

The Evolution of Phyliotites— *The story behind seaUrchin for Grasshopper*

+ A guide on how to use it

SeaUrchin*

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A grasshopper plug-in for those
who seek to replicate the delicate
forms of make-belief creatures.

*CREATED BY SOPHIA CABRAL AND UNA LIU for SCI 6338 a harvard
GSD course led by Prof. Jose Luis Garcia del Castillo Lopez

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sea Urchin

seaUrchin is a plug-in harnessing the power of simple phyllotaxis algorithms to generate a diverse array of forms. This plug-in facilitates the creation of any of the species mentioned in this encyclopedia, and we encourage users to explore the development of additional species to expand the kingdom of the phyllotites.

On a more technical note, the components of this plug-in enable the generation of a continuous and complex polyline, simplifying the translation into G-code for 3D printing purposes. Despite the intricacy of these polylines, the printing time and material utilization for all these species are highly efficient, thanks to their unique morphology.

We trust you will enjoy utilizing this plug-in, discovering new possibilities, and bringing your creations to life through the printing process!

-Sophia and Una, creators of seaUrchin

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INTRODUCTION

SEARCHIN:
A GRASSHOPPER
PLUG IN

SeaUrchin species	01	Lobius	<i>Lobius trancosi, Lobius abies & Lobius menziensi</i>
SeaUrchin has the power to replicate Phyliotites, which are a species informed and created by scarcity; their form is highly efficient in the use of materials, making them a product of millions of years of evolution. The basic morphology of these creatures consists of conspicuous spirals diverging at consistent angles. While mostly regular and symmetrical, some Phyliotites have developed irregular and complex bodies that are made up of organized parts, such as the species Contorta Methodixus and Langun Poderosa. The following pages illustrate the taxonomy of these curious species. There is a lot that we, non-Phyliotites, can learn from this kingdom, as their morphology teaches us about material use efficiency and building strong structures in the face of scarcity.	02	Langum	<i>Langum Poderosa</i>
	03	Contorta	<i>Contorta methodoxius</i>
	04	Anemona	<i>Anemona grandiosa & Anemona paraense</i>
	05	Arthodoxius	<i>Arthodoxius bragensi & Arthodoxius sylvestri</i>
	06	seaUrchin	<i>A guide and information</i>

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GENUS:
LOBIUSSEARCHIN:
A GRASSHOPPER
PLUG IN

A genus is defined by its lengthy and conical bodies, stable frame, and survival strength. The angle of divergence of these species can range from 45 degrees to 360 degrees. An incredibly diverse genus, most species are extremely efficient at transporting nutrients consumed from their mouth to the rest of their bodies, as their veins are the shortest length possible.

Lobius

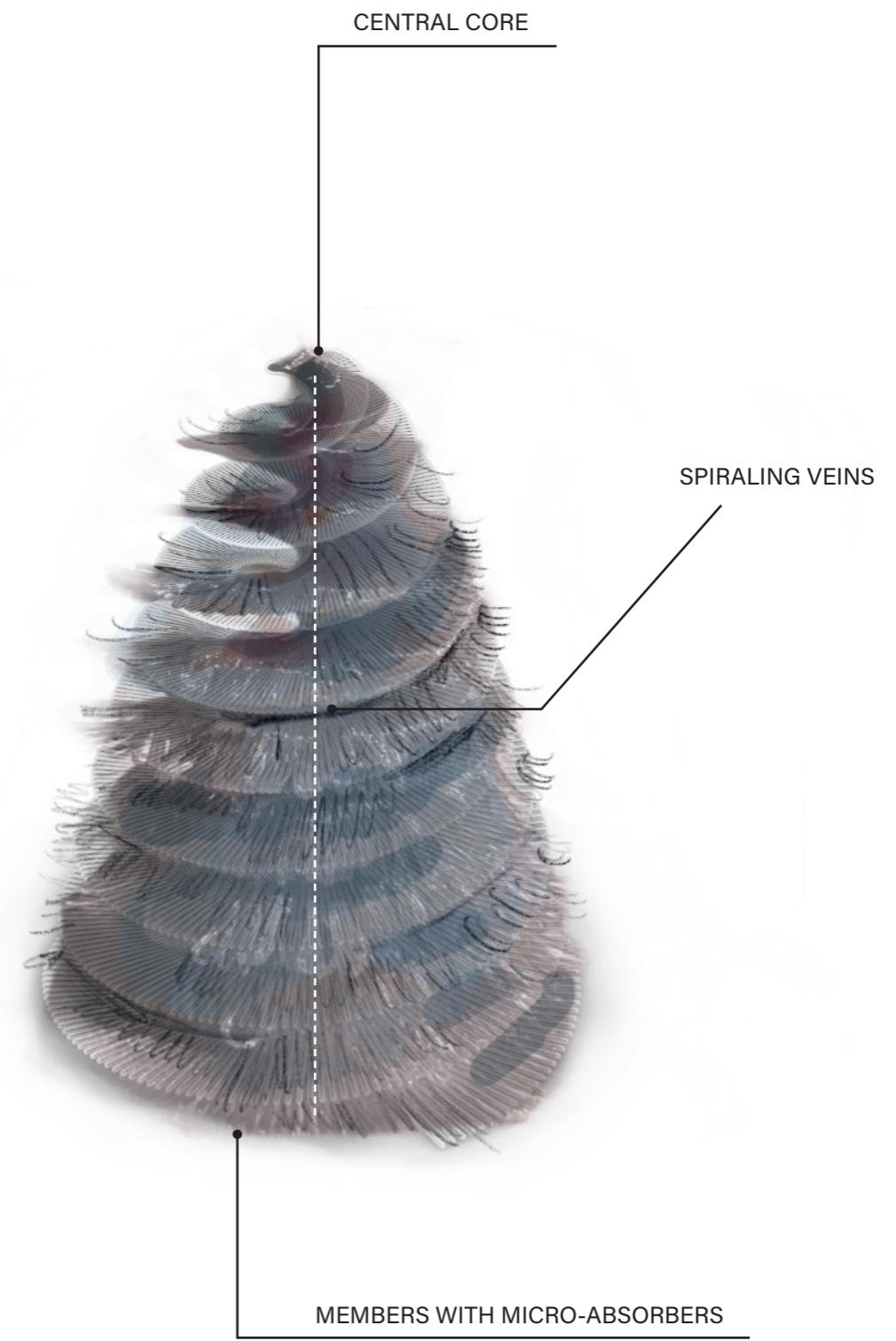
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GENUS:
LOBIUS

SEARCHIN:
A GRASSHOPPER
PLUG IN

Lobius trancosi

In the heart of the snowy Alapacia mountains, nestled in a remote valley, lives the *Lobius Trancosa* species. Life was simple for these species before the lush mountain environment in which they inhabited was transformed into an icy wilderness. Food scarcity swept through the region, leading to an evolutionary adaptation that allows these species to quickly spiral nutrients from its extremities to its core.

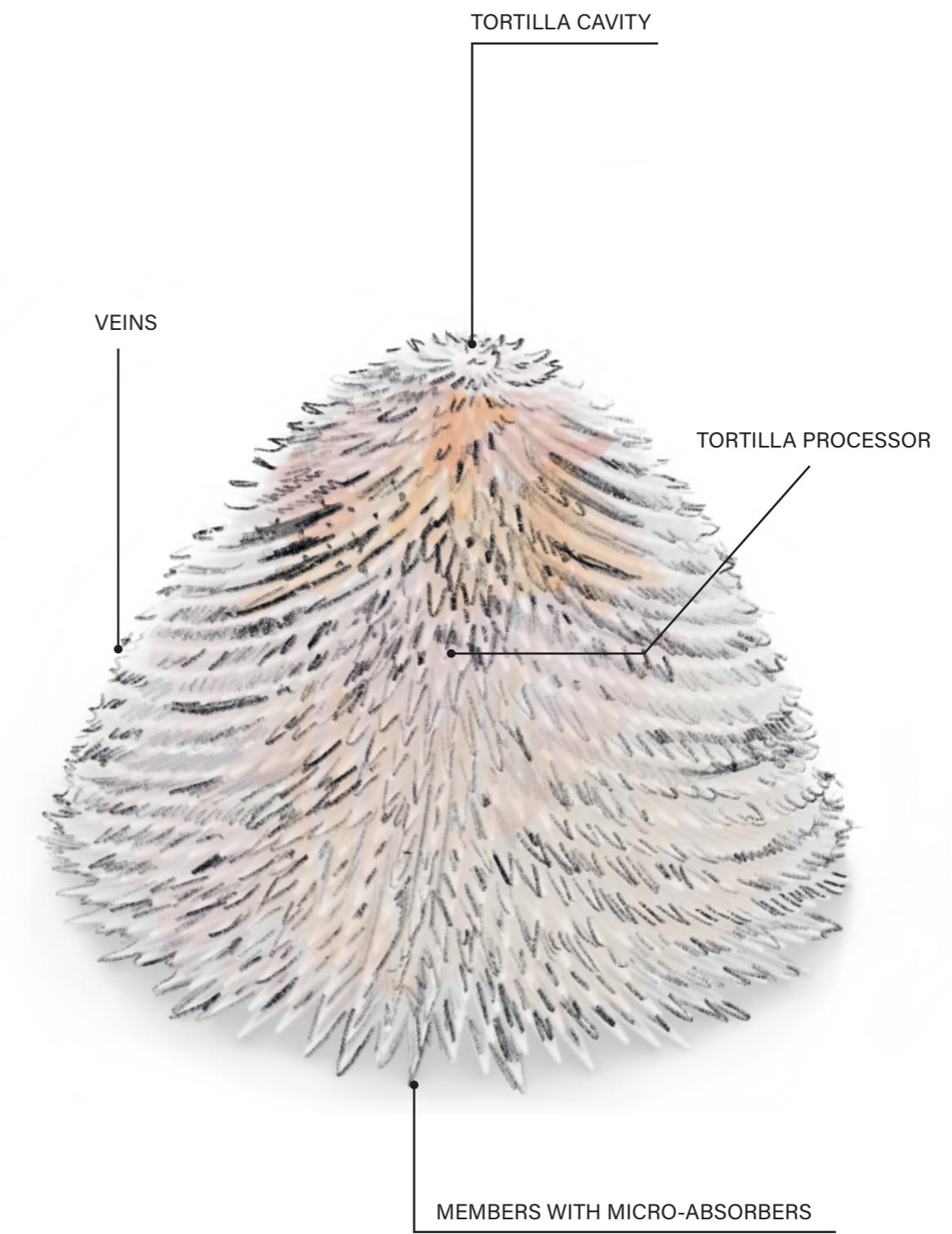


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GENUS:
LOBIUS

SEARCHIN:
A GRASSHOPPER
PLUG IN*Lobius mensiensis*

Lobius mensiensis are best known for their ability to quickly absorb nutrients from the earth beneath and transform them into tortilla chips. Although they are known for the art of tortilla making, the strongest of their kind are able to transform this craft into the making of shimmering gold.

