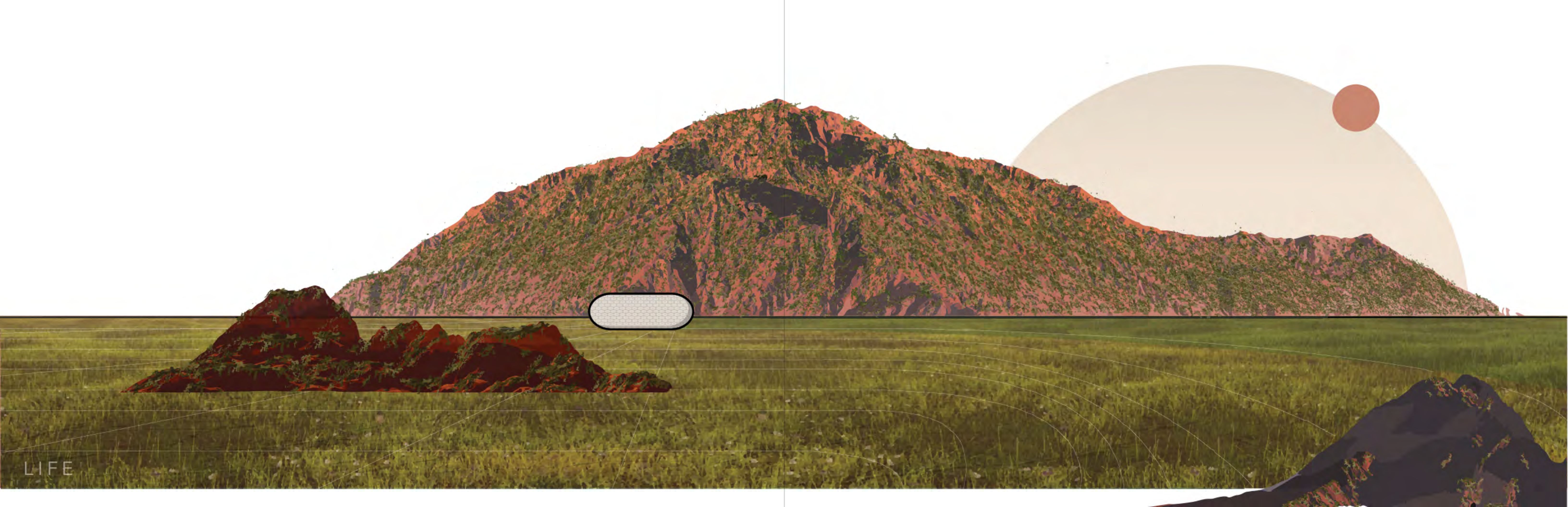
Once A.R.T.H.U.R. reaches the mature stage of its life, it will be inaccessible for humans to enter. The main duties of A.R.T.H.U.R. would be to process and fertilize regolith, mixing archaea, iron oxide, and innumerable necessary elements into the soil, leaving agriculturally viable land in its wake. As A.R.T.H.U.R. meanders along the surface, it pumps oxygen into the air, slowly transforming Mars into a livable, breathable planet.

While A.R.T.H.U.R. functions as an unseen worker, its location can be tracked along the surface. Much like a comet, its passing acts as a sight to behold and celebrate. While early in its life it will pass by the original colony once every few years, its passings would become less frequent, only appearing to certain colonies once a generation as it journeys across the span of the planet. Festivals are held for its passing, children are told tales of the mythical A.R.T.H.U.R. that spreads life where it touches, bringing good tidings, health and harvests to those it passes.

The job will eventually reach completion, the Red Planet now Green, and A.R.T.H.U.R. will exhale oxygen one final time, its reason for life fulfilled. At this stage, A.R.T.H.U.R. will be repurposed, its carapace found by a future generation, collapsed and weathered. The lands surrounding it will be declared a protected park, with the structure itself eternalized - modified into a playground for future generations to play, helmet free in a resurrected, life-filled Mars.