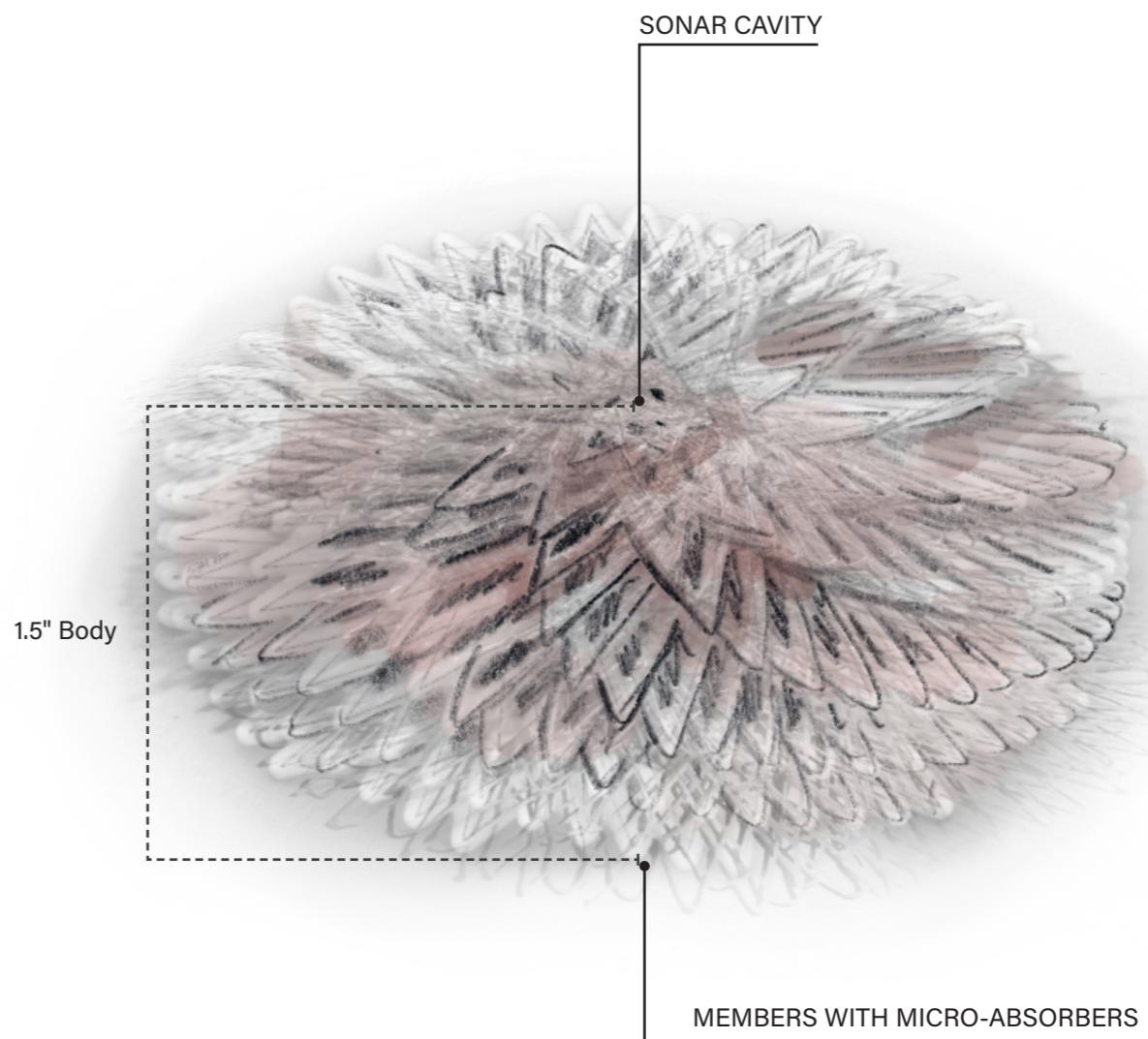


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GENUS:
LOBIUS

SEARCHIN:
A GRASSHOPPER
PLUG IN*Lobius Abies*

Deep within the Mistwood Forests, shrouded in eternal twilight, lies the entrance to the Labyrinth of Shadows. This labyrinth is no ordinary maze; its twisting passages are said to confound even the most seasoned explorers, leading them into timeless darkness. Within this enigmatic maze lives a species known as *Lobius Abies*. These species' shorter bodies enable them to blend with the ground, and their sonar cavities allow for interspecies communication from distances as far as 20 meters.



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GENUS:
LANGUMSEARCHIN:
A GRASSHOPPER
PLUG IN

A genus with many unknowns, Lagums
still lives in the shadows of knowledge.

Only one species has been uncovered so
far, namely, Langum Poderosa—a species
marked by its irregularity and ability to
quickly spread out and multiply itself
due to its thin-layer plate-like assembly.

Recent LIDAR technology has allowed for
a more in-depth exploration of this genus,
and it is expected that more species
will be found in the next few years.

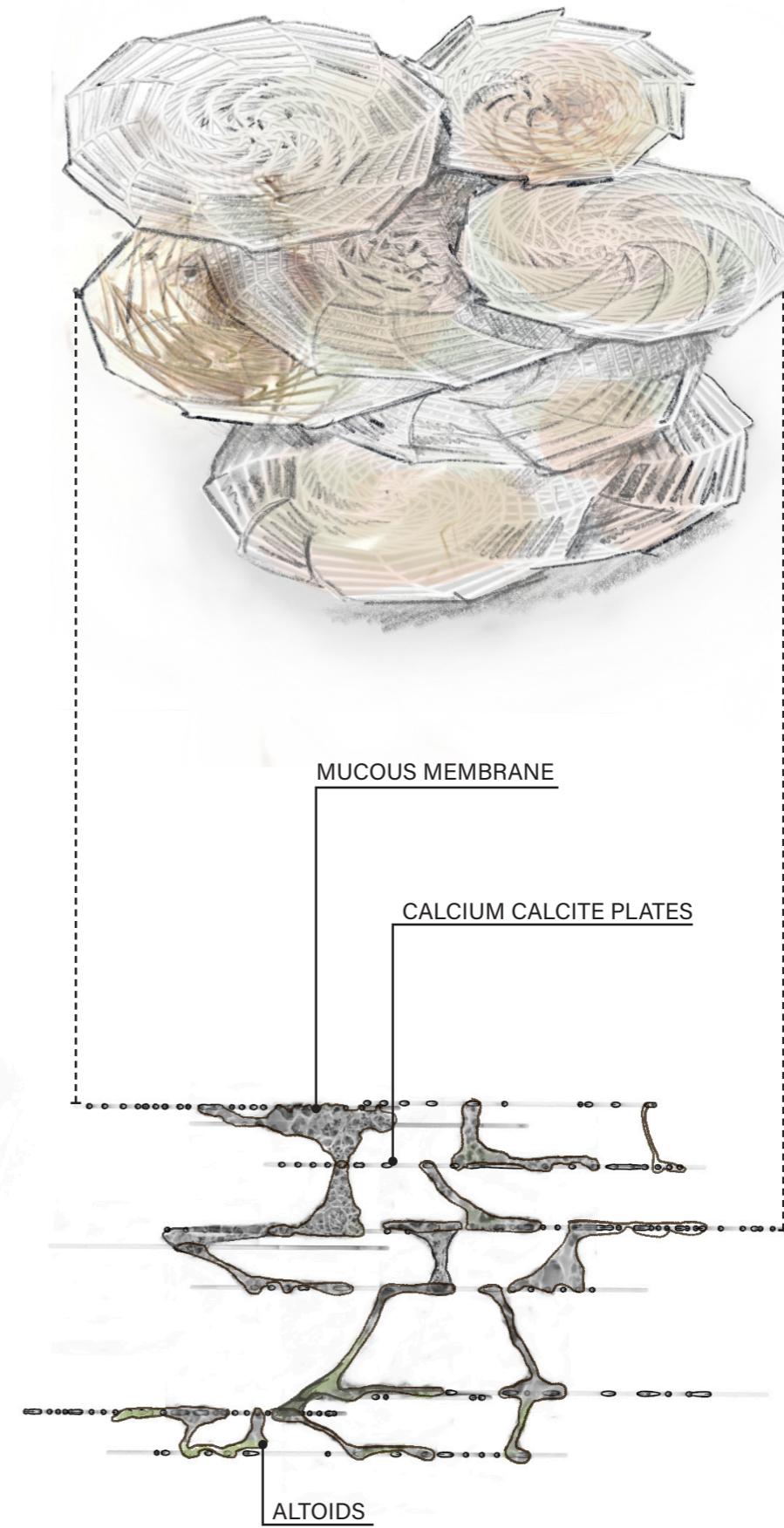
Langum

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GENUS:
LANGUM

SEARCHIN:
A GRASSHOPPER
PLUG IN*Langum Poderosa*

Langum Poderosa is known for its gelatinous form. They move at a seemingly glacial pace of 5 millimeters per year. However slow-moving, these species can quickly expand their form as they multiply their plate-like structures across layers of mucous. They leave behind a mucousy trail throughout their life-long journey, telling stories of patience, resilience, and the art of savoring the journey.



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GENUS:
CONTORTASEARCHIN:
A GRASSHOPPER
PLUG IN

Similar to Langum, much remains to be learned about Contorta. However, recent technological advances have not provided our species with any significant opportunities to further understand this genus. The best-documented species of this genus is *Contorta methodoxius*, recognized for its spiny defense mechanism.

Contorta

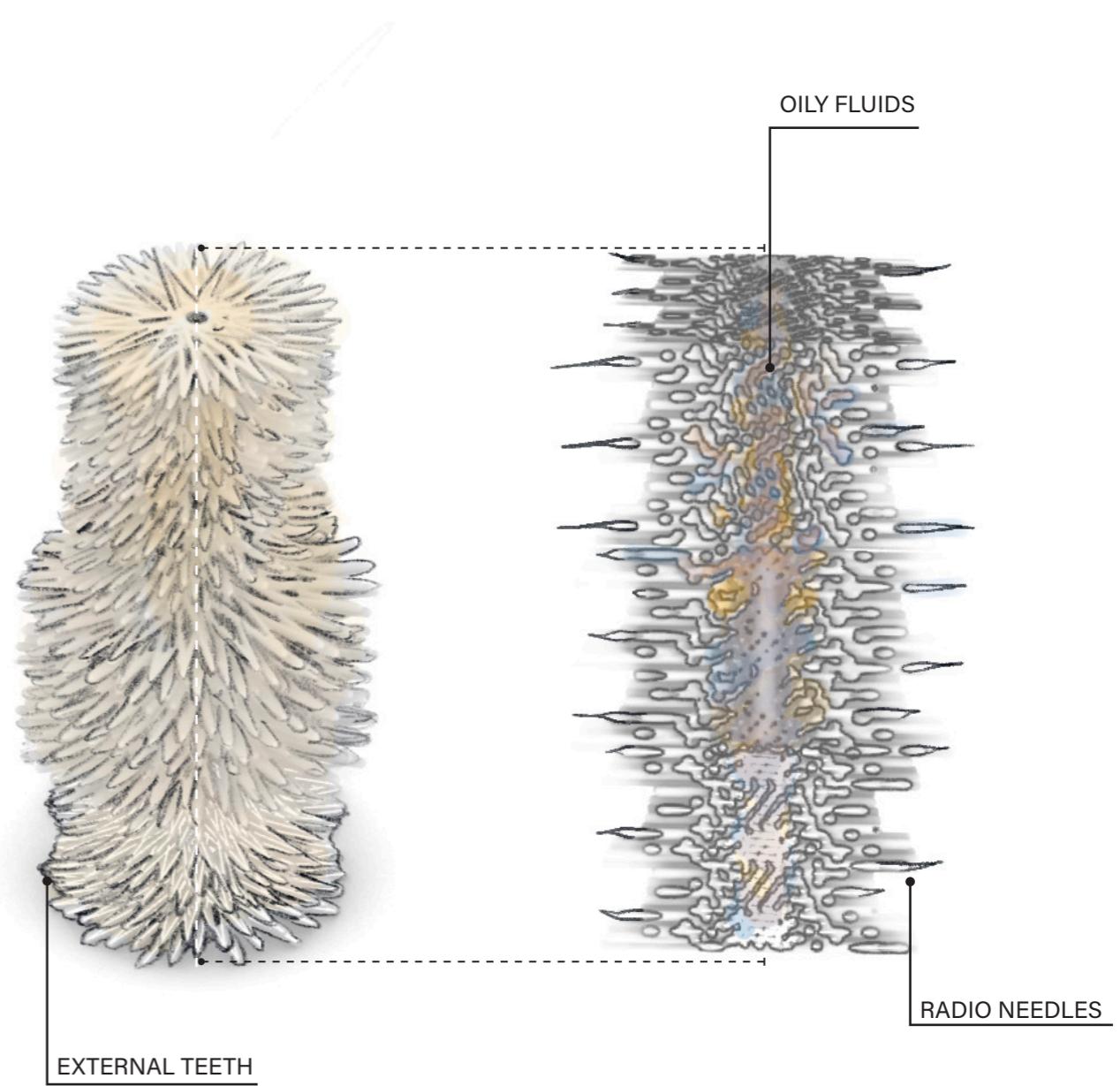
22

GENUS:
CONTORTA

SEARCHIN:
A GRASSHOPPER
PLUG IN

Methodius Concorta

Methodius Concorta is a marvel of adaptation, representing a species sculpted by the relentless forces of nature. Resembling a captivating fusion of marine elegance and terrestrial resilience, *Methodius Contorta* possesses a body composed of over 2,000 spikes (teeth). Each spike is finely tuned to scrape algae off rocks, grind up plankton, and absorb the life-giving nutrients from the ever-changing tides.



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GENUS:
ANEMONASEARCHIN:
A GRASSHOPPER
PLUG IN

The Anemona genus inhabits the underwater world, playing a crucial role in maintaining water purity through its numerous pores. Anemones also serve as shelters for various small yet significant aquatic species, earning them the distinction of being regarded as the protectors of aquatic life

Anemona

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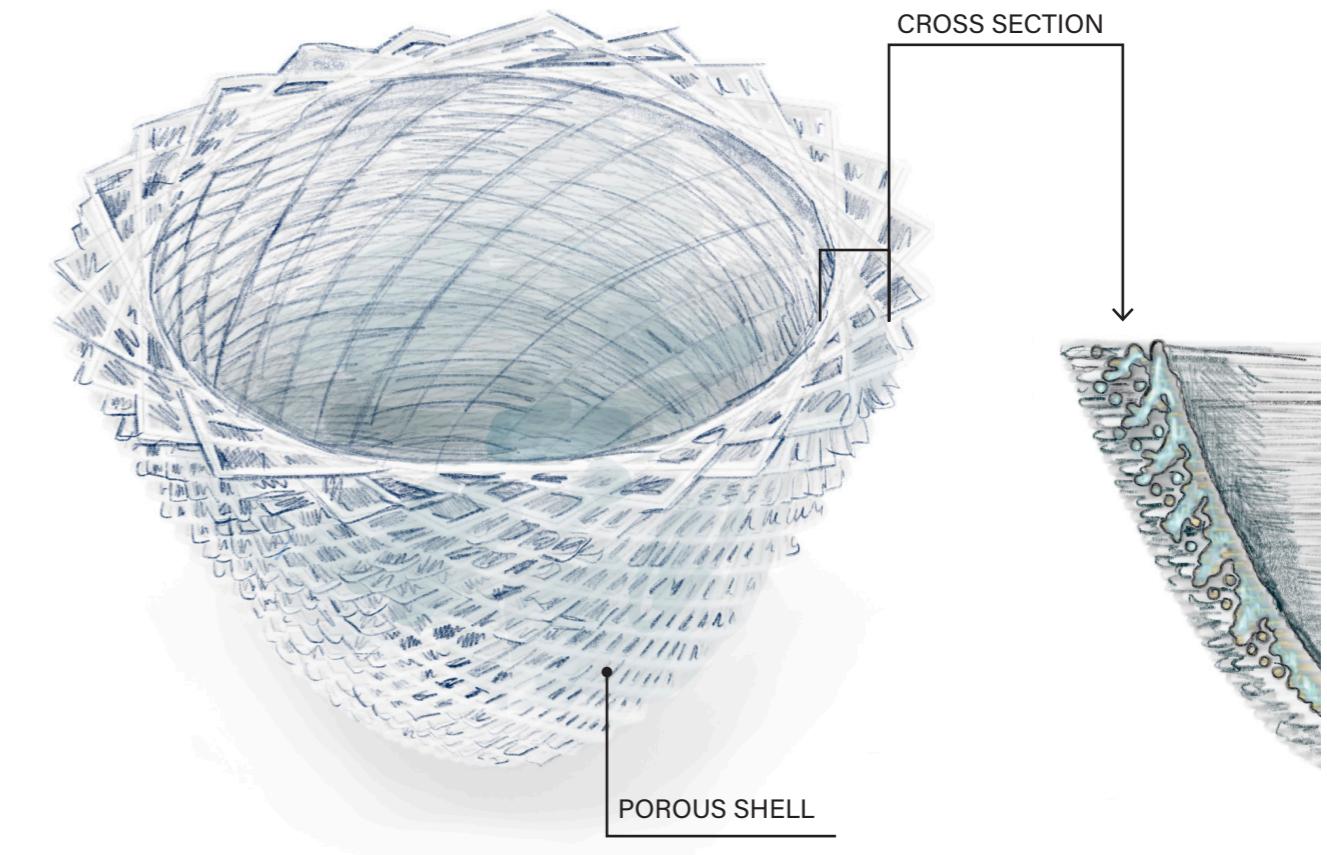
GENUS:
ANEMONA

SEARCHIN:
A GRASSHOPPER
PLUG IN

Anemona Gradiosa

With a mesmerizing blend of radiant colors that mimic the corals surrounding them, these species constitute a living tapestry of underwater beauty. Fish of all shapes and sizes, crustaceans, and other sea creatures coexist within their expansive cavity.

Anemona Gradiosa's magical touch purifies ocean waters, healing the corals, and revitalizing the once-diminished colors.



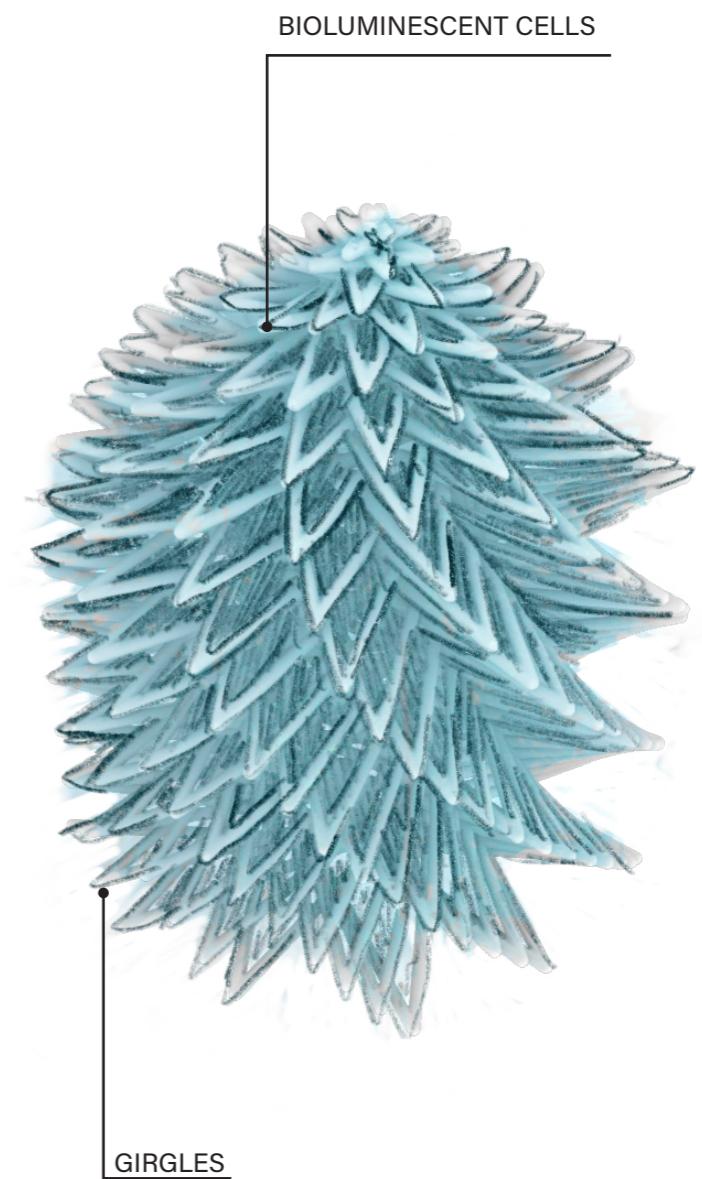
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GENUS:
ANEMONA

SEARCHIN:
A GRASSHOPPER
PLUG IN

Anemona paraenses

A secluded species, not much is known about *Anemona paraenses* other than the fact that they inhabit environments with virtually no light. They are bioluminescent, contributing to the survival of other species in these dark environments.



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GENUS:
ARTHRODOXIUSSEARCHIN:
A GRASSHOPPER
PLUG IN

Arthrodoxius is a genus marked by a slower growth rate compared to most other phylotites. Instead of prioritizing rapid growth, this genus has evolved to exhibit strength, resistance, and a shell-like structure. Arthrodoxius species are predominantly colorless, enabling their bodies to achieve nearly invisibility to potential predators.

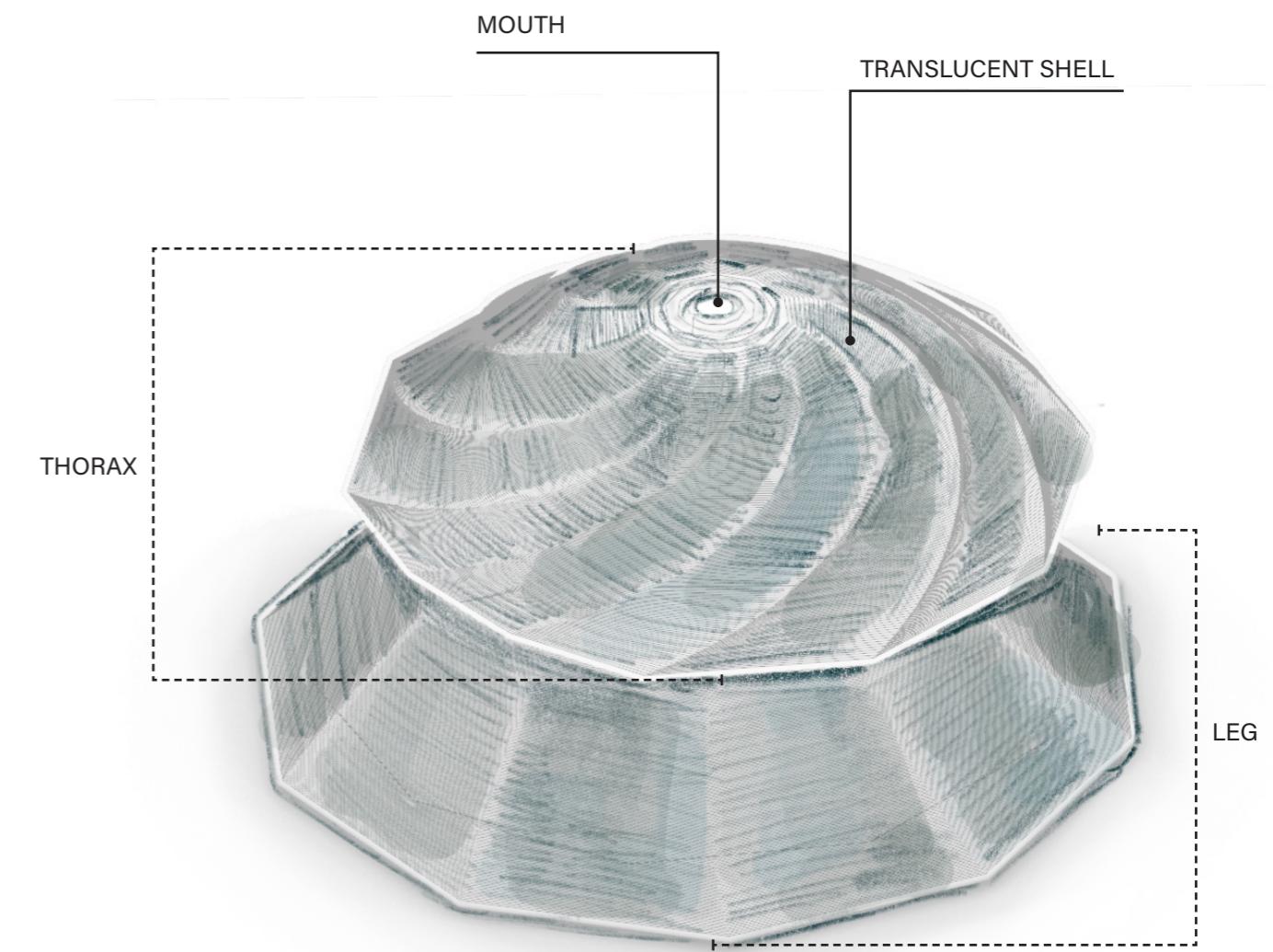
Arthrodoxius

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GENUS:
ARTHRODOXUS
SEARCHIN:
A GRASSHOPPER
PLUG IN*Anthrodoxis Sylvvestri*

Anthrodoxis Sylvvestri is a small, saucer-shaped creature adorned in a dazzling shade of yellow that sparkles like sunshine.

Anthrodoxis Sylvvestri spend their days exploring the nooks and crannies of Chromara, their saucer-shaped body allows to glide gracefully through the air with the slightest breeze. Their wings are delicate and translucent like the petals of a flower.