A.R.T.H.U.R. does not address the climate on Mars, but rather **transforms** it, leaving long-lasting impacts in its' trailing path.



LIFE

A.R.T.H.U.R. travels the surface of Mars, fertilizing the land and filling the atmosphere with oxygen.

Through a series of exterior flagella which serve 2 main functions: reconstructing regolith into viable soil and converting carbon into oxygen. While A.R.T.H.U.R. moves across the surface of Mars, the flagella dig into the ground, collect regolith which then travel through the webbed vascular system to the rotating core. This advanced nuclear reactor centrifuge genetically modifies the regolith, applying oxygen and live, breeding Archaea. The substance is then shunted back out, passing through a secondary series of tubes (exhalation funnels) expelling through the flagella into Martian soil.

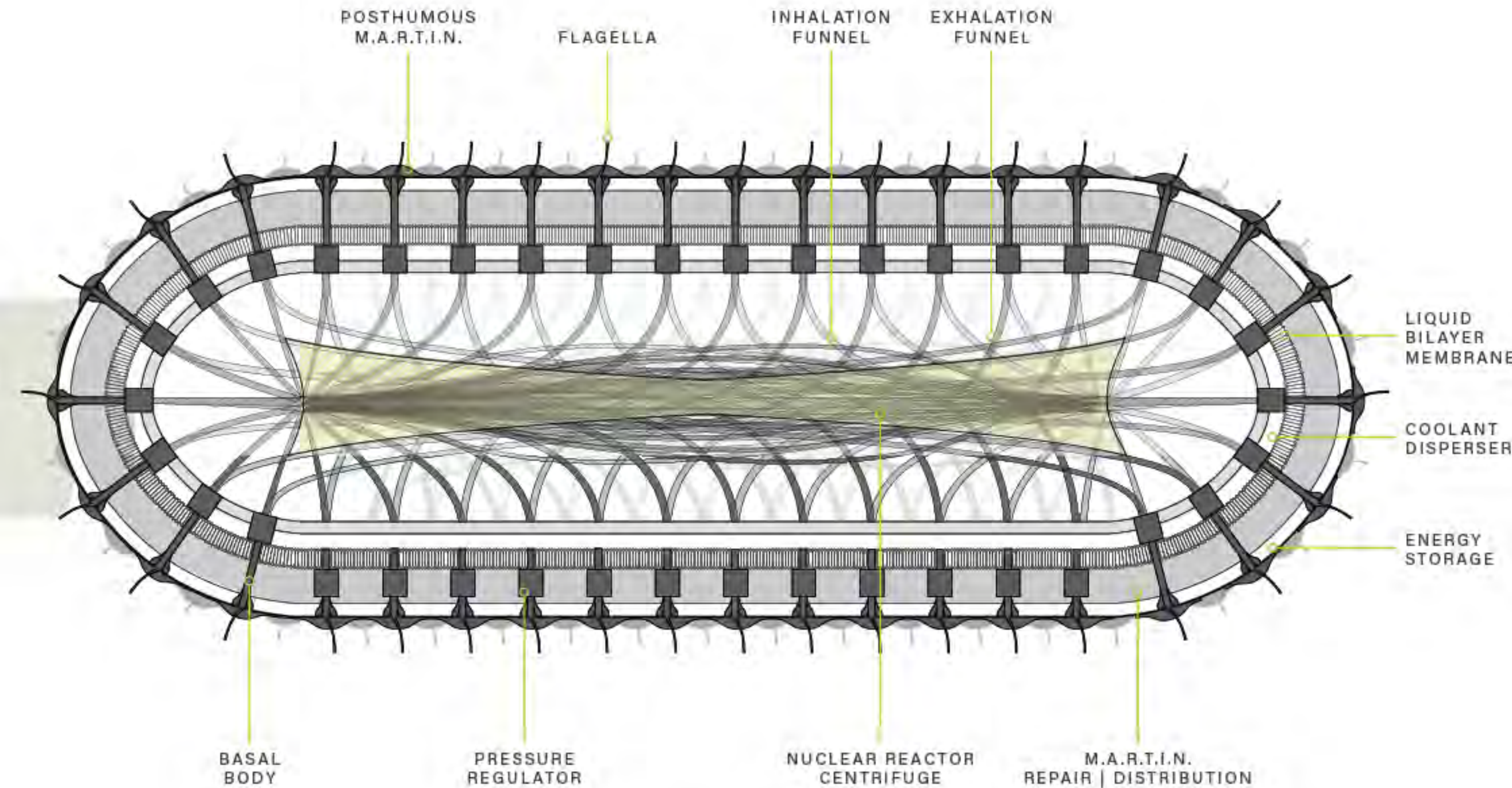
A.R.T.H.U.R. also manipulates the atmosphere. The atmosphere facing flagella collect carbon, push it through the inhalation funnels, to a secondary rotating core to be reconstructed and pumped out the exhalation funnels through the flagella back to the atmosphere.