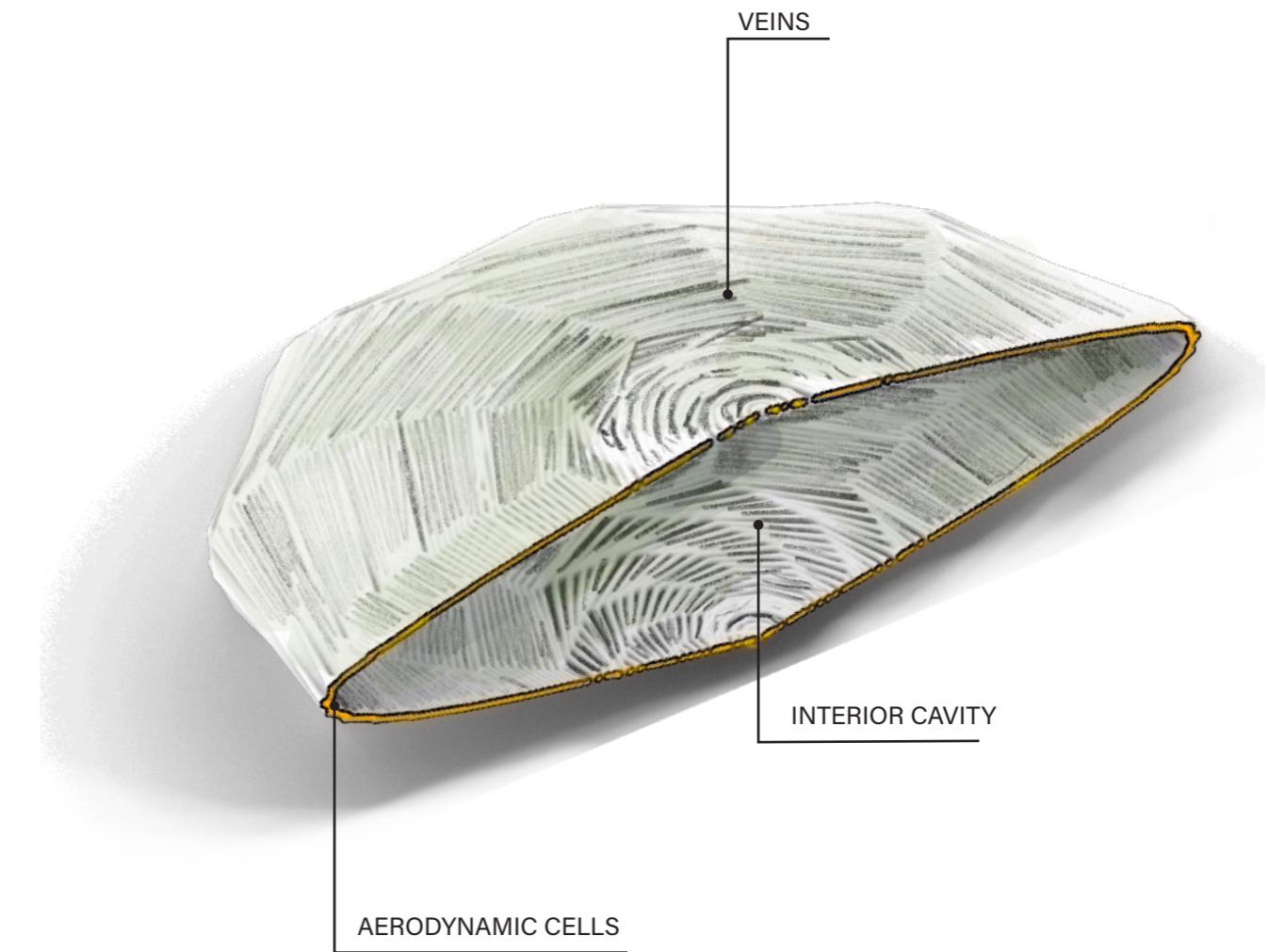


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GENUS:
ARTHRODOXUS

SEARCHIN:
A GRASSHOPPER
PLUG IN*Anthrodoxis Bragensi*

Anthrodoxis Bragensi, is a more primitive counterpart to the radiant *Anthrodoxis Sylvestri*. Unlike their colorful and vibrant cousin, *Anthrodoxis Bragensi*'s body, a solid and heavy mass, lacks the ability to soar through the skies. But *Bragensi* possessed a unique strength and resilience. Their thick rugged body allowed him to roll with astonishing speed across the terrain, traversing the rocky landscapes with speed and precision.



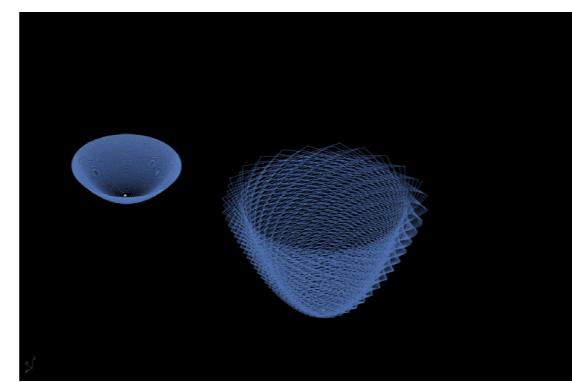
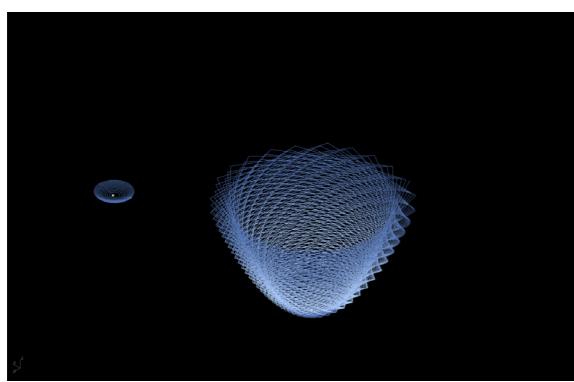
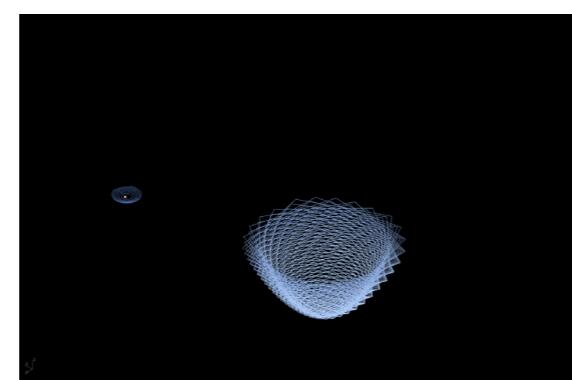
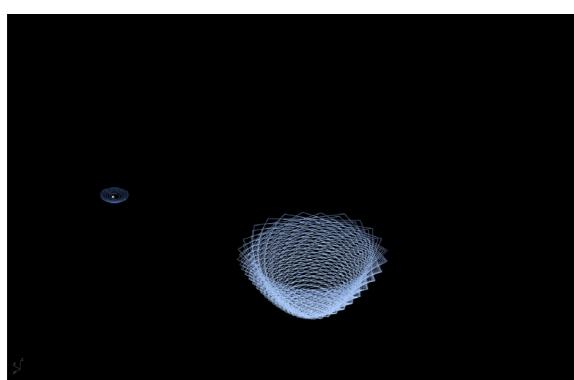
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INTRO AND INFO

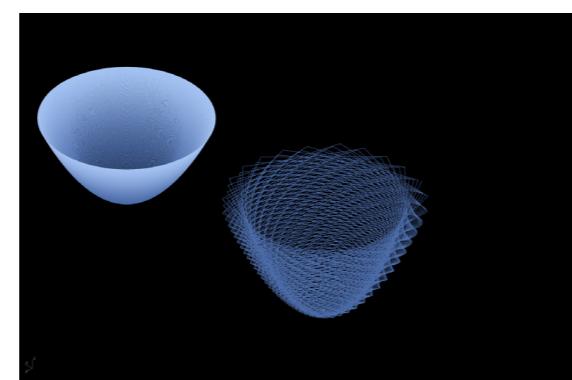
SEARCHIN:
A GRASSHOPPER
PLUG IN

Instructions
+
info

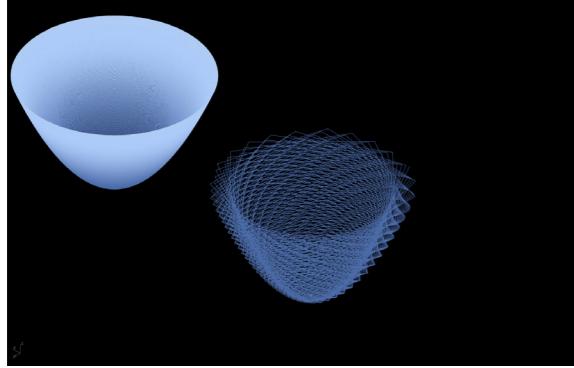
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seaUrchin polyline achieves full height



Continuous 3D printing polyline not yet at full height



Linear Length: 103222 mm

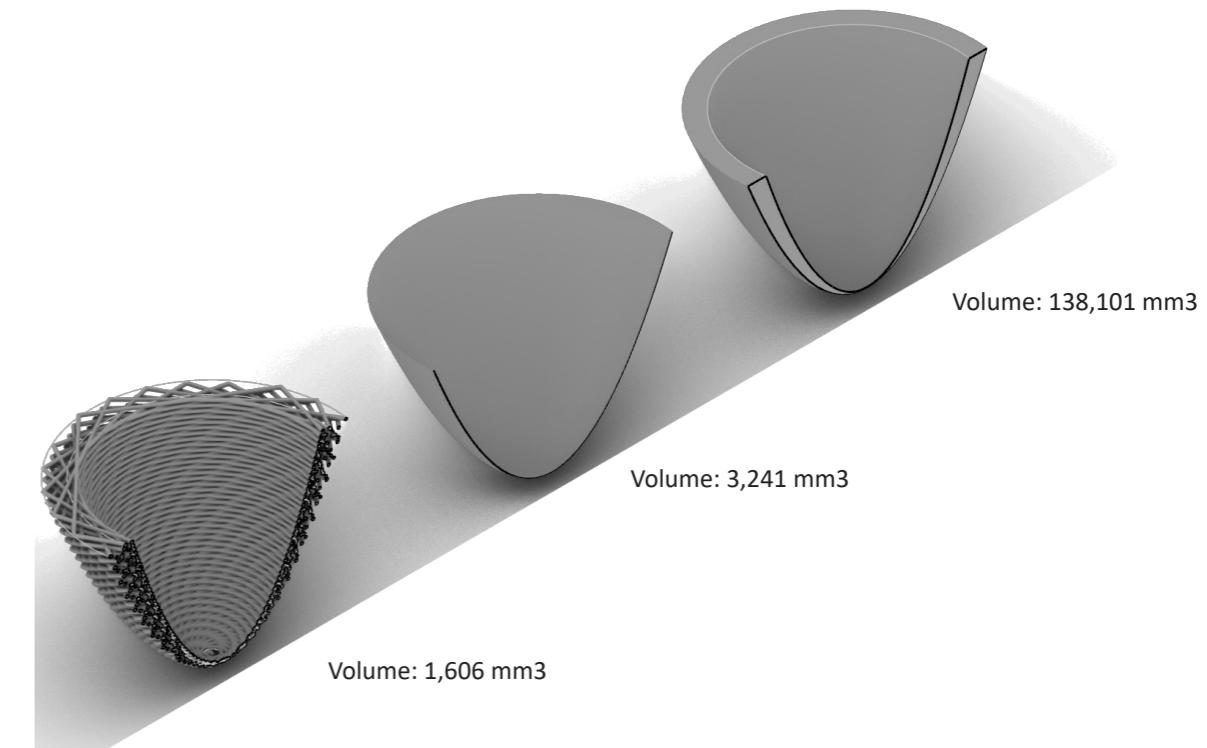
1. Material Optimization of the Anemona Genus
- This geometry achieves considerable heights while minimizing material usage. Comparison of the Traditional Printing Process for a Cone Versus Cone Printing Path Utilizing SeaUrchin

SEAURCHIN

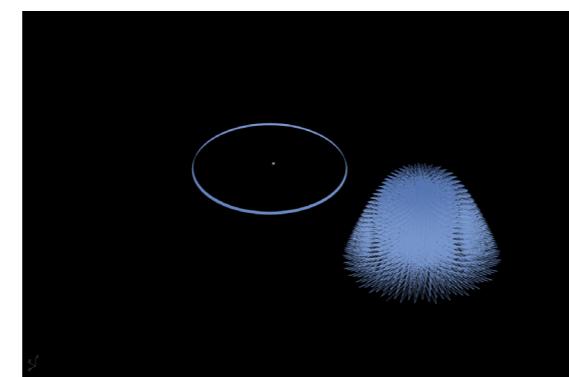
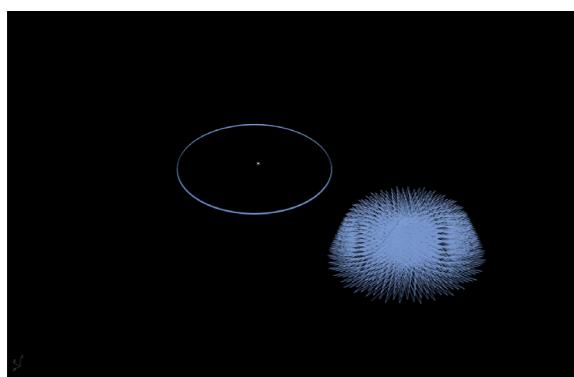
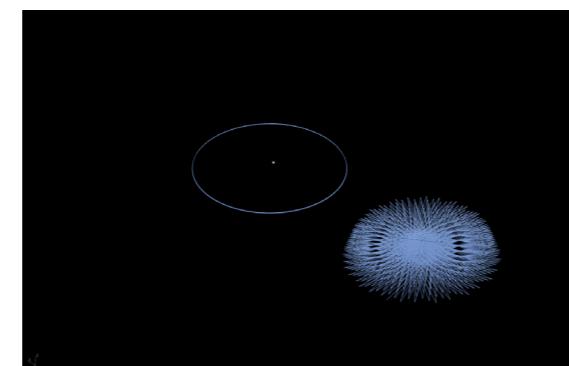
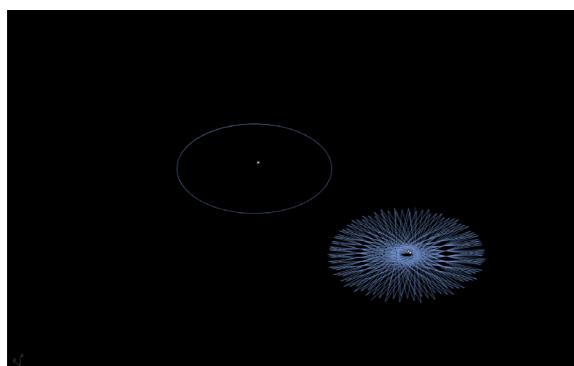
INFO

SEAURCHIN

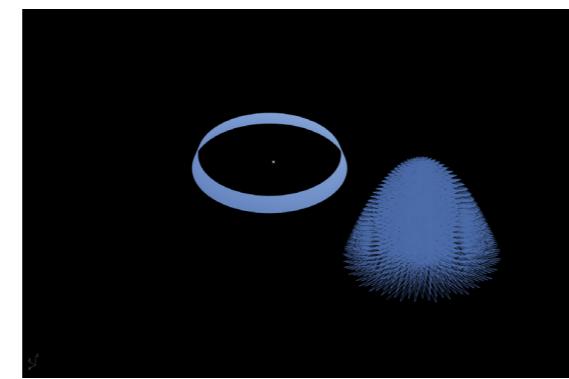
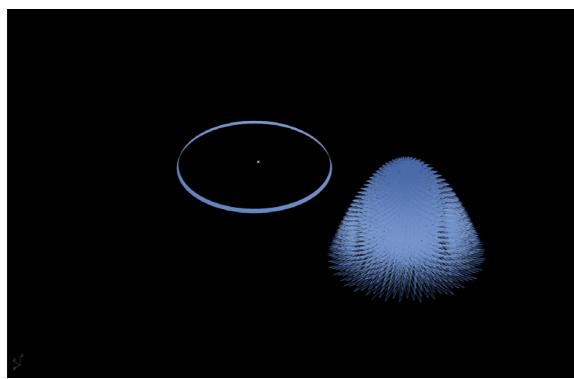
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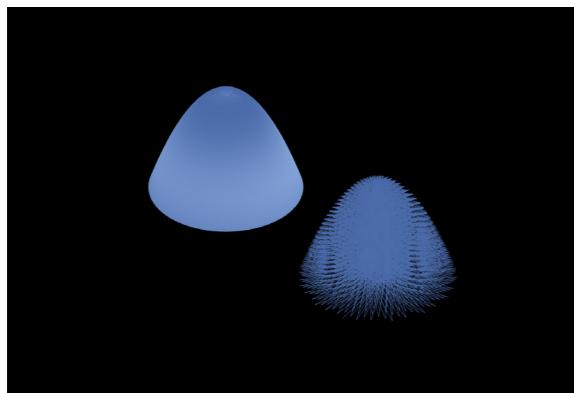
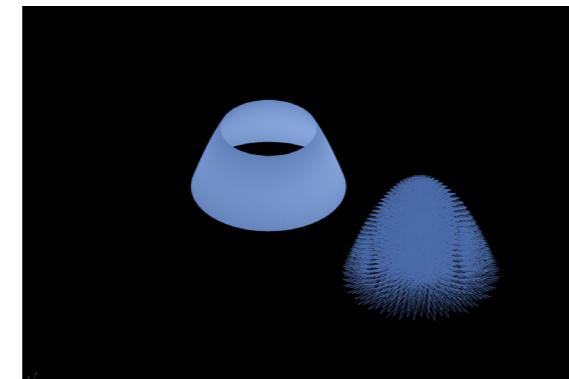
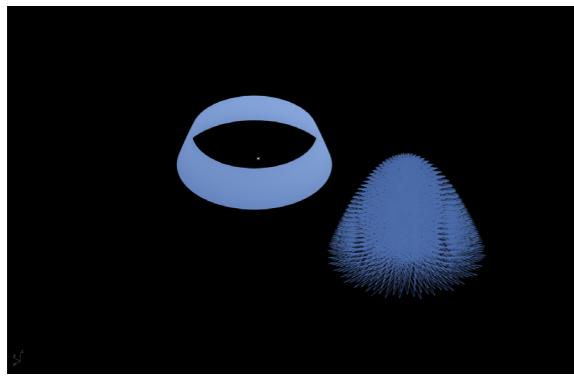
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SEAURCHIN