As A.R.T.H.U.R. rotates across Mars, the flagella switch between these two processes.

Movement is key for A.R.T.H.U.R. who crawls across the landscape at half an inch per minute, traveling only one mile in a span 89 days. By utilizing it's flagella to wave into the soil, slowly rotating itself as it digs. A.R.T.H.U.R. spirals forward, in a directional propulsion.

The Mars landscape is fraught with treacherous terrain, drops, and dangerous exposure to radiation. Routine repairs will be necessary to provide longevity. When damage occurs or a part needs replacing, the descendant M.A.R.T.I.N. probes spring to action. The M.A.R.T.I.N.s move about performing routine repairs internally. M.A.R.T.I.N.s self-reliance and 3D fabrication acumen negates the need for human interference.

FORWARD  
PROGRESSION



A.R.T.H.U.R. PLAN | SECTION

You sit on a bench, the wind whips around you as the warm sun shines through the trees. Birds singing in the distance. You take a deep breath of pure, unadulterated air as you look forward to a grassy opening. The once mythical structure known as A.R.T.H.U.R. sits, dismantled, repurposed as a playground for your child to run in. You sit amongst the Green in the place once known as the Red planet.

A.R.T.H.U.R. was never the monument... **Mars** is.

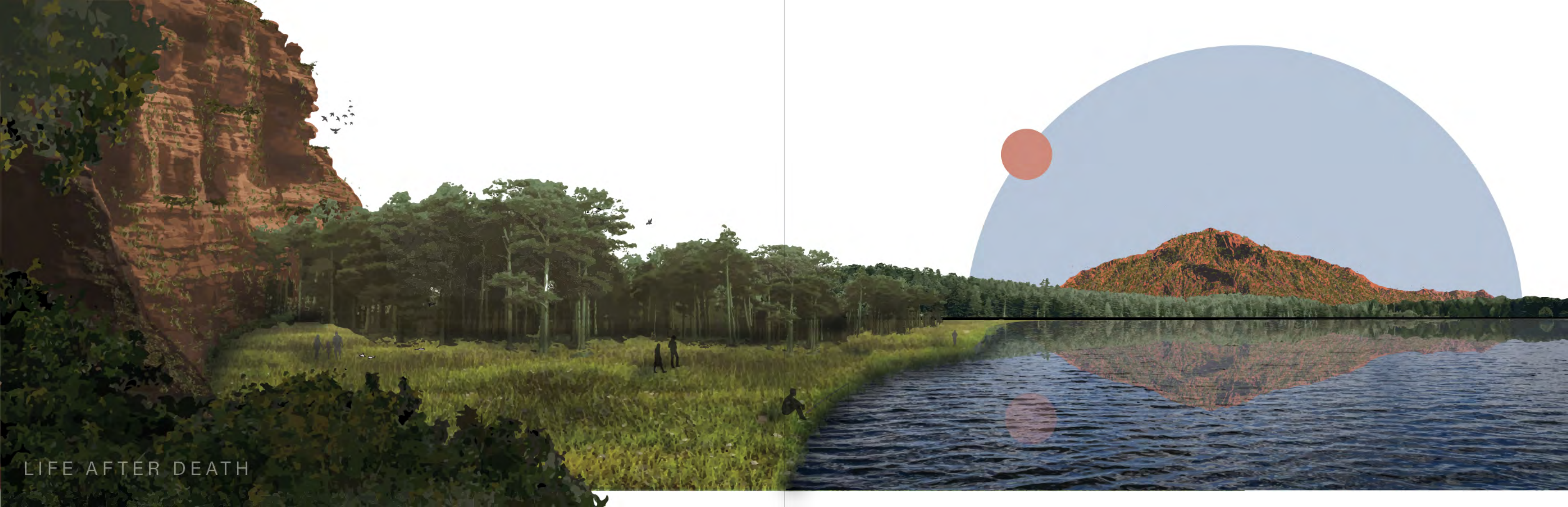
What makes this design environmentally friendly? A.R.T.H.U.R. sculpts the land itself to **BE** the monument. It does more than commemorate a human colony, it creates a land for life to live and breathe in, to thrive, to raise children, and to celebrate all that we have achieved. A monument to life itself, how far we have come and how far we can go.