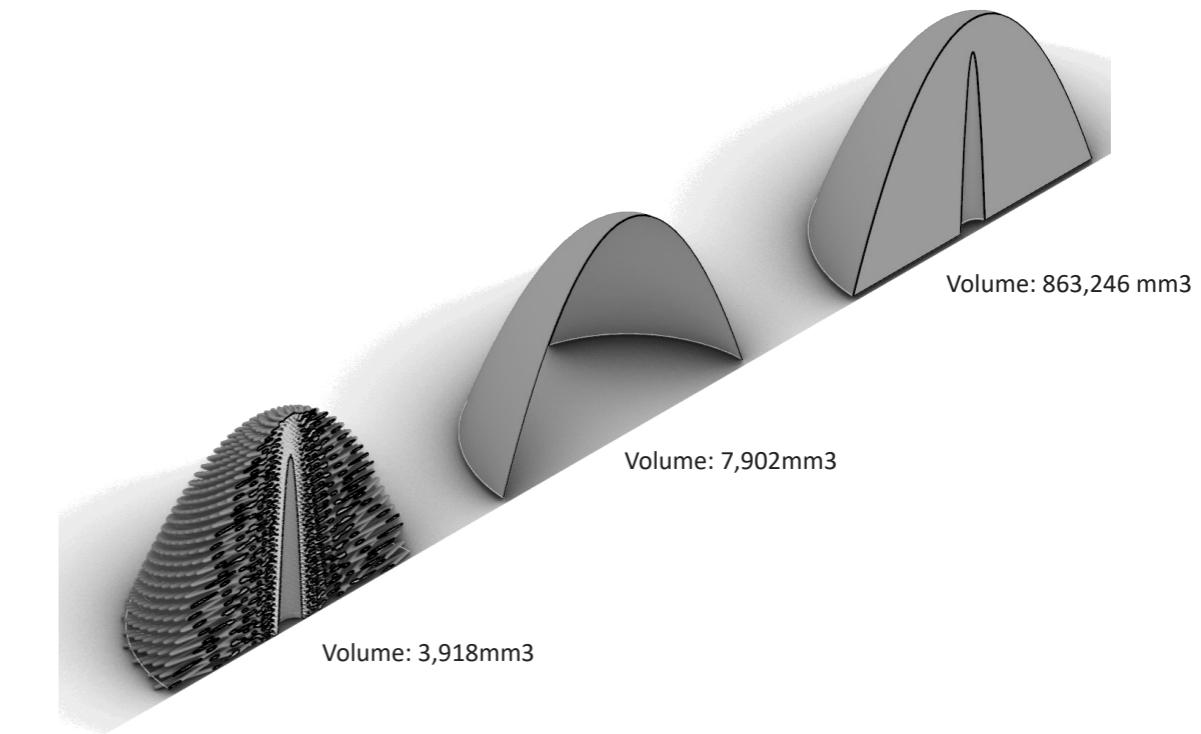


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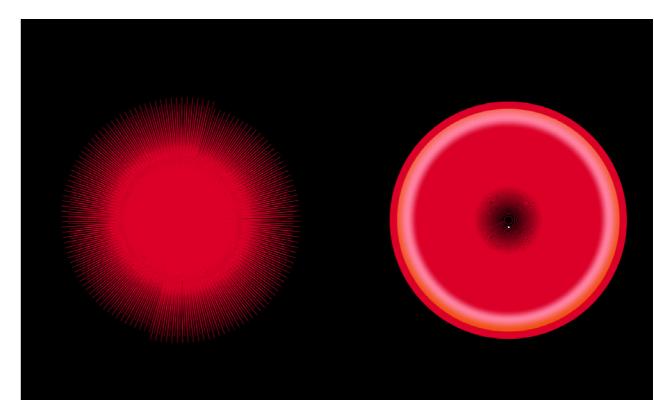
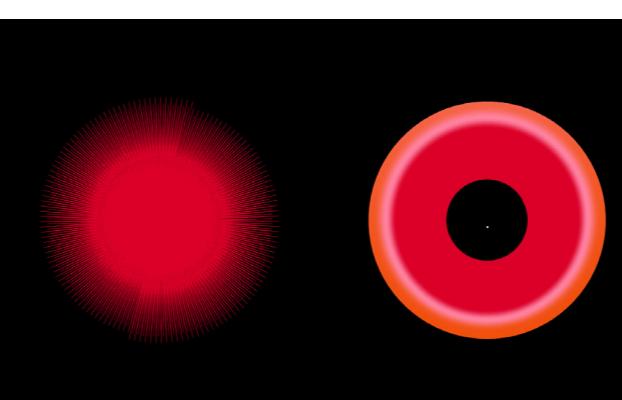
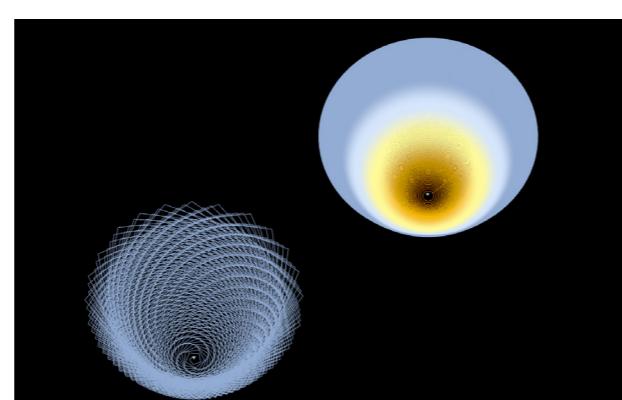
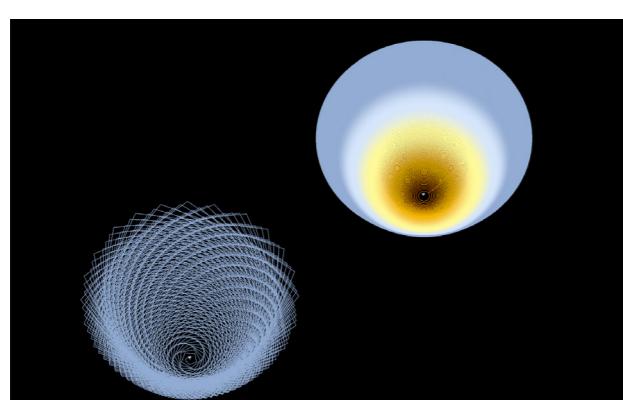
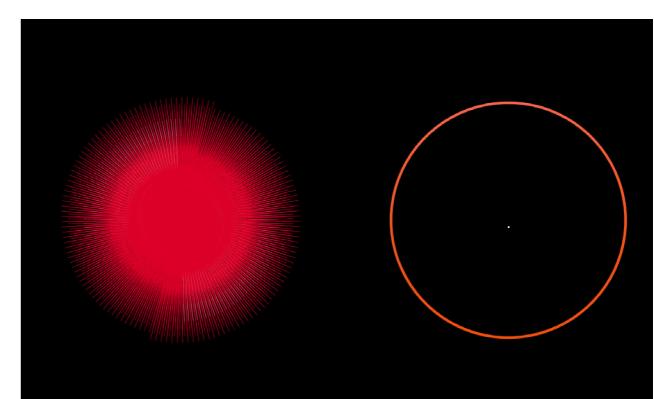
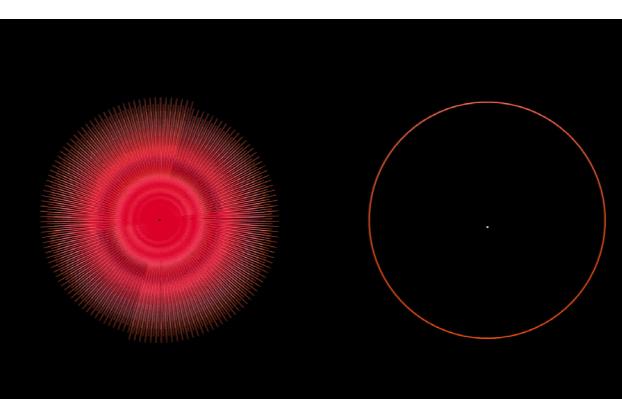
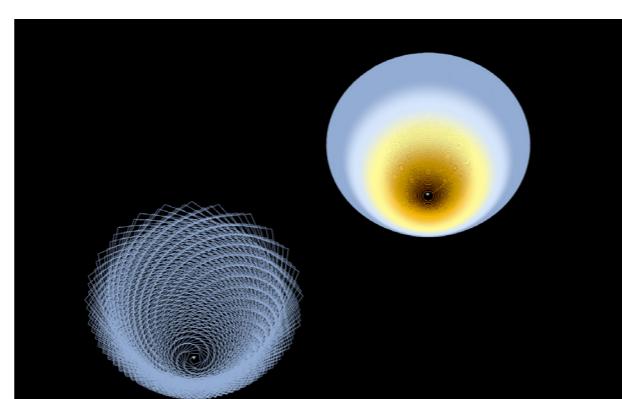
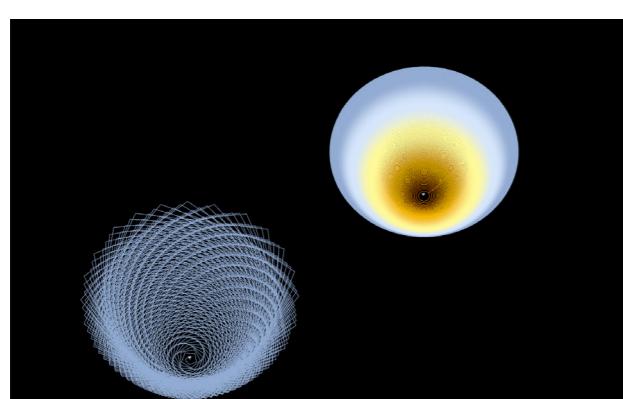
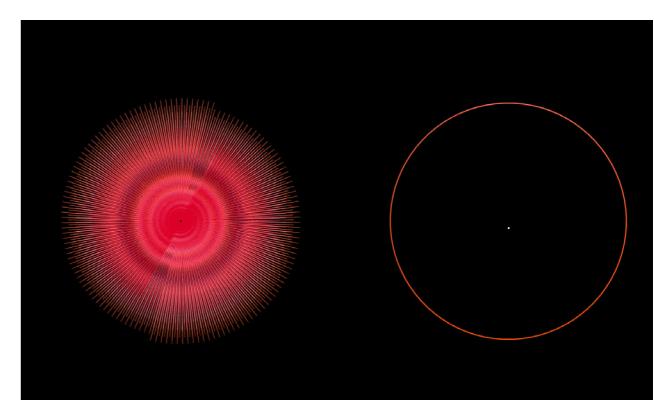
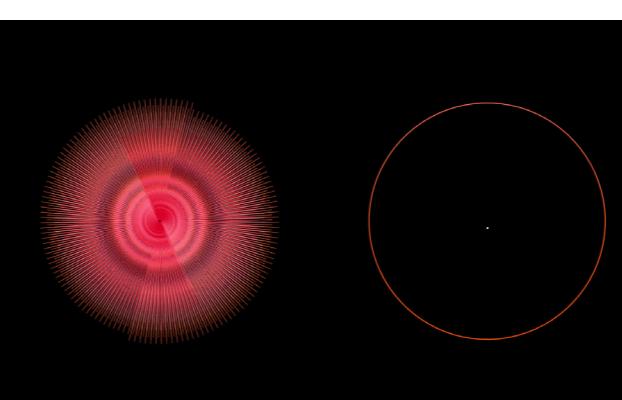
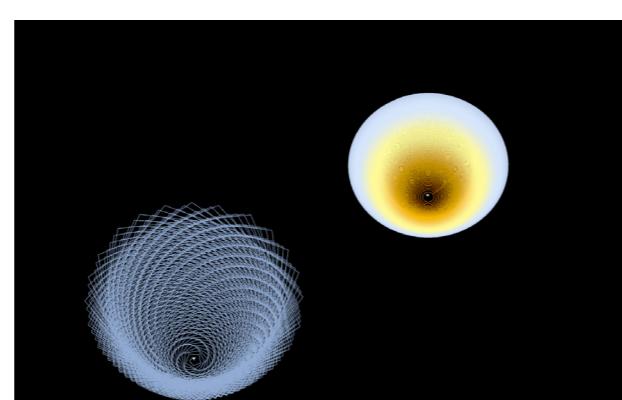
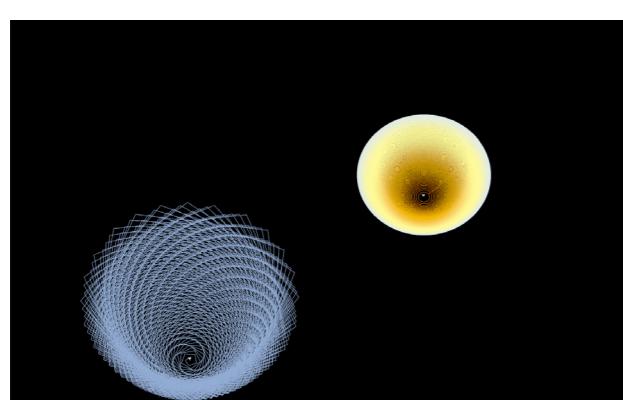
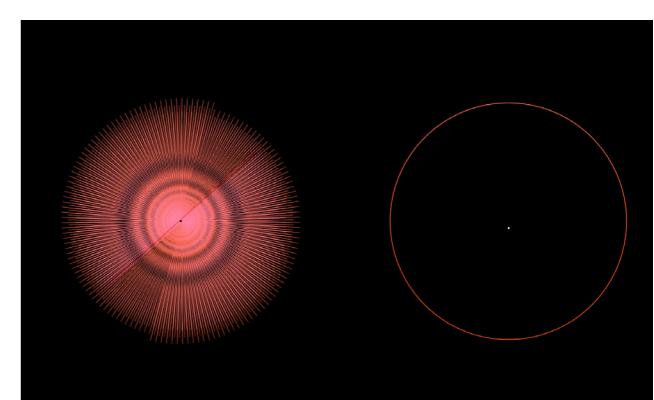
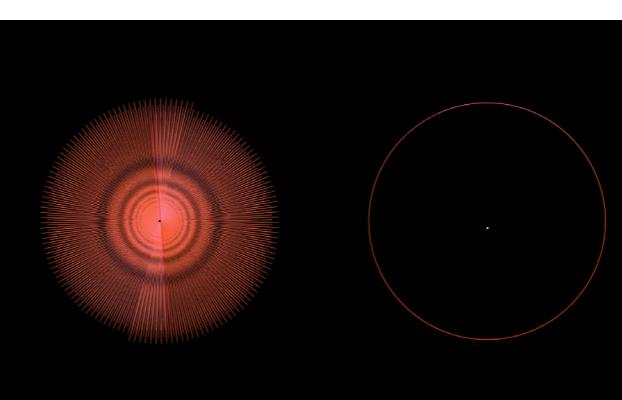
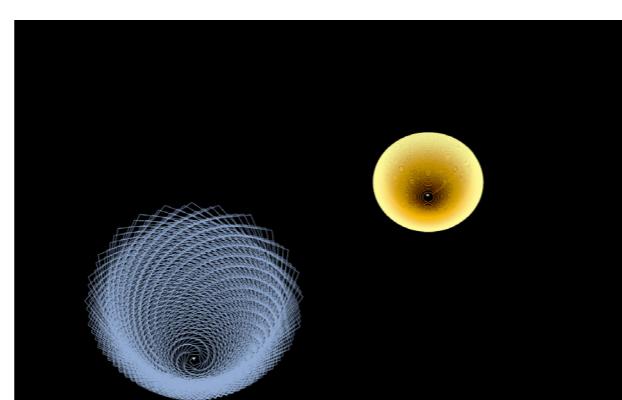
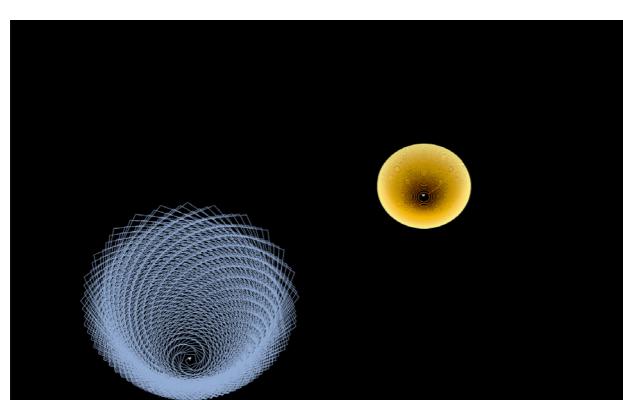
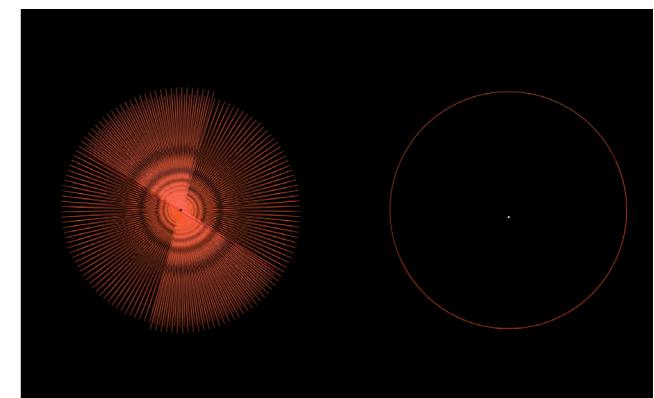
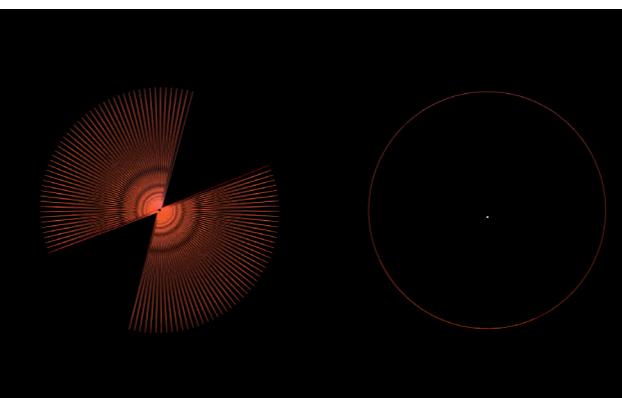
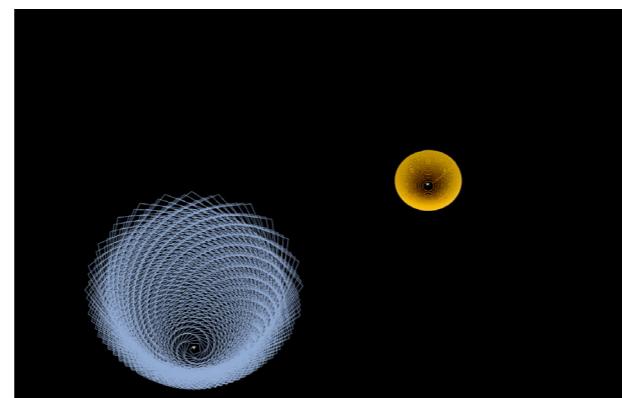
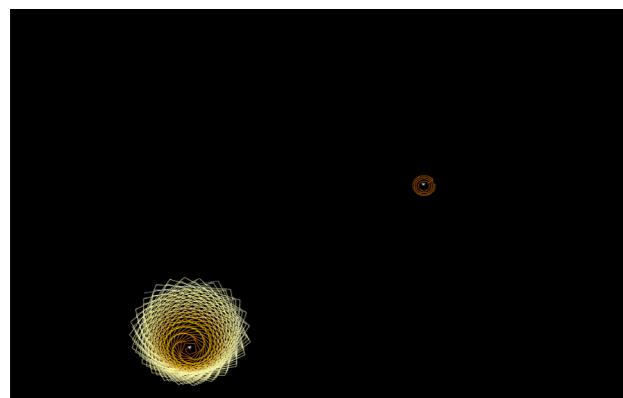


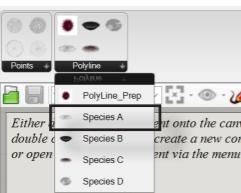
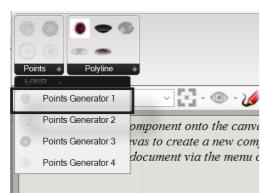
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133173 mm

Plain polyline:
162448 mm



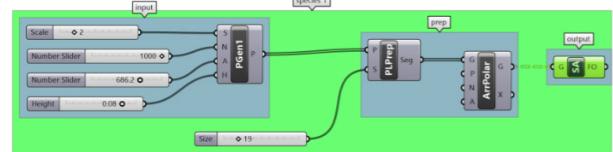
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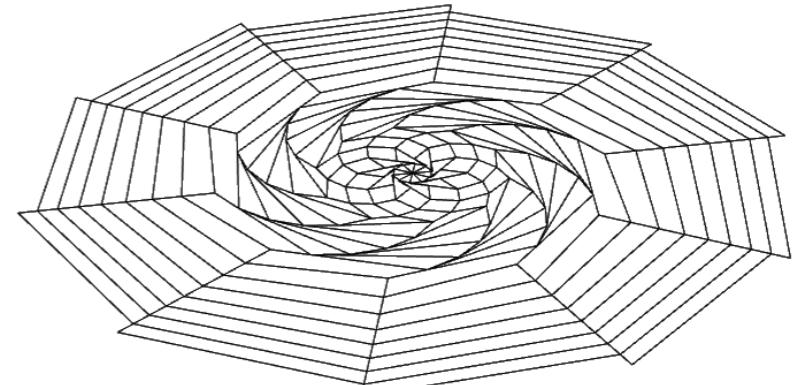


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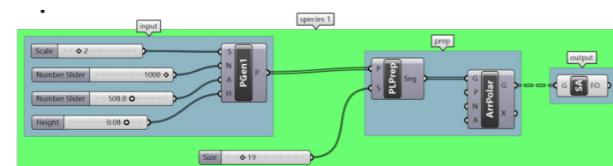
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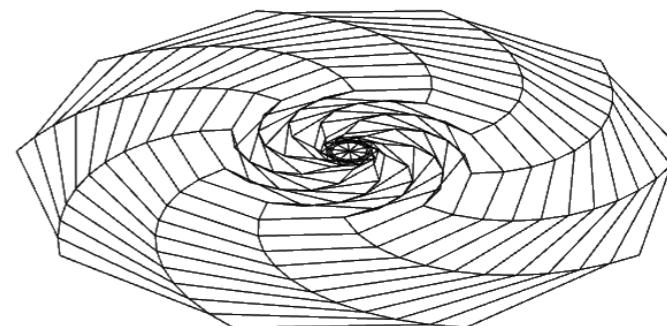
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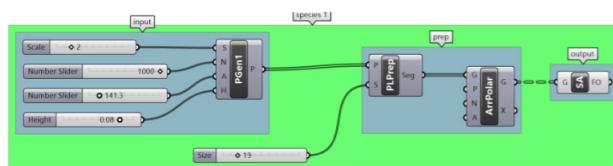
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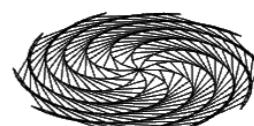
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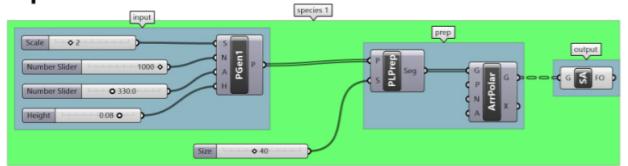
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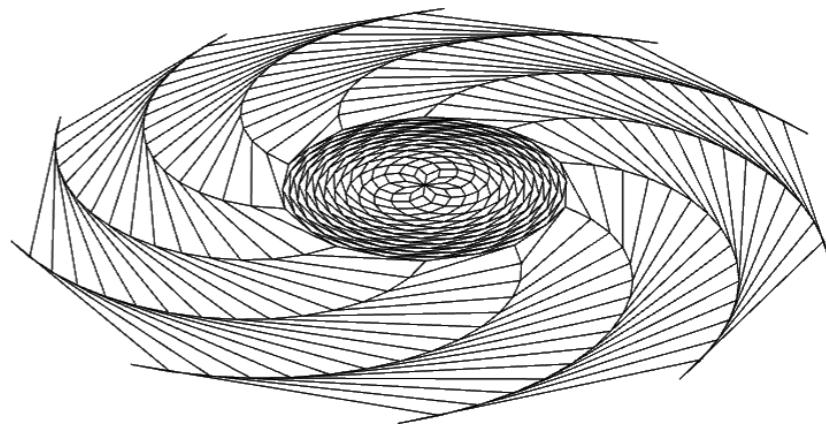
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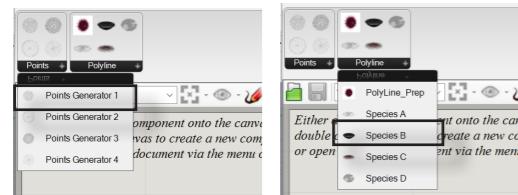
SEARCHIN

SEARCHIN

EXAMPLES

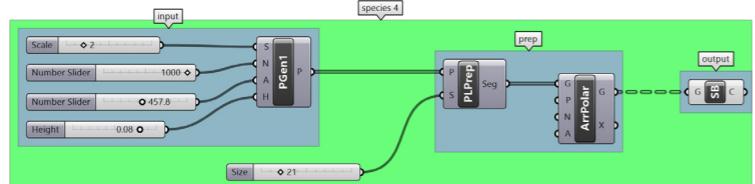
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SPECIES

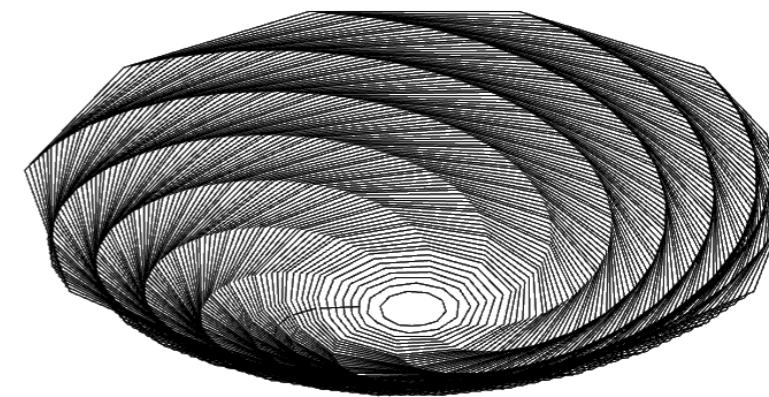


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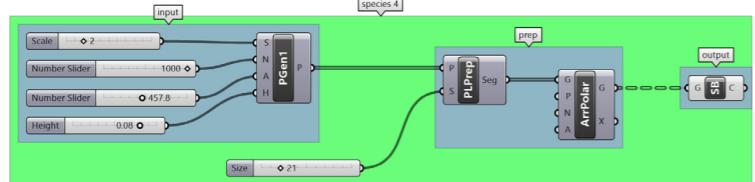


SEAURCHIN

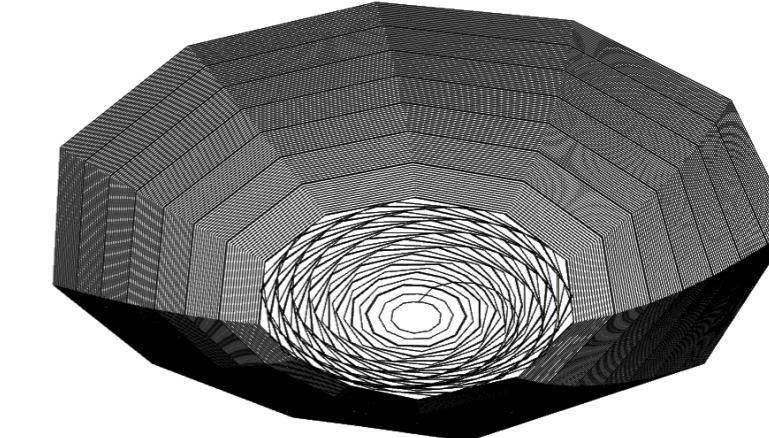


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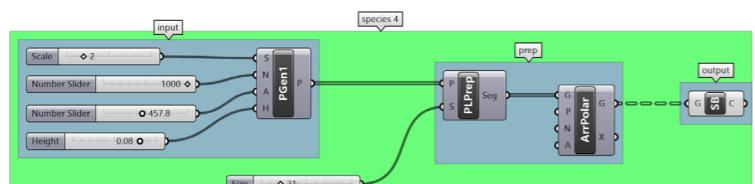


EXAMPLES

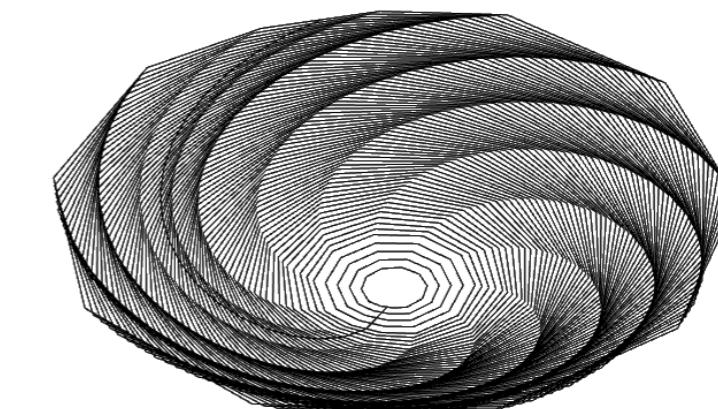


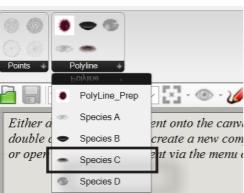
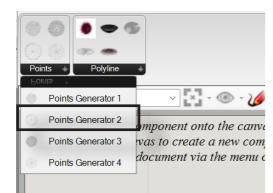
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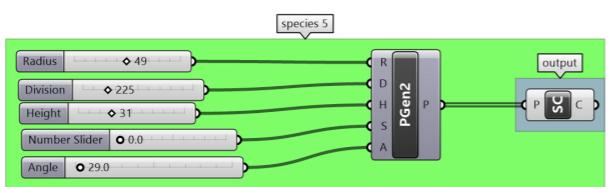
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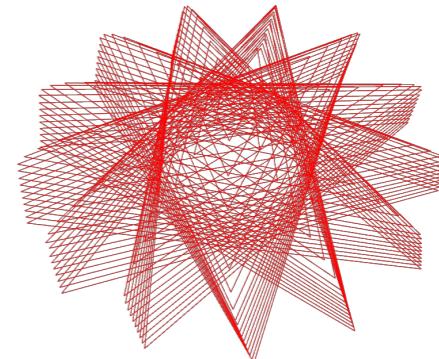
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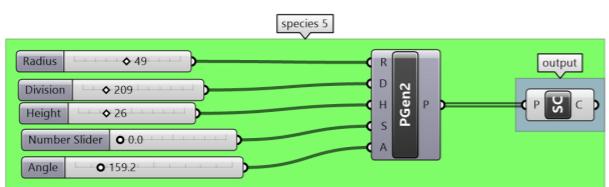


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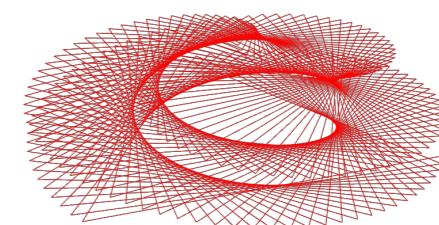


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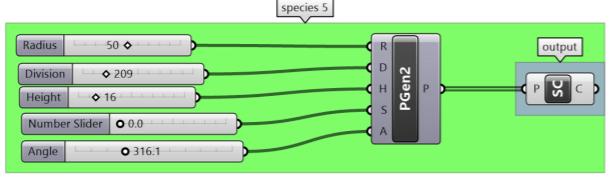


EXAMPLES

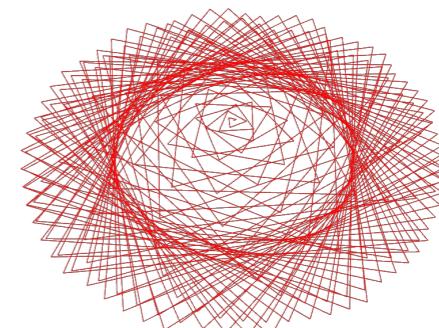
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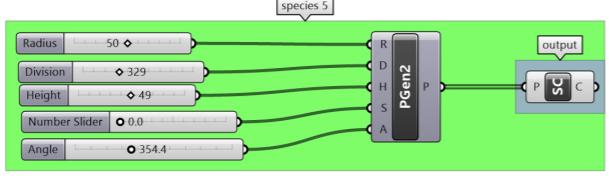
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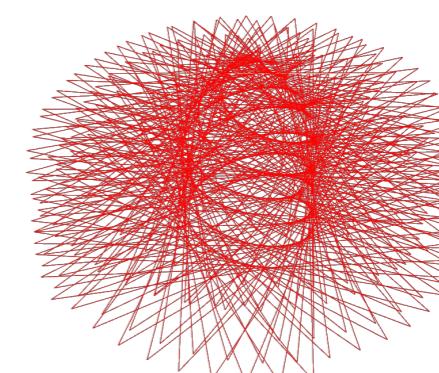
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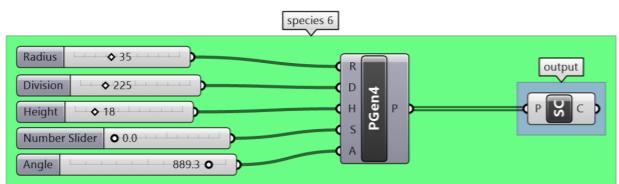
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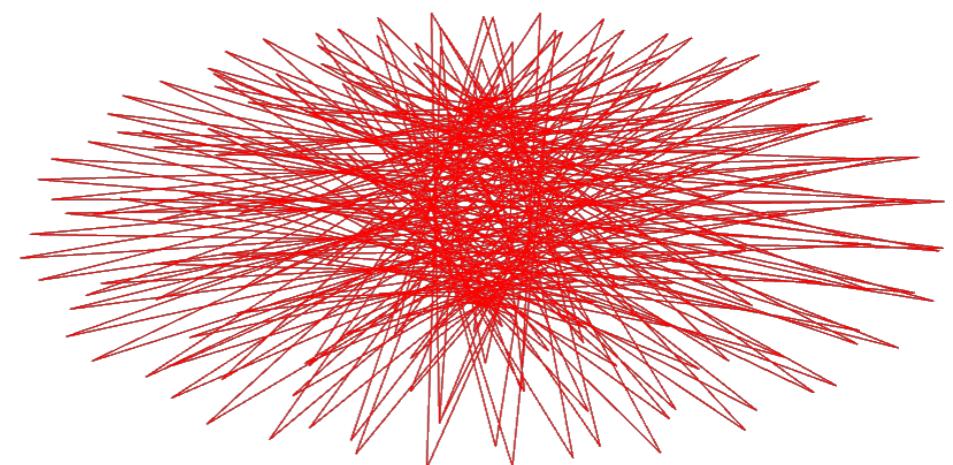


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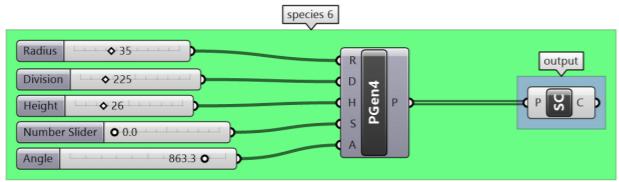