DEATH

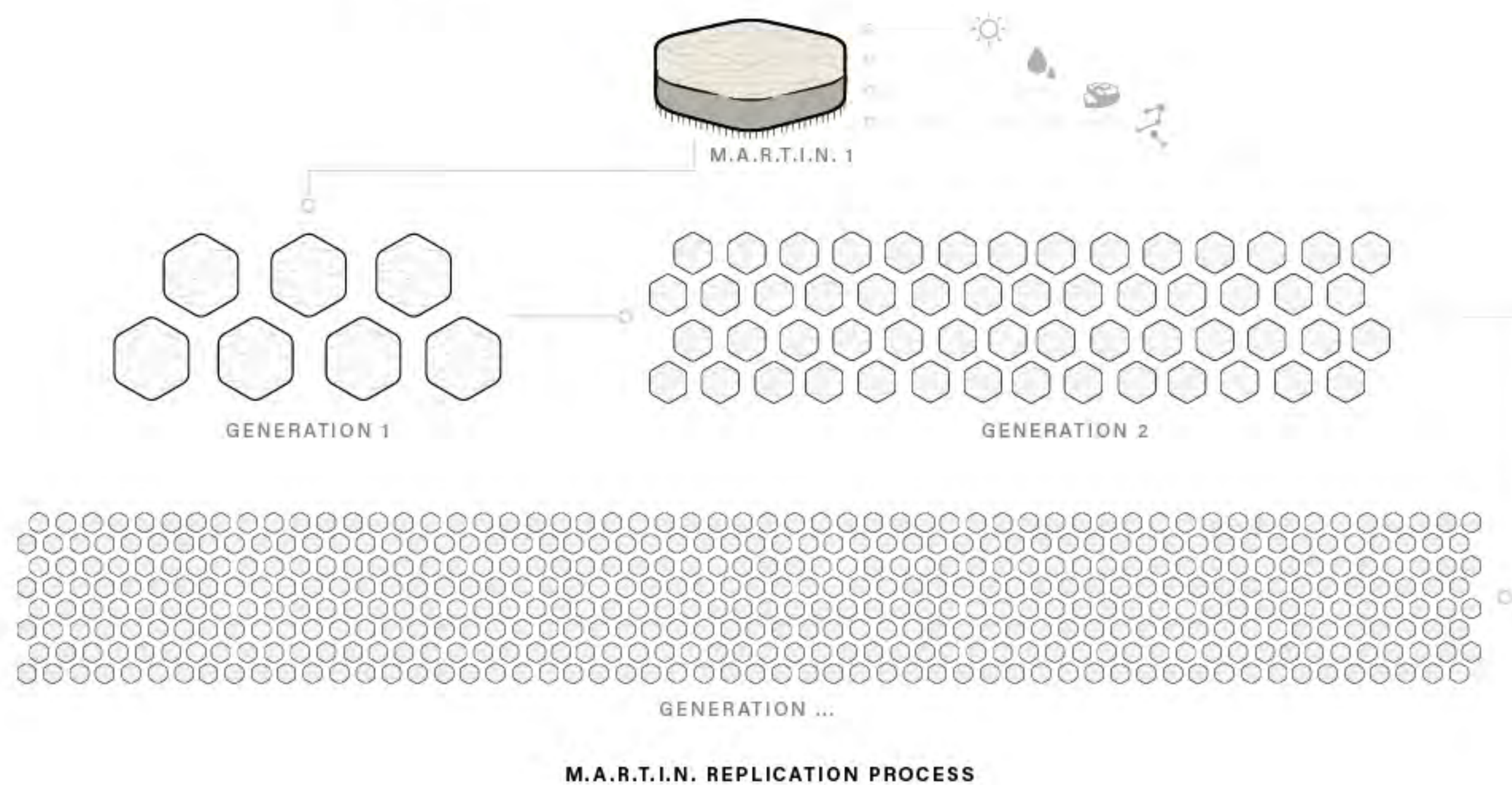




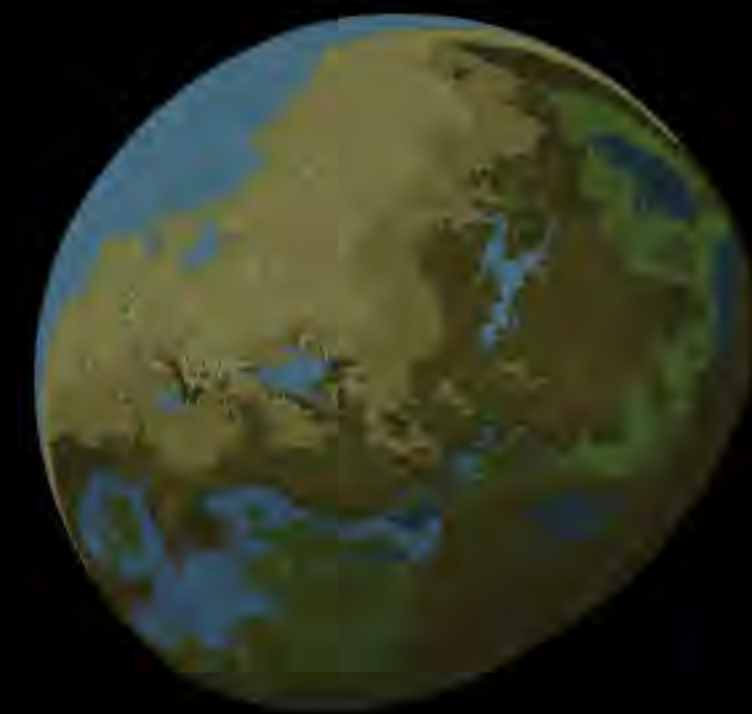


LIFE AFTER DEATH

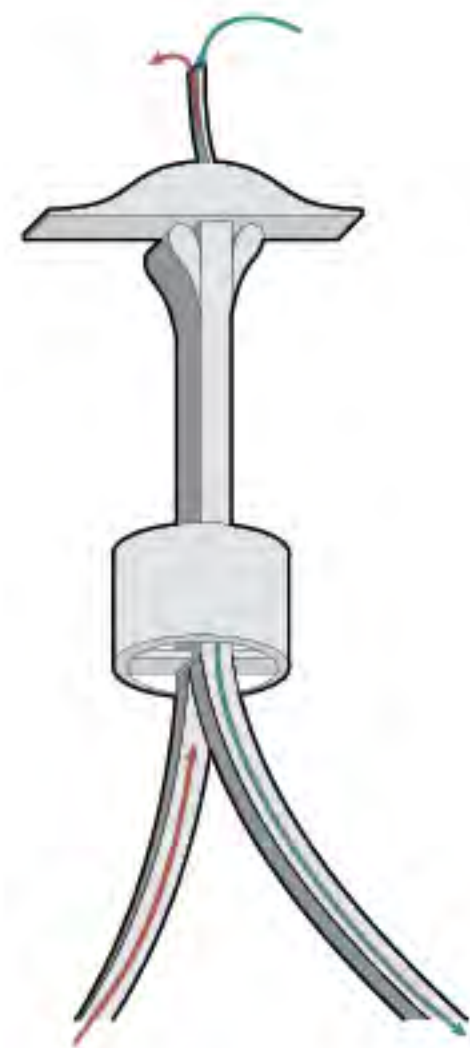
RESEARCH AND DEVELOPMENT	\$580,000
M.A.R.T.I.N. MATERIALS	\$63,500
LAUNCH   TRAVEL	\$140,000
COMMUNICATION SATELLITES	\$215,000
LIFE	PRICELESS
<b>TOTAL</b>	<b>\$998,500</b>