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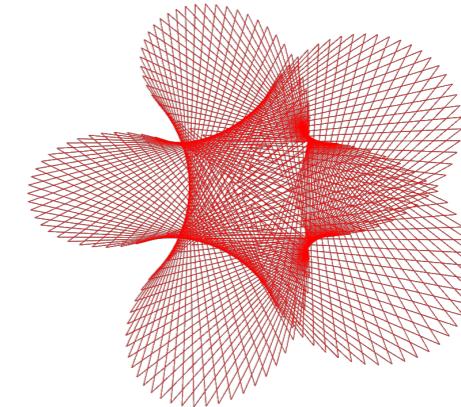


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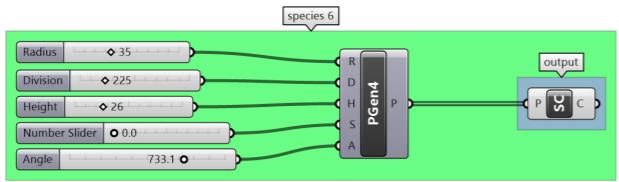


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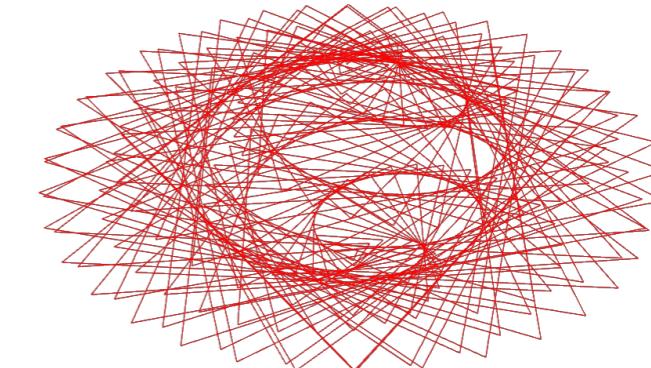


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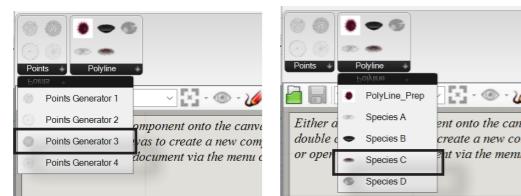
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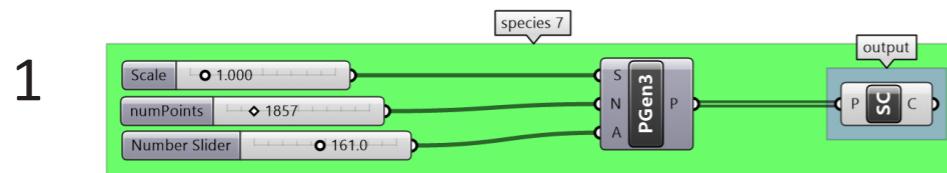
EXAMPLES



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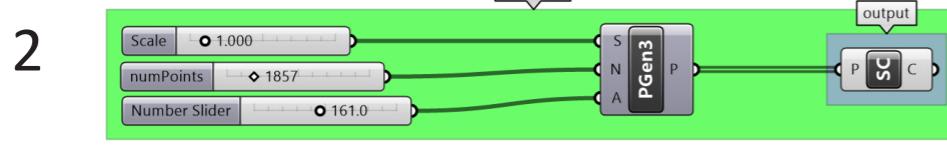
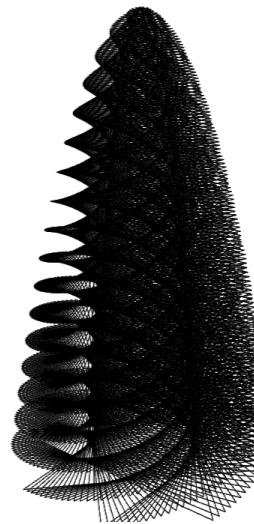


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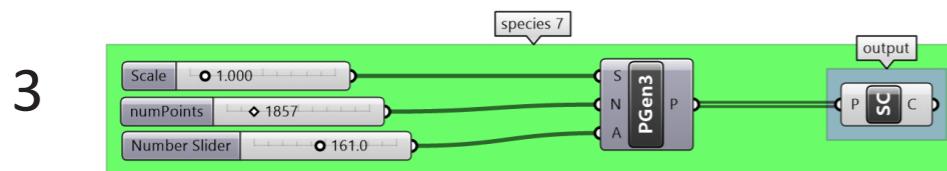
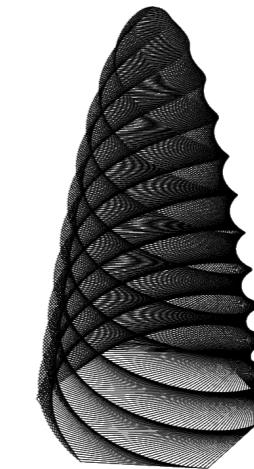
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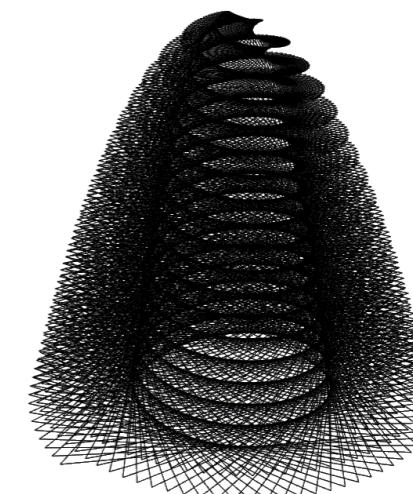
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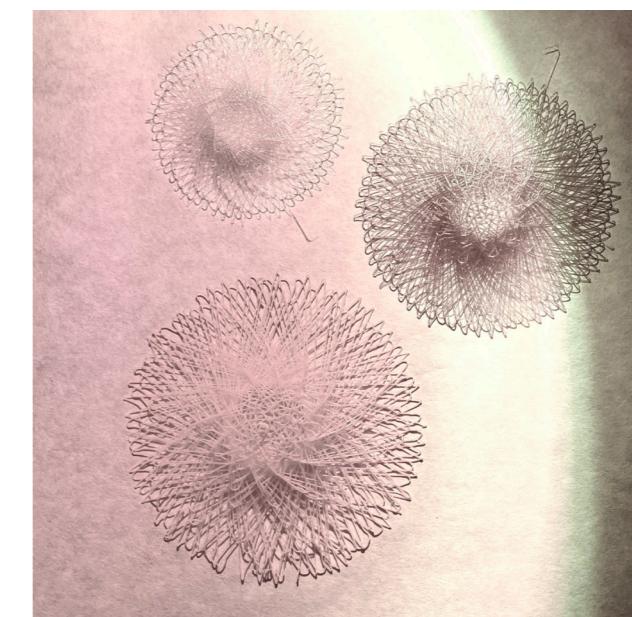
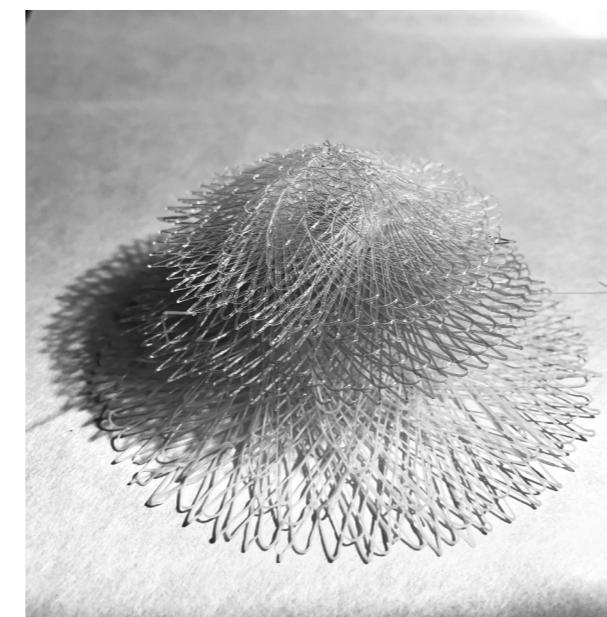
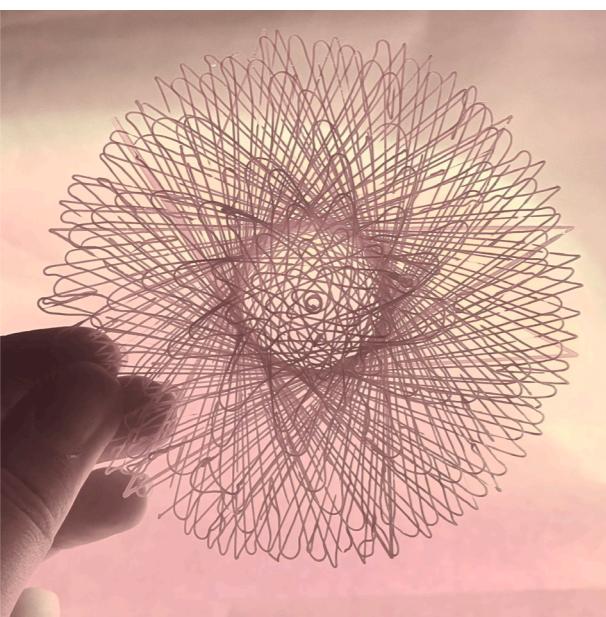
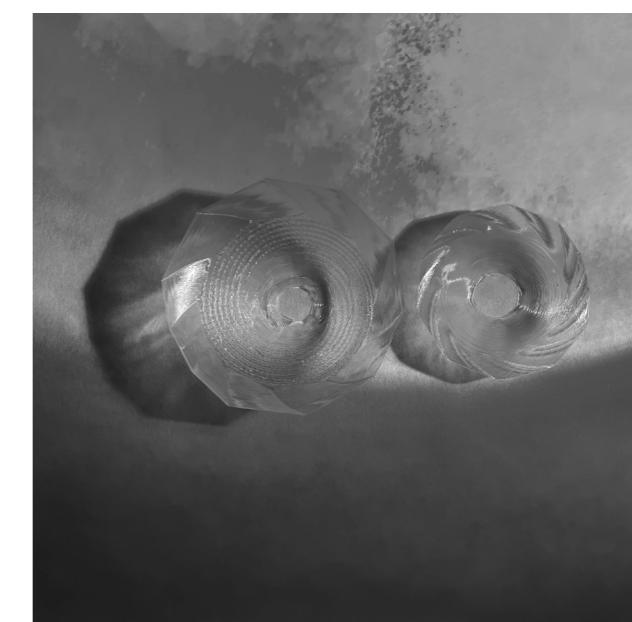
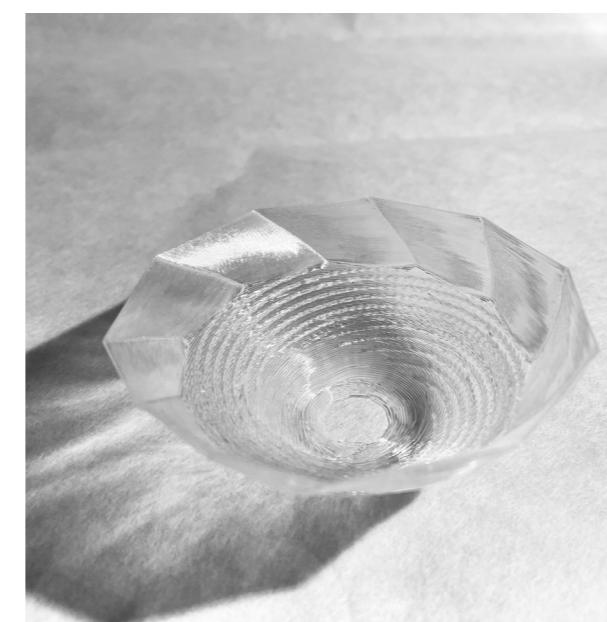
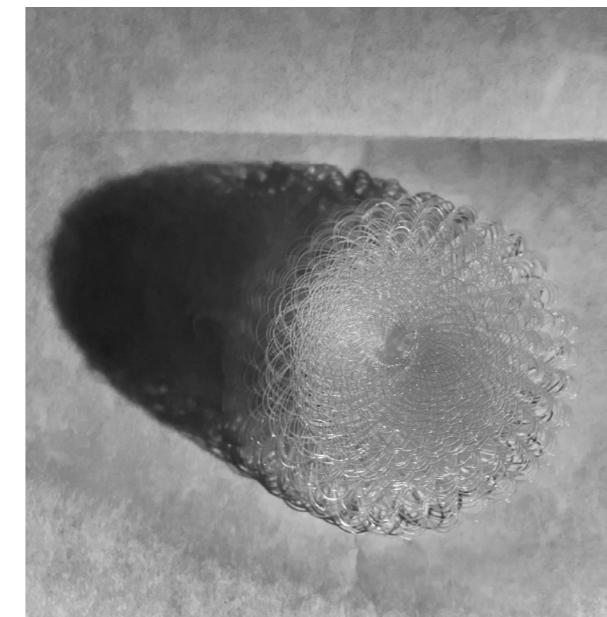


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