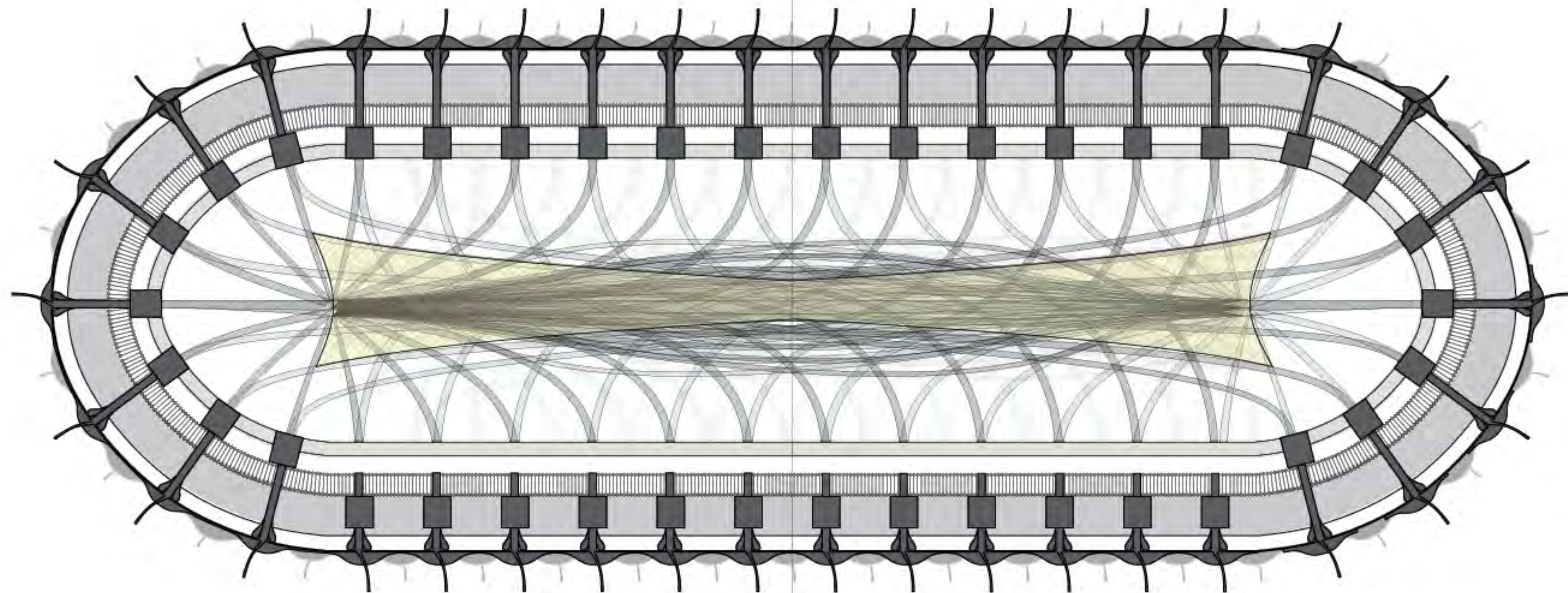
MARS, 2021



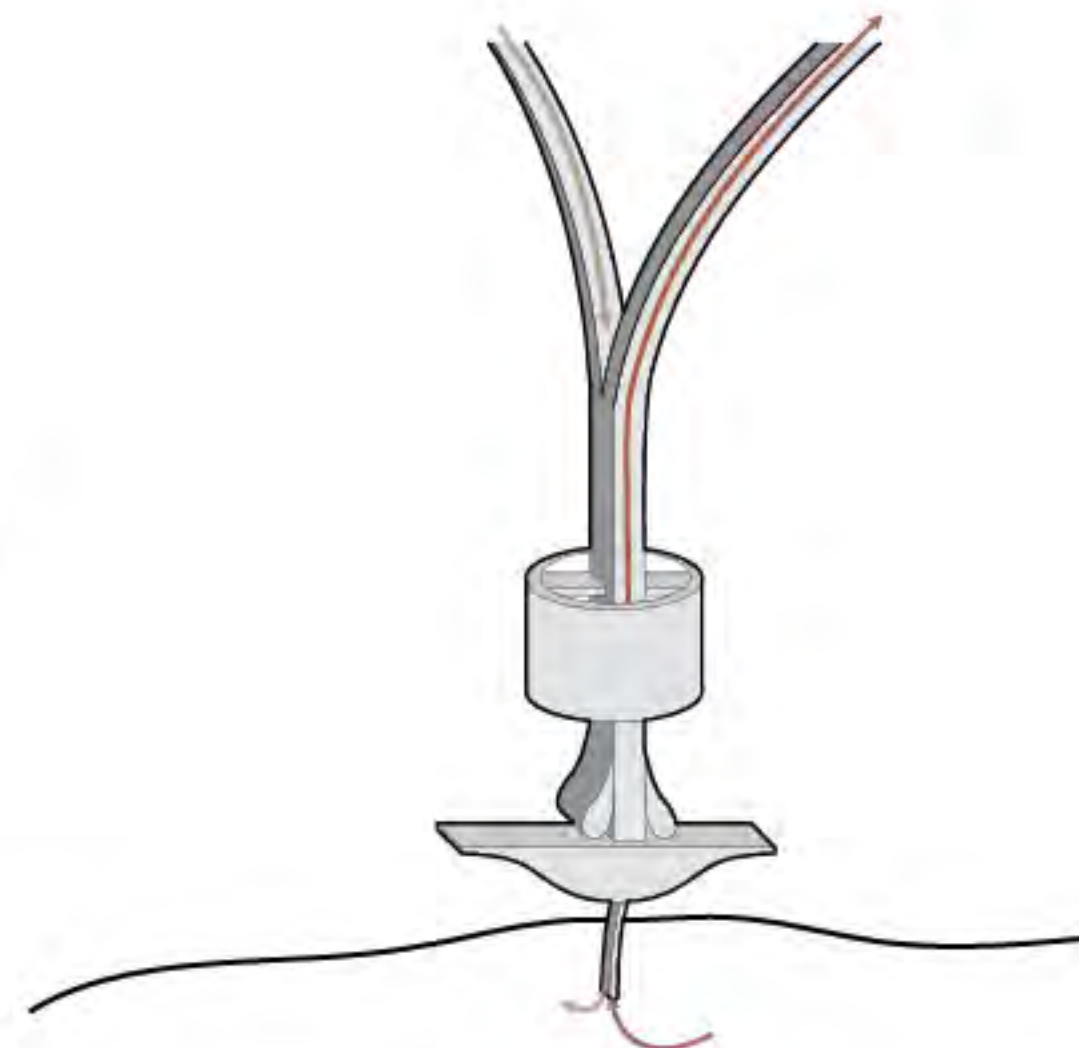
MARS, 2821



ATMOSPHERE REGENERATOR



A.R.T.H.U.R. PLAN | SECTION



REGOLITH RE-ENGINEER

